Angelo P. Giardino · Michelle A. Lyn
Eileen R. Giardino *Editors*

A Practical Guide to the Evaluation of Child Physical Abuse and Neglect

Third Edition

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This book is dedicated to SuEllen Fried, MA, and Maura Somers Dughi, JD, who are the two Lifetime Members of the Prevent Child Abuse America Board of Directors. These two outstanding child advocates have effectively worked over decades to raise awareness about the need of children and families to live and grow in safe and nurturing environments. Both SuEllen and Maura have been instrumental in catalyzing local, regional, and national efforts to prevent child abuse and neglect before it ever happens. They are inspirational figures who give voice to the vulnerable and to the resilient among us and countless children and families have benefited over the years from their tireless efforts.

Angelo P. Giardino
Michelle A. Lyn
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Foreword

Eight years have passed since the previous edition of this book, and as I reflect on this time, I am reminded of how much we have accomplished in the care of children and families dealing with abuse and how much is still left to be done. In 2017, I had the honor of serving as the President of the American Academy of Pediatrics, representing the voices of 70,000 pediatricians and other health care providers committed to the health and well-being of children and families in the USA. This role allowed me to see the good and bad news we have regarding children and their safety. On the good news side, we continue to take heart that a great deal of professional attention is focused upon the problem of child abuse and neglect. In every state of our country, there are mandatory reporting laws that require nurses, physicians, and social workers to report suspicions of maltreatment to the appropriate authorities for investigation. The act of reporting provides legal immunity to the reporter except when performed in bad faith. Progress in understanding the factors that place children at risk for harm from physical abuse and neglect now permits effective prevention and intervention initiatives. The peer-reviewed literature dealing with child abuse and neglect has proliferated with high-quality work being done and reported on the many dimensions related to the epidemiology, mechanism, treatment, and prognosis of child maltreatment. Efforts are being directed toward developing an evidence-based approach to the prevention of child abuse and neglect. Home visiting programs stand out as a shining example of the progress we can make supporting young parents to become excellent caregivers to their children, thus ensuring the health and well-being of the next generation. These are some of the positives. However, there is bad news as well, and negatives exist and remain as reasons for concern. Despite a tremendous amount of attention to the problem of maltreatment, there are still too many cases. While the incidence in the USA has been declining recently, it still remains at an unacceptable level. A single case is one too many. There is increased awareness among both the professional and lay members of our society. Underreporting continues to be a problem. There is a different standard for health professionals reporting suspected child abuse and a layperson reporting the same. The work of Jenny and colleagues documented that victims of abuse are at times missed on initial evaluations by physicians. This group of patients

presents on subsequent visits with more serious signs of abuse. This book represents a valuable and current resource for health professionals who can use it to guide the evaluation of children suspected of abuse or neglect.

In 1996, the World Health Organization declared violence against children a public health priority, mentioning specifically gun violence. Children and families remain vulnerable both in the USA and internationally as well. The words of the Secretary General of the United Nations spoken in the 2006 "World Report on Violence against Children" still ring true: "The central message of the study is that no violence against children can be justified; all violence against children can and must be prevented. Every society, no matter its cultural, economic, or social background, can and must stop every form of violence. A multidimensional approach, grounded in human rights principles and guided by evidence-based research, is urgently needed to prevent and respond to violence in all circumstances." Quantifying the actual number of child maltreatment victims globally is difficult because of variations in definitions from nation to nation, limited data collection efforts, and the tragic realization that some forms of violence against children are socially acceptable in some parts of the world and indeed may be legal and occasionally state-sponsored. Add to this risk and misery the waves of child victims seen almost nightly on our video screens fleeing worn-torn conflicts after being exposed to unspeakable acts of violence, now including chemical attacks once thought eliminated in modern civilized times. The conscious institutional indifference to the plight of fleeing children and families is a form of neglect.

In critical care, my own specialty, we often provide care to child abuse victims and families who suffer from the more extreme effects of inflicted injuries. Rigorous work in the field of outcome measures determines that victims of child abuse have longer hospital lengths of stay, more complications, and more difficulties in discharge planning on average when compared to children with noninflicted injuries. They are also more likely to be readmitted to hospitals. Each year, at least 1700 children are known to die as a result of child abuse and neglect. More than twice as many die as a result of intentional penetrating wounds. Recent estimates show that 90% of the fatal cases of child abuse and neglect are in children under 3 years of age and more than 60% are in children under 1 year of age. At Texas Children's Hospital, the former Chair of Pediatrics in 2004, Dr. Ralph D. Feigin, addressed the fact that more children died as a result of abuse than malignancy. Texas Children's responded by building a well-organized and strong child protection team to assist our community in evaluating suspected cases, training large numbers of health care professionals and child advocates in how best to recognize child maltreatment and then to comply with the mandated reporting responsibility. Additionally, the team has an academic component to engage in further work in our understanding of the multiplicity of aspects of this social problem. Now, in addition to this traditional clinical and academic work, this child abuse team addresses prevention efforts, initiatives to promote resilience in our communities, and academic work around a host of other adversities such as food insecurity, postpartum depression, and the vulnerabilities faced by children whose parents are incarcerated. While we have done much, a great deal of work remains to be done in order to ensure that all children have the greatest

opportunity to be raised in a safe and nurturing family who are supported by a concerned and interested community.

We are traveling on a long journey toward dealing with child abuse and neglect. This book represents a practical contribution to the understanding and evaluation of child maltreatment and ultimately toward its prevention and elimination.

Houston, TX, USA Fernando Stein
June 2018

Preface

> *… something I learned in 1968 when I walked into the University of Colorado School of Medicine as a pediatric intern. I learned then, from [C.] Henry Kemp, that child abuse and neglect is not just a medical problem, a social problem, or a legal problem. It is ultimately a child's and a family's problem, and solving it requires each of us in medicine, social work, law enforcement, the judiciary, mental health, and all related fields to work together for that child and family*.
>
> (Krugman 1991, p. 101)

Child abuse and neglect is a major threat to the health and well-being of children throughout the world. Maltreatment has long been known to occur primarily in the family setting and is a problem firmly rooted in the pattern of caregiving provided to the child (Ludwig and Rostain 1992). Historical review and cultural studies indicate that caregivers have maltreated children in all cultures and nations of origin (Hobbs et al. 1993; Korbin 1987; Lazoritz 1992; Levinson 1989; Radbill 1987; Solomon 1973). Over the past decade, we have seen growth of the child protection movement, a steady increase in the professional literature dealing with child abuse and neglect, increased public awareness of the issues surrounding child maltreatment, and the promulgation and enactment of model legislation. Despite a greater focus on the issues of abuse, child abuse and neglect remain a major problem facing children and families today (CM 2008).

The revised manual, *A Practical Guide to the Evaluation of Child Physical Abuse and Neglect (2nd edition)*, is intended as an updated resource for health care professionals. Many of the new photographs that have been included in this revision came from the teaching archive at Texas Children's Hospital and we recognize the dedication and commitment of medical photographer, Jim deLeon, who tirelessly sought to serve children and families during his quarter century of service at the hospital. It is the purpose of the text to help increase knowledge of abuse and provide easy access to basic information concerning the health care evaluation of a child suspected of having been physically abused or neglected. The manual provides a framework from which to comprehensively evaluate the child and draws upon the most up-to-date literature for the available evidence to support best practices. The intended audience for the manual includes health care providers and

related professionals who work with abused children, including physicians, nurses, nurse practitioners, clinical social workers, mental health professionals, and child protection workers. Law enforcement personnel and attorneys may use the manual as a resource when working with children and families. The text provides practical information with a balance between the areas of content and the comprehensiveness of material included. The authors include clinically relevant information to guide the initial interview, examination, and the accurate documentation of the evaluation of a child who may have been physically maltreated. Toward that end, the ultimate goal of this manual is to assist the professional in performing and documenting a complete and accurate evaluation.

The text uses the terms *health care professional* and *health care provider* interchangeably in recognition that many disciplines provide care to abused and neglected children and their families. The term *parenting* is often subsumed in the term *caregiving* to indicate the practices and actions to which the child is subject.

A Short Historical Reflection on Professional Attention to Child Abuse and Neglect

In undertaking the revision process to produce the second edition, we had the opportunity to reflect upon the professional journey that our field has been traveling upon. This is most clearly illustrated by the trajectory of our peer-reviewed literature regarding child abuse and neglect.

Although child abuse is as old as recorded history, it has become an issue for pediatricians only in the mid-twentieth century. John Caffey first described the association between subdural hemorrhage and long bone fractures in 1946 (Caffey 1946). He recognized that both were traumatic in origin but did not recognize the causal mechanism. Caffey thought that trauma leading to these injuries was either unobserved or denied because of negligence. In one reported case, Caffey (1946) raised the possibility of inflicted trauma but stated that the "evidence was inadequate to prove or disprove [intentional mistreatment]" (p. 172). In the early 1950s, Frederic Silverman (1953) emphasized the repeated, inflicted nature of the trauma, despite denial by caregivers. Subsequent medical literature contained reports of abuse, but little attention was given to the issue. It was not until C. Henry Kempe and his colleagues coined the term "battered child" in 1962 that the medical and legal communities took action (Kempe et al. 1962).

Within a few years, most states in the USA had adopted abuse-reporting statutes (Heins 1984). By 1967, all 50 states had some form of legislation regarding child maltreatment (Fontana and Besharov 1979; Heins 1984). Legislative efforts culminated in a 1974 federal statute called the Child Abuse Prevention and Treatment Act (PL 93–247). This law focused national concern on the prevention, diagnosis, and treatment of child abuse. Model legislation was part of this effort, and states were encouraged to evaluate their statutes and adequately address the issues of child abuse and neglect.

Of historical interest, Kempe first used the term battered child in a 1961 address to the American Academy of Pediatrics to describe young children who were vic-

tims of serious physical abuse. Subsequently, he and his colleagues published a study by the same name in 1962 (Heins 1984; Kempe et al. 1962). The first description was of children generally younger than 3 years old, often with evidence of malnutrition and multiple soft tissue injuries. Subdural hemorrhages and multiple fractures were commonly found. Kempe et al. (1962) also included children with less severe or isolated injuries in their description of the battered child. Although any child with an inflicted injury has been battered, the term battered child is typically used to describe a child with repeated injuries to multiple organ systems. Health care providers who treat children should be able to identify those who are severely abused and injured and should know how to respond accordingly as well.

Fontana et al. (1963) extended the early conceptualization of child abuse to include forms beyond physical injury by introducing the term maltreatment syndrome. Maltreatment included both battered children and children who were poorly fed and inadequately supervised. Fontana et al. (1963) added neglect to the evolving description of child abuse.

The original articles by Caffey (1946), Silverman (1953), Kempe et al. (1962), and Fontana et al. (1963) provide the modern medical history of child abuse. Their insight and persistence set the stage for the recognition of child abuse as a pediatric problem and resulted in an outpouring of medical, social, and psychological literature dealing with abuse and neglect.

Thirty years after the Kempe et al. (1962) article, Dr. Richard Krugman (1992), then the director of the C. Henry Kempe National Center for Prevention of Child Abuse and Neglect, observed how far the child protection movement had come in a short time. He compared the 1962 figure of 447 reported victims of battering to the 1991 estimate of 2.7 million reports of abuse (Krugman 1992). Krugman stressed the staggering disparity between 447 cases and 2.7 million reports, even if not all reports of abuse result in a determination of maltreatment. In addition, Krugman (1992) observed that the 1991 estimate of 2.7 million reports of abuse did not account for the number of unreported cases that were not suspected, misdiagnosed, or simply not reported. Figure 1 shows the exponential growth of the professional literature moving from occasional articles to an evidence base of hundreds and now thousands of peer-reviewed articles currently available.

Child abuse and neglect is now regarded as a public health problem throughout the globe. It is recognized as part of the continuum of violence and victimization against the vulnerable that includes other forms of family violence as well. Paolo Sergio Pinheiro in his August 2006 report to the UN General Secretary made clear that there can be no compromise in challenging violence against children: “Children’s uniqueness—their potential and vulnerability, their dependence on adults—makes it imperative that they have more, not less, protection from violence” (The United Nations Secretary General’s Study on Violence Against Children 2006, p. 5).

It is the responsibility of the health care professional to conduct the health care evaluation of the child suspected of having been abused or neglected, to consider a broad differential diagnosis, and to accurately identify the child’s condition based on the information available. Working in the context of a multidisciplinary team, the health care provider then participates in the investigation and works to ensure proper medical and community action that involves treating the child’s existing injuries and ensuring protection from future injury.

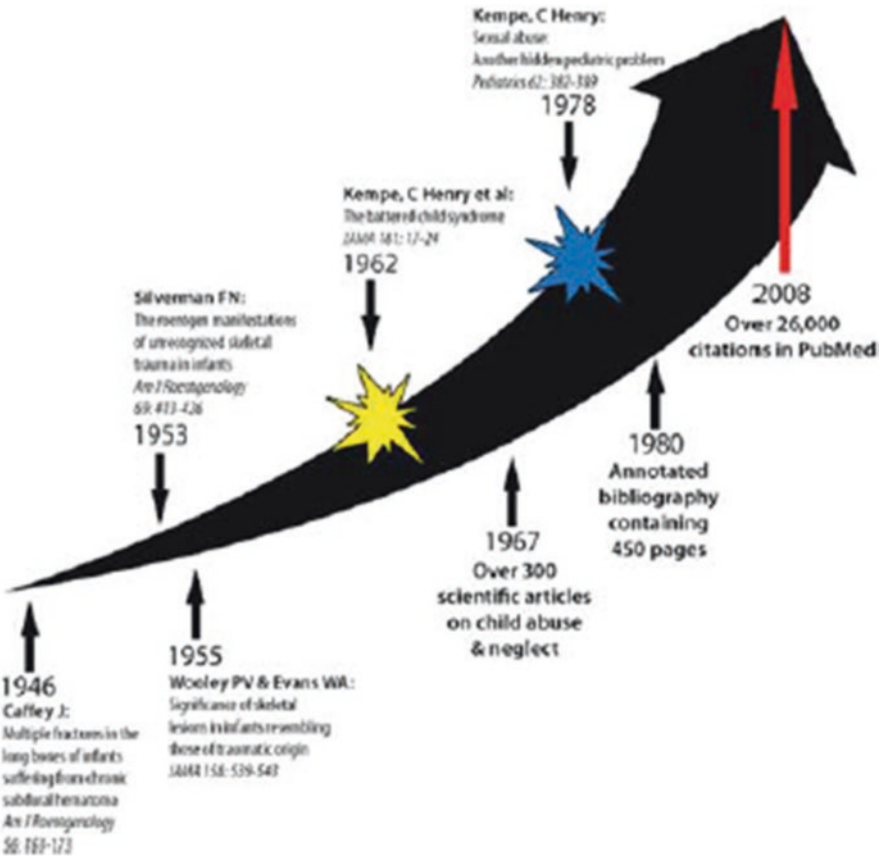

Fig. 1

How the Book Is Organized

The manual is organized into four main parts, as follows. Part I contains Chaps. 1 and 2, which provide an overview on the phenomenon of child abuse and neglect and offer a general approach to the evaluation of the maltreated child. The need for a systematic and comprehensive approach in the evaluation of suspected child maltreatment cases is highlighted. In addition, the authors support an interdisciplinary evaluation to enhance attention to both physical and psychosocial aspects and to facilitate the development of comprehensive treatment plans that build upon each discipline's different skills and perspectives.

Part II, composed of Chaps. 3, 4, 5, 6, 7, 8, and 9, addresses specific forms of maltreatment such as skin injury, abusive head trauma, and neglect. Each of these chapters addresses mechanisms of the specific type of injury, characteristic findings, clinical approach, differential diagnosis, and proposed treatments where applicable.

Some information is repeated in several chapters to allow for those providers who may need to use a specific chapter as a reference when working with a child with a given symptom or finding. When more detailed information is available in a related chapter, the reader is referred there as well. In addition, Chap. 9 concludes with current information on the evaluation of child fatalities including information on the postmortem examination.

Part III includes Chaps. 10, 11, and 12 and addresses the relationship of child maltreatment to children with special needs, the overlap of intimate partner violence with child maltreatment and on approaches to the prevention of child abuse and neglect. Finally, Part IV comprised of Chaps. 13, 14, 15, and 16 covers a number of the issues related to the teamwork so essential to the evaluation and investigation of child abuse and neglect. Overarching team issues as well as specifics related to psychosocial assessment and interaction with the child protection system are addressed, as well as legal issues, and the important interface with mental health professionals that may occur in cases of suspected and substantiated abuse and neglect. These chapters are intended to give more detail regarding these critically important issues.

In conclusion, this manual is written to assist the health care provider in performing a systematic evaluation of the child suspected of abuse or neglect. It is our hope that as the clinician develops greater expertise in the evaluation of the maltreated child, he or she will recognize patterns suggestive of physical abuse and neglect more easily, be better able to complete the appropriate medical and psychosocial evaluations of the child, and become more cognizant of the ultimate responsibility to work with other professionals and agencies to ensure the safety and recovery of the victimized child. We believe that the needs of the child and family are best served by knowledgeable health care professionals who clearly understand their role as health care provider and child advocate. We agree with Dr. Krugman that in the final analysis, child abuse and neglect is a "child's and a family's" problem and we hope that this book helps health care professionals assist children and families as they confront this challenge.

Salt Lake City, UT, USA
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Authors' Note

Every effort has been made to ensure that information concerning the recommended ordering of laboratory and diagnostic tests, the interpretation of laboratory values, and suggested drug dosages and usages stated in this manual are accurate and conform to the accepted standards at the time of publication. However, the reader is advised to consult printed information on each test or drug prior to ordering a study or administering any medication, especially when ordering unfamiliar tests or using infrequently used drugs.

Contents

Contributors

Angela Bachim is board-certified in both general pediatrics and child abuse pediatrics. She is currently Assistant Professor of Pediatrics at Baylor College of Medicine and Texas Children's Hospital in Houston. Her research interests include the accurate diagnosis of child abuse and health services research for the field of child abuse pediatrics.

Lauren R. Burge received her BS in Biology from Abilene Christian University and completed her medical degree at the University of Texas Health Science Center at San Antonio. She went on to complete her pediatric residency at the University of Oklahoma and is currently a child abuse pediatrics fellow at Baylor College of Medicine. Her interests include children in foster care and helping to further the education of community partners and medical professionals in the prevention and recognition of child abuse.

Thomas Casolaro was a Graduate Research Assistant at the University of Texas at Arlington.

Kelli Connell-Carrick has devoted her career to the children and families affected by child maltreatment. She was an assistant professor at the University of Houston Graduate College of Social Work, a research associate of both the Center for Public Policy at the University of Houston and the Center for Child Welfare at the University of Texas at Arlington, and was involved in a statewide evaluation of retention and job training of CPS and adult protection workers. Dr. Connell-Carrick has over 60 competitively selected publications and presentations in the areas of child maltreatment, neglect of infants and toddlers, parenting education, foster care and aging out, and professional development of child welfare staff. She has also coauthored two books, *Understanding Child Maltreatment: An Ecological and Developmental Perspective*, published by Oxford University Press (with M. Scannapieco), and *Methamphetamine: What You Need to Know* (with Sallee, Liebe, Myers and Sallee), published by Eddie Bowers. She is published in such journals as *Child Welfare*, *Child and Adolescent Social Work*, and *The Journal of Interpersonal*

Violence. Dr. Connell-Carrick was the PI on a large federal grant from 2005 to 2008 that involved developing, delivering, evaluating and disseminating a training curriculum to CPS supervisors throughout the state of Texas on the needs of youth aging out of foster care. In 2004, Dr. Connell-Carrick won the Humanitate Award for Outstanding Literary Achievement from the North American Resource Center for Child Welfare.

Paige Culotta is a board-certified pediatrician currently in her third year of her child abuse pediatrics fellowship with Baylor College of Medicine at Texas Children's Hospital in Houston, where she also completed her pediatrics residency. Dr. Culotta received an undergraduate degree in biology from Louisiana State University in Baton Rouge and went on to complete medical training at the Louisiana State University Health Sciences Center in New Orleans. At Texas Children's Hospital she assists the Child Protection Team medical consultation service in identifying, evaluating, and diagnosing suspected child maltreatment cases and also participates in medical examinations of sexual abuse victims at the Children's Assessment Center. Dr. Culotta has a special interest in teaching and is currently pursuing a master's degree in education at the University of Houston. She has given numerous lectures in the community as well as to medical students, residents, and staff physicians to promote knowledge and prevention of child abuse. She has an interest in research on medical child abuse with a focus on improved screening and prevention.

Allan DeJong has been involved in the management of suspected physical and sexual abuse of children for over 35 years. Dr. De Jong began studying and managing child sexual abuse cases at Thomas Jefferson University Hospital upon joining the faculty at Jefferson Medical College of Thomas Jefferson University in 1978. Dr. De Jong currently holds the rank of Clinical Professor of Pediatrics at the Sidney Kimmel Medical College of Thomas Jefferson University. Dr. De Jong has been the Medical Director for the Children's Advocacy Center of Delaware (CACD) since it opened in 1996 and helped establish CACD sites in each of Delaware's three counties by 2003. He became Director of the Children at Risk Evaluation (CARE) Program at Nemours—Alfred I. duPont Hospital for Children in 1997 and has practiced full time as a child abuse pediatrician since that time. He is board-certified in General Pediatrics and in Child Abuse Pediatrics. Dr. De Jong has lectured regionally and nationally on physical and sexual abuse of children, and has 36 publications in the field of child abuse. He is a member of the Ray Helfer Society, the International Society for the Prevention of Child Abuse, the Pennsylvania Attorney General's Medical/Legal Advisory Board for Child Abuse, and the Delaware Child Protection Accountability Commission, and is the Chair of the Suspected Child Abuse and Neglect (SCAN) Education Program Advisory Board for the Pennsylvania Chapter of the American Academy of Pediatrics.

Erin E. Endom is Assistant Professor in the Department of Pediatrics, Baylor College of Medicine, and is a member of the section of Pediatric Emergency

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Dr. Endom received her MD in 1988 from the University of Texas Medical School in Houston, Texas, and subsequently completed a 3-year pediatric residency in 1991 from Baylor College of Medicine affiliated hospitals. She is a subboard-certified pediatric emergency physician.

Her special interests include child abuse and neglect, and emergency and disaster preparedness. From 1998 to 2007, she served as the Pediatric Emergency Medicine section editor for the online medical textbook UpToDate (www.uptodate.com).

Angelo P. Giardino is Senior Vice President/Chief Quality Office at Texas Children's Hospital. Prior, Dr. Giardino served as the Chief Medical Officer for Texas Children's Health Plan, a provider-sponsored HMO that serves over 430,000 Medicaid and CHIP enrollees in Texas. He is a Certified Physician Executive (CPE) within the American Association for Physician Leadership. He completed the Patient Safety Certificate Program from the Quality Colloquium, is certified in medical quality (CMQ) as designated by the American Board of Medical Quality, and is a Distinguished Fellow of the American College of Medical Quality. He is Professor of Pediatrics and Section Head of Academic General Pediatrics at Baylor College of Medicine. Dr. Giardino is a member of the American Academy of Pediatrics' Committee on Child Health Finance, and he recently completed a 3-year term on the quality improvement committee for the Children's Hospital Association and worked on quality measurement and the role of value-based alternative payment models in the pediatric setting. Dr. Giardino received his medical degree and doctorate in education from the University of Pennsylvania and completed his residency and fellowship training at The Children's Hospital of Philadelphia. He received his Master's in Public Health from the University of Massachusetts. He holds subspecialty certifications in Pediatrics and Child Abuse Pediatrics by the American Board of Pediatrics. He is a recipient of the Fulbright & Jaworski L. L. P. Faculty Excellence Award at Baylor College of Medicine. His academic accomplishments include publishing several textbooks on child abuse and neglect and presenting on a variety of pediatric topics at national and regional conferences.

Eileen R. Giardino is Associate Professor and family nurse practitioner at the Cizik School of Nursing at the University of Texas Health Science Center at Houston. She loves teaching and has taught at all levels of the nursing curriculum. She received her PhD from the University of Pennsylvania and her master's from Widener University. Her areas of expertise include child abuse and domestic violence. She is core faculty for the HRSA (Health Resources and Services Administration) Lonestar LEND (Leadership, Education in Neurodevelopment Disabilities) program at UTHealth Houston. Her scholarship is nationally recognized through presentations and manuscript publications. As a renowned expert APRN and educator, Dr. Giardino is a role model and mentor to nursing students

and states that her most prized accomplishment is supporting students to achieve their professional goals.

Rebecca G. Girardet is Professor of Pediatrics and the Director of the Division of Child Protection Pediatrics at McGovern Medical School at the University of Texas Health Science Center at Houston. She is also Medical Director of the Texas Forensic Assessment Center Network, a collaborative effort between pediatric and adult medical experts and the Texas Department of Family and Protective Services that provides consultative services and education to Child Protective Services, Adult Protective Services, and Childcare Licensing workers statewide. Dr. Girardet is board-certified in child abuse pediatrics and in general pediatrics. She is author of several original research publications, is an active clinical practitioner, and has served as an expert witness in numerous court testimony proceedings.

Christopher S. Greeley is Chief of the Section of Public Health Pediatrics at Texas Children's Hospital, the first such section in the country. He is Professor and Vice-Chair for Community Health in the Department of Pediatrics at Baylor College of Medicine. He received his medical degree from the University of Virginia in 1992 and complete internship and residency in pediatrics at Vanderbilt University. He received a Master's in Clinical Research from the University of Texas Health Science Center at Houston, with a special concentration on Comparative Effectiveness Research. He is board-certified in General Pediatrics as well as Child Abuse Pediatrics, and is a member of the American Medical Association and the American Academy of Pediatrics. He also served on the Board of Directors of Prevent Child Abuse America from 2005 to 2014 and was Chair for 2009–2013. He is the current president of the Ray E. Helfer Society, the international society for physicians working in the field of child maltreatment, and was appointed chair of the Child Abuse and Neglect Prevention Task Force for Texas.

Pamela Wallace Hammel is a board-certified Forensic Odontologist, and is the forensic dental consultant to Children's Hospital of Michigan in Detroit and to the Macomb and Oakland County Michigan medical examiner offices. As a member of DMORT (Disaster Mortuary Operational Response Team) and NDMS (National Disaster Medical System), Dr. Hammel has participated in three aviation disasters, the World Trade Center Identification Unit in 2001, and for Hurricanes Katrina and Rita in New Orleans in 2005. Dr. Hammel is a Fellow of the American Academy of Forensic Sciences and has served as program chair, secretary, and chair of the Odontology Section of the Academy. She is also a fellow of the American College of Dentists, the International College of Dentists, and the Pierre Fauchard Academy. She has lectured internationally and authored/coauthored articles in the *New England Journal of Medicine* and the *Archives of Pediatric and Adolescent Medicine* and chapters in three books on child abuse. She has served on the Michigan State Board of Dentistry, is an active board examiner for the Commission on Dental Competency, and is a faculty member at the University of Detroit Mercy Dental School.

Nancy S. Harper is Medical Director for the Otto Bremer Trust Center for Safe & Healthy Children at the University of Minnesota Masonic Children's Hospital and Hennepin County Medical Center. Dr. Harper is board-certified in General Pediatrics and Child Abuse Pediatrics. She graduated from Dartmouth Medical School in 1995 and completed her pediatric residency in 1998 at Naval Medical Center Portsmouth in Virginia. After graduation, Dr. Harper served as a staff pediatrician and child abuse consultant for Naval Medical Center Portsmouth and US Naval Hospital Okinawa in Japan. In 2004, Dr. Harper resigned from the US Navy and entered into fellowship training in Forensic Pediatrics at Brown University in Providence, Rhode Island, graduating in January 2007. She then served as the Medical Director for the CARE Team at Driscoll Children's Hospital in Corpus Christi, Texas, from 2007 through 2014. Dr. Harper served on the Committee on Pediatric Centers of Excellence (79th Legislature) tasked with the development of guidelines for designating regional centers of excellence for child abuse in Texas. Governor Perry appointed Dr. Harper to the statewide Blue Ribbon Task Force to Reduce Child Abuse and Neglect (81st Legislature, SB 2080) and the Task Force to Reduce Child Abuse and Neglect and Improve Child Welfare (82nd Legislature, SB 1154). The Task Force was legislatively charged with addressing child abuse prevention and the promotion of child well-being for the state of Texas. Dr. Harper served as the programming chair for the American Academy Pediatrics Section on Child Abuse and Neglect from 2012 through 2017 and is invested in improving educational opportunities on child maltreatment both nationally and internationally.

Toi Blakley Harris is Professor at the Menninger Department of Psychiatry and Behavioral Sciences and the Department of Pediatrics at Baylor College of Medicine. She is also Associate Provost of Institutional Diversity, Inclusion and Equity for Baylor. Dr. Harris participates in research initiatives that work toward the reduction of mental health disparities within pediatric and adolescent populations. These include educational research projects in the area of mentorship and clinical research targeting pediatric trauma, psychosomatic illness, pediatric and adolescent suicide, and improving community partnerships to improve access to care.

Reena Isaac is Assistant Professor of Pediatrics at Baylor College of Medicine, and a physician on the Child Abuse Pediatrics Team of the Section of Public Health Pediatrics of Texas Children's Hospital. Dr. Isaac completed her pediatrics training at Albert Einstein College of Medicine/Jacobi Medical Center in New York City, and forensic pediatric training at Brown Medical Center in Providence, Rhode Island, in 2005. Dr. Isaac has conducted numerous medical investigations of suspected medical child abuse cases, and has testified as an expert witness in both family and criminal court regarding such cases.

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Michelle A. Lyn is Associate Professor of Pediatrics at Baylor College of Medicine and the Medical Director of Care Management/Patient Flow at Texas Children's Hospital in Houston. She received her medical degree from the State University of New York at Buffalo School of Medicine and completed her residency in Pediatrics at Albert Einstein College of Medicine—Montefiore Medical Center in Bronx, New York. After serving an additional year as Chief Resident, she moved to Texas to complete her postgraduate fellowship in Pediatric Emergency Medicine at Baylor College of Medicine. Dr. Lyn holds board certifications in Pediatrics, Pediatric Emergency Medicine, and Child Abuse Pediatrics.

Dr. Lyn is an administrator, educator, and clinician. She previously served as the Chief of Child Protection in the Section of Emergency Medicine. Her academic accomplishments include published chapters, development of curricula on the evaluation of child maltreatment, and presentations on a variety of pediatric topics related to evaluation and management of children in health care crisis. She has participated in numerous radio and television broadcasts to discuss topics of injury prevention, child maltreatment, and emergency medicine. Dr. Lyn is the recipient of the Baylor College of Medicine Department of Pediatrics Award of General Excellence in Teaching and the Baylor College of Medicine Fulbright and Jaworski Excellence in Teaching Award. She is also the recipient of several Houston community awards including the Breakthrough Women Award from Texas Executive Women and The Houston Chronicle and the Unstoppable Leader Award from the Greater Houston Women Chamber of Commerce.

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board-certified in Pediatrics and Child Abuse Pediatrics. After graduating from Temple University College of Medicine in 2000, she completed her pediatric residency at St. Christopher's Hospital for Children, where she then served as the founding Medical Director of the Child Protection Program for over 13 years. Dr. McColgan also completed the Michigan State University Primary Care Development Fellowship in 2006. She is the Founding Advisory Board Chair and Pediatric Advisor of Prevent Child Abuse Pennsylvania. She also serves on the Pennsylvania Children's Trust Fund Board and the Philadelphia Academy Charter School Board.

Taylor McLain graduated from Texas A&M University and the University of Texas McGovern Medical School. She is currently completing her training in Pediatrics at Baylor College of Medicine and Texas Children's Hospital. She will fulfill the position of Chief Resident for the academic year of 2018–2019. After completion of her Chief Residency, Dr. McLain plans to work as an outpatient primary care physician. She is an active member of the American Academy of Pediatrics and an inductee of the Gold Humanism Honor Society. She has a special interest in the area of education and advocacy surrounding child maltreatment.

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Dr. Narang is board-certified in both General Pediatrics and Child Abuse Pediatrics, and has published on various medical and legal topics pertaining to child abuse. He is recognized as a national and international expert in child abuse and neglect, with a specific emphasis in abusive head trauma and medico-legal aspects of child maltreatment. He is the recent recipient of the Fulbright–Nehru Scholarship in 2014–2015, conducting child maltreatment research and education in various parts of India.

Vincent J. Palusci is Professor of Pediatrics at New York University School of Medicine in New York City, where he is a board-certified general and child abuse pediatrician at the Bellevue Hospital Frances L. Loeb Child Protection and Development Center. Dr. Palusci entered private practice in 1987 and later joined the faculty of the College of Human Medicine at Michigan State University, where he was a TRECOS Fellow. After leading hospital child protection teams in Grand Rapids and Detroit, he returned in 2008 to chair the NYU Hospitals Child Protection Committee and to teach students, residents, and fellows. He has coedited six books and authored more than 50 reports and chapters, 40 scholarly articles, and 100 research abstracts on child abuse and neglect, including abusive head trauma, mandated reporting, child death review, prevention, and the effects of maternal drug use on infants. He has provided training nationally and internationally for physicians, social workers, child protection workers, attorneys, and other medical and child welfare professionals, and has testified before state, federal, and international bodies on the issue of child maltreatment. Dr. Palusci is a Fellow of the American Academy of Pediatrics and a founding member of the Ray E. Helfer Society. He was appointed to the American Board of Pediatrics Child Abuse Pediatrics Subboard during 2012–2017 and the American Academy of Pediatrics Council on Child Abuse and Neglect for 2012–2018. In addition, he serves as program chair for the AAP Section on Child Death Review and Prevention. In New York, he is a CHAMP medical provider and serves on the boards of the American Professional Society on the Abuse of Children (APSAC)—New York and Prevent Child Abuse—New York. He was a member of the APSAC Board of Directors during 2008–2014 and Editor of the APSAC Advisor for 2011–2014. He currently serves on the editorial boards of *Child Abuse and Neglect*, *Child Maltreatment,* and *Pediatric Radiology*. In 2004, he received the Ray E. Helfer Award for child abuse prevention from the American Academy of Pediatrics and the National Alliance for Children's Trust and Prevention Funds.

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Maria Scannapieco Dr. Maria Scannapieco, PhD, MSW, is a Distinguished University Professor at the School of Social Work, University of Texas at Arlington, and Director of the Center for Child Welfare (since 1996).

Dr. Maria Scannapieco has worked in the public child welfare arena for 30 years as an educator and researcher, with direct child protection and foster care administration experience. Maria Scannapieco has received over a million dollars a year since 1996 from state and federal grants for workforce development, training programs, curriculum development, technical assistance, and research. She has extensive experience in grant development, implementation, management, and dissemination. Dr. Scannapieco has over 150 publications and presentations competitively selected many in the areas of the impact of child maltreatment, out-of-home placement, youth aging out of foster care, Indian Child Welfare, and training and retention of child welfare workers. Dr. Maria Scannapieco has three books with Oxford University Press (with Rebecca L. Hegar) *Kinship Foster Care: Practice, Policy, and Research* (1999), *Understanding Child Maltreatment: An Ecological and Developmental Perspective* (2005) (with Kelli Connell-Carrick), and *Understanding Mental Health Problems of Children and Adolescents: A Guide for Social Workers* (with Kirstin Painter).

Carl J. Schmidt is a forensic pathologist with extensive experience in child abuse. He is Associate Professor in the Department of Pathology at the University of Michigan and the Chief Medical Examiner for Wayne and Monroe Counties, also in Michigan. He trained in pathology at the Medical College of Ohio in Toledo and trained in forensic pathology in Detroit. Dr. Schmidt has published on child abuse and sudden infant death. He also has participated in forensic training in Latin America, especially Colombia. He has also been part of Michigan's Child Death Review Team since 1996, and has contributed to training for CDR since 2000.

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devoted his scholarly efforts in the areas of epidemiology and prevention of child maltreatment and intimate partner violence, technology use in health care, and health services to children in foster care. He has published over 80 original articles and book chapters, and has been funded for multiple program and research grants from the Agency for Healthcare Research and Quality, the Centers for Disease Control and Prevention, US Administration on Children and Families, and the US Department of Justice, as well as generous private foundations. He has served in various roles on multiple national and international committees and organizations, and is currently serving on the board of directors of Prevent Child Abuse America.

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Dr. Shenoi is the coordinator of Houston Trauma Link, a coalition formed in 2000 to reduce the morbidity and mortality of childhood injuries in Houston/Harris County. The coalition comprises entities from the public and private health sectors, health departments, law enforcement, and transportation. The group integrates existing data sources to provide a local pediatric injury data system that supports injury prevention and control activities in the community. Dr. Shenoi's research interests include pediatric submersions, child maltreatment, and pediatric trauma.

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Part I
Child Abuse as a Health Problem

Chapter 1
Introduction: Child Abuse and Neglect

Angelo P. Giardino, Michelle A. Lyn, and Eileen R. Giardino

Definition

Child Abuse

Child abuse and neglect, *child maltreatment*, and *child victimization* are interchangeable terms that refer to a major public health problem confronting children and families. Abuse manifests when the child's or adolescent's caregiver fails to provide for the youth's health and well-being either by causing an injury or, as in neglect, by not meeting a basic need. Because of the multifaceted nature of abuse, a comprehensive definition of child abuse and neglect draws upon information from a number of disciplines and a variety of professionals. The phenomenon of child maltreatment has diverse medical, developmental, psychosocial, and legal consequences. Child abuse and neglect, along with its synonyms, describes a wide range of situations. It involves caregiver acts of commission or omission that had or are likely to have injurious effects on the child's physical, developmental, and psychosocial well-being. Child maltreatment is broadly categorized into (a) physical abuse, (b) sexual abuse, (c) emotional/psychological abuse, and (d) neglect. Neglect is

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further subcategorized into specific areas, such as physical, supervisional, educational, and emotional/psychological (see Chap. 7).

Physicians and nurses commonly focus on definitions that highlight the medical aspects of injury, while clinical social workers tend to focus on family and caregiving systems that give rise to abuse. Law enforcement officers and attorneys may concentrate on the evidence that determines guilt or innocence of the suspected perpetrator of the abuse. Definitions are purposely broad to encompass the many different etiologies, presentations, and clinical manifestations of abuse or neglect cases (Azar 1991; Bourne 1979; Helfer and Kempe 1987; Hobbs et al. 1993; Ludwig 1992; Wissow 1999). Clinical situations may vary widely, ranging from the relatively rare case of a child who is tortured to death by a psychotic caregiver to the more commonly seen case of a toddler who sustains a bruise to his or her buttocks during the application of corporal punishment. The unifying theme in all definitions of child maltreatment is that abuse and neglect occurs in the context of either active or passive caregiving behavior that is destructive to the normal growth, development, and well-being of the child (Ludwig 1993).

At the federal level, the Child Abuse Prevention and Treatment Act (CAPTA) defines child abuse and neglect as:

> Any recent act or failure to act on the part of a parent or caregiver, which results in death, serious physical or emotional harm, sexual abuse, or exploitation, or an act or failure to act which presents an imminent risk of serious harm. (CAPTA 2010, p. 6)

The wording in the federal legislation sets the minimum standard for states that accept federal funding, and then each state defines child abuse and neglect in its own state statutes and regulations (Child Welfare Information Gateway 2008). *Physical abuse* occurs when a child has suffered injury due to the actions of his or her caregiver. Specifically for physical abuse definitions, laws tend to speak to acts of commission during which a child is injured by the actions of a caregiver. *Neglect* describes inadequate parenting or caregiving where there is potential for injury resulting from omissions on the part of the caregivers in meeting the child's basic needs. Neglect is present when a child experiences poor hygiene, exposure to the elements, lack of compliance with medical therapy, inadequate supervision, and forms of malnutrition related to parental control over feeding (see Chap. 7). Neglect definitions then tend to speak to acts of omission that fail to provide for the child's basic needs, which put the child at risk for physical, emotional, or educational harm (Leeb et al. 2008). Acts of commission and omission are considered deliberate and intentional even if the harm to the child is not the intended consequence since "intention only applies to the caregiver acts – not the consequence of those acts." For example, a caregiver may intend to hit a child, applying corporal punishment for discipline, so the act of hitting is not accidental or unintentional, but if the child has a concussion, albeit not the desired result, the intentional act resulted in physical abuse (Leeb et al. 2008).

The Fourth National Incidence Study (NIS-4) (Sedlak et al. 2010) defines physical abuse according to the harm standard as:

- **Physical abuse.** Physical abuse includes shaking, throwing, purposefully dropping a child, hitting, pushing, grabbing, dragging or pulling, punching or kicking, and other physical abuse. The NIS classifies children as physically abused under the harm standard if they suffered at least a moderate injury from physical abuse. Moderate injuries are defined as physical, mental, or emotional injuries or conditions (or behavior problems) resulting from physical abuse which are serious enough to persist in observable form for at least 48 h. Examples include bruises, nightmares, depression, and fearfulness (Sedlak et al. 2010, pp. 3–6).

The NIS-4 defined neglect according to the harm standard as falling into three distinct categories:

- **Physical Neglect**: This type of neglect includes abandonment; refusal of custody; illegal transfer of custody; unstable custody arrangements; medical neglect; inadequate supervision; inadequate attention to needs for food, clothing, shelter, or personal hygiene; and other disregard for the child's physical needs or physical safety. From inadequate supervision to the end of this list, the NIS includes the child in the harm standard estimates only if the maltreatment results in demonstrable injury or impairment that is serious or fatal.
- **Emotional neglect**: Maltreatment of this type includes inadequate nurturance or affection, chronic or extreme domestic violence in the child's presence, knowingly permitting drug or alcohol abuse or other maladaptive behaviors, failure or refusal to seek the needed treatment for an emotional or behavioral problem, overprotective treatment, inadequate structure, inappropriately advanced expectations, exposure to maladaptive behaviors and environments, and other inattention to the child's developmental or emotional needs.
- **Educational neglect**: Children are included in this category when their parent (or parent-substitute) knowingly permits their chronic truancy an average of at least 5 days per month, exhibits a pattern of keeping the child home without legitimate reason, fails to register or enroll a school-age child in school in violation of the state law, or refuses to allow or provide the needed attention for a diagnosed educational problem, learning disorder, or other special education needs (Sedlak et al. 2010, pp. 3–8 to 3–10).

Regardless of personal or professional preference for a specific definition, it is important that healthcare providers both (1) understand the definition of child abuse and neglect and (2) comply with the required actions contained in the state laws governing the geographical area in which they practice. In all 50 of the United States, healthcare professionals such as nurses, physicians, and social workers are considered mandated reporters and are required to report suspected cases of child abuse and neglect to the appropriate authorities. Finally, federal

and state laws on child abuse and neglect refer to cases of harm caused by caregivers, either parents, or those in caregiving roles (US Department of Health and Human Services 2008). Cases of harm to children and adolescents caused or perpetrated by noncaregivers are also seen as crimes (e.g., assault) but are not viewed as child maltreatment owing to the lack of a caregiving relationship between the perpetrator and victim.

Reporting

Healthcare professionals use clinical skills and judgment to decide if a child's injuries are due to abuse and/or neglect. They are mandated reporters of suspected child abuse and neglect and are obligated in all jurisdictions to comply with the law (see Chap. 17). Clinical social workers are an excellent resource for helping healthcare professionals understand specific child abuse reporting laws and guidelines.

Scope of the Problem

Epidemiology

The incidence of child maltreatment (the number of new cases identified in a 1-year period) is often determined through research using data sources from reports of abuse and neglect. The data sources represent those cases known to social service or law enforcement agencies. The flaw in determining incidence by this method is that not all abuse is reported and not all reports are considered to be actual abuse or neglect after investigation. Aggregation and comparisons among studies are problematic because reports often originate from reporting standards that vary. For example, a legal standard that holds up to rules of evidence governing an adversarial courtroom situation would likely yield different results than a social service's standard for abuse, which is less strict and allows the investigator's judgment as well as physical evidence to be used.

In the federal fiscal year (FFY) 2016, child protective services (CPS) agencies received an estimated 4.1 million reports of suspected maltreatment. This number involved approximately 7.4 million children. A child abuse report is considered to be substantiated if investigation yields a determination that the child has been abused or is at significant risk of being abused or neglected. Substantiation implies a degree of certainty on the part of the CPS agency that the abuse occurred or that the child is at significant risk of such. Of the 4.1 million referrals, after processing and investigation, approximately 676,000 children were substantiated to be child

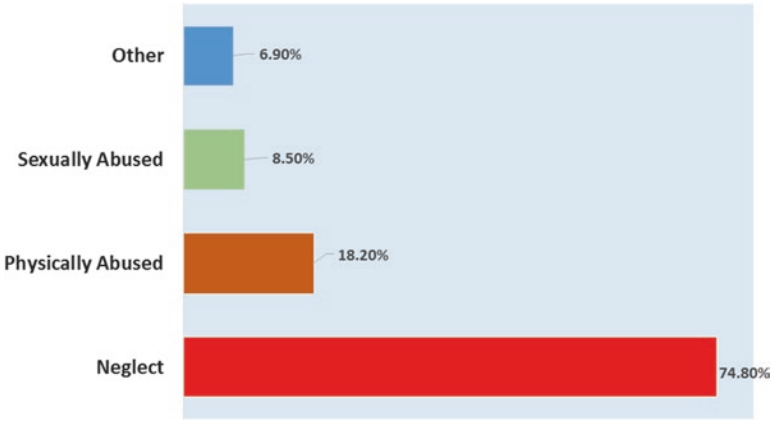


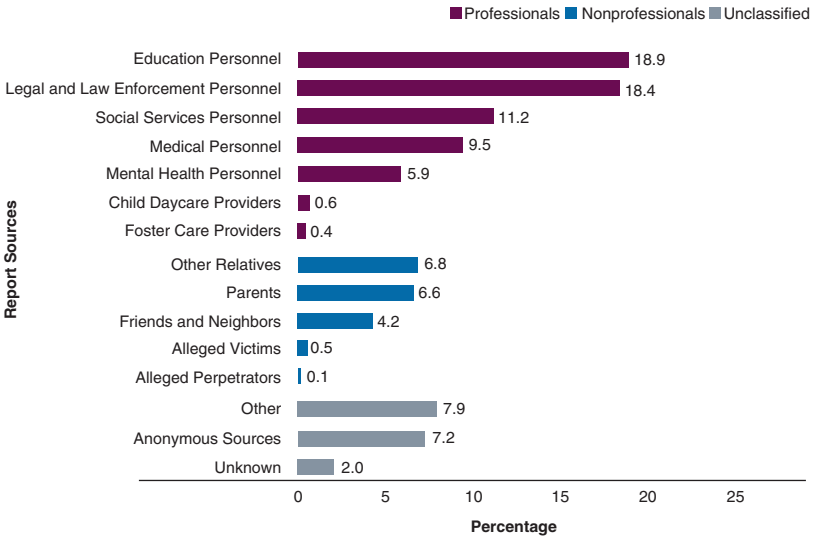
Fig. 1.1 Types of maltreatment by percentage (unique count of child victims and duplicate count of maltreatment types). (US Department of Health and Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau. (2018). *Child maltreatment 2016*. Available from https://www.acf.hhs.gov/cb/research-data-technology/statistics-research/child-maltreatment)

maltreatment victims. The most common form of substantiated abuse in 2016 was child neglect, which accounted for 74.8% of cases, followed by physical abuse at 18.2%, then child sexual abuse at 8.5% of cases, and, finally, other maltreatments which accounted for 6.9% of cases (US Department of Health and Human Services et al. 2018). See Fig. 1.1.

For FFY 2016, professionals submitted 64.9% of the reports. The highest reporting professionals were education personnel (18.9%) followed closely by legal and law enforcement personnel at 18.4%, with medical personnel including professionals and nonprofessionals at 9.5% (US Department of Health and Human Services et al. 2018). See Fig. 1.2.

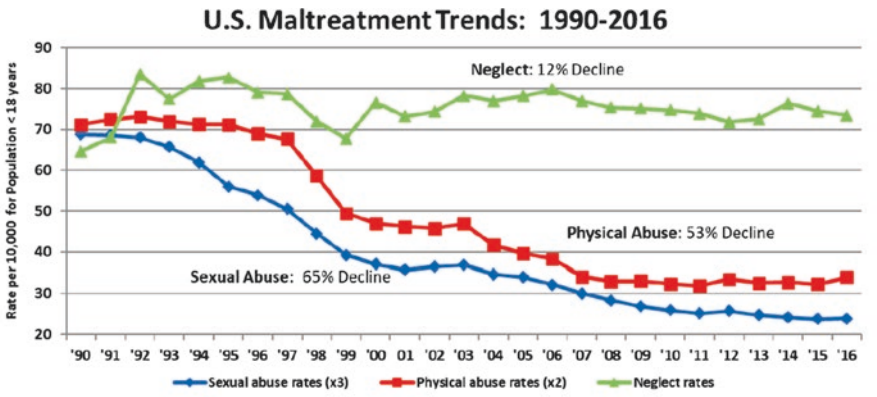
Finkelhor, Saito, and Jones (2018) analyzed trends in reporting and substantiation rates for child abuse and neglect from the 1990s through 2016. They identified a decline in the number of substantiated cases of physical abuse. According to their most recent analysis, the incidence of substantiated physical abuse cases declined 553% from 1992 to 2016 (Fig. 1.3). Cases of child sexual abuse have also declined substantially, with a 65% decrease in the number of substantiated cases observed from 1992 to 2016. However, child neglect, which is the most common form of child maltreatment, declined at the lowest rate, 12% (Fig. 1.3).

The NIS-4 was mandated by the US Congress in the Keeping Children and Families Safe Act of 2003 (P.L. 108-36) to provide up-to-date epidemiologic incidence data that uses a different method than the counting of reports to and investigated by CPS agencies (US Department of Health and Human Services



Data are from the Child File. Based on data from 49 states. States were excluded from this analysis if more than 25.0 percent had an unknown report source. Numbers total to more than 100.0 percent due to rounding. Supporting data not shown.

Fig. 1.2 Report sources, 2016 (US Health and Human Services et al. 2018, p. 8)



Note: Trend estimates represent total change from 1992 to 2016. Annual rates for physical abuse and sexual abuse have been multiplied by 2 and 3 respectively in this figure so that trend comparisons can be highlighted.

[1] The statistics in this table and this figure concern substantiated cases of sexual abuse, physical abuse and neglect. A substantiated case means case that has been reported to a child protection agency, investigated and deemed to have occurred according to a "preponderance of evidence." The child maltreatment cases referred and investigated by state child protection agencies primarily involve abuse by caregivers. The cases do not include many involving stranger abusers, unless some element of caregiver neglect was involved.

Fig. 1.3 Child maltreatment trends. (From Finkelhor, Saito, and Jones 2018 used with permission)

2009). The NIS methodology views maltreated children investigated by CPS agencies as representing only the "tip of the iceberg" (Fig. 1.4). Children investigated by CPS are included along with maltreated children who are identified by professionals in a wide range of agencies in representative communities

Fig. 1.4 Levels of recognition of child abuse and neglect. (US Department of Health and Human Services, Children's Bureau, Administration for Children, Youth and Families, Administration for Children and Families. (2001). A history of the National Incidence Study of Child Abuse and Neglect (p. 2-2). https://www.acf.hhs.gov/sites/default/files/opre/nis4_report_congress_full_pdf_jan2010.pdf. Accessed April 9, 2018)

(Table 1.1). The NIS-4 uses data gathered from a nationally representative sample of 122 counties. CPS agencies in these counties provided data about all children in cases they accept for investigation during one of two reference periods (September 4, 2005, through December 3, 2005, or February 4, 2006, through May 3, 2006). Additionally, professionals in these same counties served as NIS-4 sentinels and reported data about maltreated children identified by the following organizations: elementary and secondary public schools; public health departments; public housing authorities; short-stay general and children's hospitals; state, county, and municipal police/sheriff departments; licensed daycare centers; juvenile probation departments; voluntary social services and mental health agencies; shelters for runaway and homeless youth; and shelters for victims of domestic violence.

Fatal Child Abuse

According to the US Health and Human Services, Child Maltreatment 2016, an estimated 1705 children died from abuse and neglect in the United States. These child deaths due to maltreatment represent a 7.4% increase from the 2012 estimate (US Department of Health and Human Services et al. 2018) (see Table 1.2). Further

Table 1.1 National Incidence of Harm Standard Maltreatment in the NIS-4 (2005–2006) and comparison with the NIS-3 (1993) and the NIS (1986) Harm Standard Estimates

Harm standard maltreatment category	NIS–4 Estimates 2005–2006		Comparisons with earlier studies					
			NIS–3 estimates 1993			NIS–2 estimates 1986		
	Total no. of children	*Rate per 1000 children*	Total no. of children	*Rate per 1000 children*		Total no. of children	*Rate per 1000 children*	
All Maltreatment	1,256,600	*17.1*	1,553,800	*23.1*	*m*	931,000	*14.8*	*ns*
Abuse:								
All Abuse	553,300	*7.5*	743,200	*11.1*	*	507,700	*8.1*	*ns*
Physical abuse	323,000	*4.4*	381,700	*5.7*	*m*	269,700	*4.3*	*ns*
Sexual abuse	135,300	*1.8*	217,700	*3.2*	*	119,200	*1.9*	*ns*
Emotional abuse	148,500	*2.0*	204,500	*3.0*	*m*	155,200	*2.5*	*ns*
Neglect:								
All Neglect	771,700	*10.5*	879,000	*13.1*	*ns*	474,800	*7.5*	*m*
Physical neglect	295,300	*4.0*	338,900	*5.0*	*ns*	167,800	*2.7*	*m*
Emotional neglect	193,400	*2.6*	212,800	*3.2*	*ns*	49,200	*0.8*	*
Educational neglect†	360,500	*4.9*	397,300	*5.9*	*ns*	284,800	*4.5*	*ns*

* The difference between this and the NIS–4 incidence rate is significant at $p \leq .05$.

m The difference between this and the NIS–4 incidence rate is statistically marginal (i.e., $.10 > p > .05$).

ns The difference between this and the NIS–4 incidence rate is neither significant nor marginal ($p > .10$).

† Educational neglect is identical under the Harm and Endangerment Standards. It is included in both tables because it is in the summary categories in both standards: All Neglect and All Maltreatment

Note: Estimated totals are rounded to the nearest 100.

From Sedlak et al. (2010). Fourth National Incidence Study of Child Abuse and Neglect (NIS-4): Report to Congress. Washington, DC: U.S. Department of Health and Human Services, Administration for Children and Families. Available at: http://www.acf.hhs.gov/programs/opre/abuse_neglect/natl_incid/index.html

Table 1.2 Child fatality rates per 100,000 children (2012–2016) (US Department of Health and Human Services et al. 2018, p. 54)

Year	Reporting states	Child population of reporting states	Child fatalities from reporting states	National fatality rate per 100,000 children	Child population of all 52 states	National estimate of child fatalities
2012	51	74,277,427	1621	2.18	74,542,811	1630
2013	51	74,121,591	1551	2.09	74,383,731	1550
2014	51	74,086,682	1588	2.14	74,346,098	1590
2015	49	70,416,380	1589	2.26	74,349,174	1680
2016	49	72,009,469	1700	2.36	74,338,157	1750

Data are from the Child File and Agency File. National fatality rates per 100,000 children were calculated by dividing the number of child fatalities by the population of reporting states and multiplying by 100,000

If fewer than 52 states reported data, the national estimate of child fatalities was calculated by multiplying the national fatality rate by the child population of all 52 states and dividing by 100,000. The estimate was rounded to the nearest 10. If 52 states reported data, the national estimate of child fatalities was calculated by taking the number of reported child fatalities and rounding to the nearest 10. Because of the rounding rule, the national estimate could have more or fewer fatalities than the actual reported number of fatalities

Table 1.3 How do deaths occur? Maltreatment types of child fatalities (2016) (US Department of Health and Human Services et al. 2018)

Maltreatment type	Child fatalities	Maltreatment types	Maltreatment types (percent)
Medical neglect	–	82	5.7
Neglect	–	1079	74.6
Other	–	217	15.0
Physical abuse	–	639	44.2
Psychological abuse	–	19	1.3
Sexual abuse	–	18	1.2
Unknown	–	1	0.1
National	**1447**	**2055**	**142.0**

Based on data from 44 states. Data are from the Child File. A child may have suffered from more than one type of maltreatment, and therefore, the total number of reported maltreatments exceeds the number of fatalities, and the total percentage of reported maltreatments exceeds 100.0%. The percentages were calculated against the number of child fatalities in the reporting states

analysis showed that the youngest children were at highest risk for child fatality from maltreatment. Children aged 0–3 years accounted for 70% of the child abuse and neglect fatalities, with infants younger than 1 year accounting for nearly 21% of these maltreatment-related fatalities.

Child abuse and neglect fatalities include those caused by neglect only, 74.6%; medical neglect, 5.7%; physical abuse, 44.2%; child sexual abuse, 1.2%; and psychological abuse, 1.3%. See Table 1.3.

Using the different methodology that goes beyond cases counted by CPS, the NIS-4 study estimated 2400 children died in 2005–2006 as a result of harm standard abuse or neglect (Sedlak et al. 2010).

Inflicted vs. Noninflicted Injuries

Different forms of injury have different risks. For example, central nervous system injury in younger children is particularly serious. Bruises may be superficial or harbingers of more serious deeper injury. Burns observed in child maltreatment cases tend to be highly severe. Finally, skeletal injuries may be isolated or multiple in nature and may be associated with other injuries. DiScala, Sege, Guohua, and Reece (2000) conducted a 10-year retrospective study of medical records in the National Pediatric Trauma Registry (NPTR) from 1988 to 1997 that compared hospitalized, injured children younger than 5 years to determine differences between inflicted (n = 1997) and accidental injuries (n = 16,831). The study compared children who had accidental injury with children who were abused and found that abused children tended to be younger (12.8 months vs. 25.5 months) and were mainly injured by battering (53%) and shaking (10.3%). The abused children were more likely to have a preinjury medical history of a medical problem or condition. The unintentionally injured children were mainly injured by falls (58.4%) and motor vehicles (37.1%).

Despite these epidemiologic differences among inflicted and noninflicted injuries, there are opportunities to further coordinate the injury prevention efforts among

the groups of practitioners who tend to independently address each injury type. Cohen et al. (2002) called attention to the lack of integration among professionals who address inflicted injuries with other professionals who address noninflicted injuries. A "bridging the gap" strategy would find opportunities for coordinated injury prevention efforts in which "ideas and practices could be cross-applied, including training of practitioners, data collection, and analysis, application of tools, and methodologies, examination of risk and resiliency factors, and identification of funding sources and partners" (Cohen et al. 2002, p. 473). Shenoi et al. (2013) sum up the more integrated prevention approach as one embodied by the well-established public health approach.

A public health approach (Christoffel and Gallagher 2006) to injury prevention involves the surveillance of a specific injury, identification of its risk factors and protective factors, evaluation of interventions that reduce the injury burden, and dissemination and widespread adoption of best practices that are effective in decreasing the burden of injury. This approach based on population health principles should be hinged on the human ecological model in the prevention of *all* types of injuries in children – unintentional and intentional. In the human ecological model, there is a progressive, mutual accommodation between an active, growing human being and the changing properties of the immediate settings in which the developing person lives, as this process is affected by relations between these settings and by the larger contexts in which the settings are embedded (Bronfenbrenner 1979). During the past two decades, it has become more apparent to the public health community that intentional injury is at its core, a public health intervention similar to that which is used to reduce unintentional injuries (Shenoi et al. 2013; Peterson and Brown 1994; Christoffel and Gallagher 2006; Barlow and Calam 2011).

Etiology of Physical Abuse and Neglect

Models for Abuse

No single cause of physical abuse and neglect has been identified. Child maltreatment and its cause are multifactorial, and research into etiologies has been difficult owing to the unique characteristics of child maltreatment, which include:

- The extreme socially deviant nature of the behavior
- Low prevalence
- Presence of varying factors in its context
- Political and historical changes in the definition of the behavior
- Complex nature of the behavior that requires conventional wisdom to be re-evaluated when it pertains to human nature and parenting (The National Academies Press 1993)

Therefore, theoretical approaches and conceptual models help to organize the complex issues involved in child abuse and neglect. A jigsaw puzzle approach captures the multifactorial nature of child abuse and helps to explain causes (Hobbs

et al. 1993). This approach incorporates diverse knowledge and understanding from a variety of sources including anthropology, child advocacy, criminology, education, history, law, medicine, political science, psychology, and sociology.

Early theories and models based on the existence of psychopathology in the parent (usually the mother) have evolved into more holistic cognitive and ecological models that try to account for factors involved in child maltreatment (Gil 1975; Newberger and Newberger 1981; Steele 1987). At present, cognitive and ecological models are most accepted and focus more on what the abuser has learned and experienced and how these forces may predispose him or her to function in a family context (Zuravin 1989). Models describe the cause of abuse as multilevel and interactive, involving the individual, the caregivers, the community, and the global sociocultural context (Gil 1975; Newberger and Newberger 1981).

The ecological approach is associated with the seminal work of psychologist Urie Bronfenbrenner (1977). It defines child development in the context of an interacting, dynamic system. The ecology for child development includes the family (microsystem), the community in which the family exists, forces applied to the system (exosystem), and sociocultural values that overlay the community and its families (macrosystem) (Bronfenbrenner 1977). Garbarino (1977) applied ecological principles to the study of abuse and neglect, thus introducing the interactional nature of the roles of the parent and child, family, social stress, and social and cultural values (Belsky 1980; Justice et al. 1985). The human ecology or socioecological model is a useful paradigm from which to address the factors that place people at risk for a variety of forms of violence, including child abuse and neglect. See Fig. 1.5.

Helfer's Clinical/Developmental Model for Risk Factors

Helfer (1973, 1987) provided a clinical and developmental perspective to the application of the ecological model to understanding child abuse and neglect. He stated that the caregiver and child interact around an event or in an environment where the

Fig. 1.5 Ecological model for understanding violence. (Centers for Disease Control and Prevention. (2009). https://www.cdc.gov/violenceprevention/overview/social-ecologicalmodel.html. Note: This socioecological model considers the complex interplay between individual, relationship, community, and societal factors. It allows us to address the factors that put people at risk for experiencing or perpetrating violence)

end result is that the child is injured or put at significant risk of injury or neglect. Helfer's (1987) approach accounts for the caregiver, the child, and triggers and stressors of the event or environment.

The Helfer (1973, 1987) model uses caution in defining the child's contribution to an abusive interaction. A child needs parenting, and nothing a child does, says, or thinks is a reason to inflict injury on that child. However, personality or physical characteristics can be predisposing factors to child abuse or neglect. Characteristics of the child associated with risk for abuse or neglect include such conditions as prematurity and disability (Breslau et al. 1982; White et al. 1987; Garbarino et al. 1987). Proposed reasons why premature infants are at higher risk for abuse and neglect include decreased bonding between child and parent, medical fragility of the child, and stress associated with the level of medical care that prematurity requires (Sameroff and Abbe 1978). Proposed reasons that physically and mentally challenged children are at increased risk center on the high demand that special needs place on the caregiver (Frisch and Rhodes 1982). The healthcare provider can identify child factors that may place the child at risk for injury and provide to the caregiver ongoing anticipatory guidance related to these stressors.

Stress defined as internal anxiety related to a perception of an inability to meet external demands is often cited as a factor in abusive interactions (Selye 1956). Because stress is a subjective phenomenon, what is stressful to one individual may or may not be stressful to another. Coping strategies may mitigate the amount of stress experienced in a given situation. Subsequently, caregiver stress and frustration figure prominently in the occurrence of child abuse (Straus and Kantor 1987). Stressors most often related to child abuse are those associated with poverty, significant life events, caregiver-child interaction patterns, and caregiver role conflicts (Justice and Justice 1976; Straus and Kantor 1987).

Helfer (1973) cited the following as risk factors associated with potential abuse or neglect:

Caregiver Factors

- Personal history
- Personality style
- Psychological functioning
- Expectations of the child
- Ability to nurture and assist the child's developmental progress
- Rearing practices modeled during the parent's own upbringing
- Degree of social isolation characteristic of the parent
- His or her ability to ask for and receive help from other individuals in the social network
- Support of the caregiver's partner in assisting with the parenting role
- Ability to deal with internal and external difficulty and coping strategies

Child Factors

- Prematurity and disability
- Poor bonding with caregiver
- Medical fragility
- Level of medical care of premature children
- Special needs of physically and mentally disabled children
- Child perceived as "difficult"

Environmental Factors

- Poverty
- Significant life events
- Caregiver-child interaction patterns
- Caregiver role conflicts

Effects

The physically abused or neglected child may sustain physical, emotional, and developmental effects. Injured or neglected children experience physical consequences that vary in severity depending on the type of injury, organ systems involved, and extent of tissue damage inflicted. Physical effects of abuse are discussed separately in subsequent chapters.

Maltreatment also may have negative effects on the child's behavior, development, and psychosocial functioning. Studies using "clinical" populations of seriously disturbed individuals found a high correlation between maltreatment and poor behavioral, psychosocial, and developmental outcomes (Lamphear 1985; Oates 1982; Parish et al. 1985). However, reliable, consistent predictions concerning the effects of maltreatment are difficult to make, and this remains an active area of research interest. Well-designed, longitudinal studies of the long-term effects of physical abuse and neglect point toward a complex relationship between child maltreatment and subsequent development. The impact of victimization on development hinges on "mediating" factors that mitigate against the negative effects of abuse and neglect on the child (Augoustinos 1987; Crittenden 1992; Martin and Elmer 1992). Possible mediating variables identified are the child's personality characteristics and coping strategies, available resources in the environment, the child's perception of how responsive people are to his or her plight, and the modeled adult behavior that the child observes during the aftermath of the abuse (Augoustinos 1987).

Felitti et al. (1998) examined the potential long-term impacts of childhood abuse on health and well-being. They explored the connection between exposure to

childhood abuse and household dysfunction to subsequent health risks and the development of illness in adulthood. They developed a series of adverse childhood experiences (ACEs) studies (Felitti et al. 1998). Of 13,494 adults who completed a standard medical evaluation in 1995–1996, 9508 completed a survey questionnaire that asked about their own childhood abuse and exposure to household dysfunction; the investigators then made correlations to risk factors and disease conditions.

In order to assess exposure to child abuse and neglect, the ACE questionnaire asked about categories of child maltreatment, specifically psychological, physical, and sexual maltreatment. When asking about physical abuse, the questionnaire asked the patients if a parent or other adult in the household had (1) often or very often pushed, grabbed, shoved, or slapped them or (2) often or very often hit them so hard that marks or other injuries resulted.

In order to assess exposure to household dysfunction, the ACE questionnaire explored categories of dysfunction, such as having a household member who had problems with substance abuse (e.g., problem drinker, drug user), mental illness (e.g., psychiatric problem), criminal behavior in household (e.g., incarceration), or having a mother who was treated violently. In assessing if the respondent's mother was treated violently when the patient was a child, the survey asked if their mother or stepmother (1) was sometimes or very often pushed, grabbed, slapped, bitten, or hit with a fist, or with something hard, or had something thrown at her or (2) was ever repeatedly hit for at least a few minutes or threatened with or hurt by a knife or gun.

In addition to the questionnaire information, the standardized medical examination of the adults assessed risk factors and actual disease conditions. The risk factors included smoking, severe obesity, physical inactivity, depressed mood, suicide attempts, alcoholism, any drug abuse, a high lifetime number of sexual partners, and a history of sexually transmitted disease (STD). The disease conditions included ischemic heart disease, cancer, stroke, chronic bronchitis, emphysema, diabetes, hepatitis, and skeletal fractures. The study found that the most prevalent ACE was substance abuse (25.6%), the least prevalent adverse experience was criminal behavior (3.4%), the prevalence of physical abuse was 10.8%, and the prevalence of the mother being treated violently was 12.5%.

Overall, 52% of the respondents had one or more ACEs and 6.2% had four or more adverse experiences. The following were findings in respondents who experienced four or more ACEs compared with those who had none:

- Risk of alcoholism, drug abuse, depression, and suicide attempt increased 4- to 12-fold.
- Rates of smoking, poor self-rated health, and high number of sexual partners and STDs increased two- to fourfold.
- Physical inactivity and severe obesity increased 1.4- to 1.6-fold.

A major finding of the ACE studies was a graded relationship between the number of exposures to maltreatment and household dysfunction during childhood to the presence in later life of multiple risk factors and several disease conditions associated with death in adulthood (see Fig. 1.6).

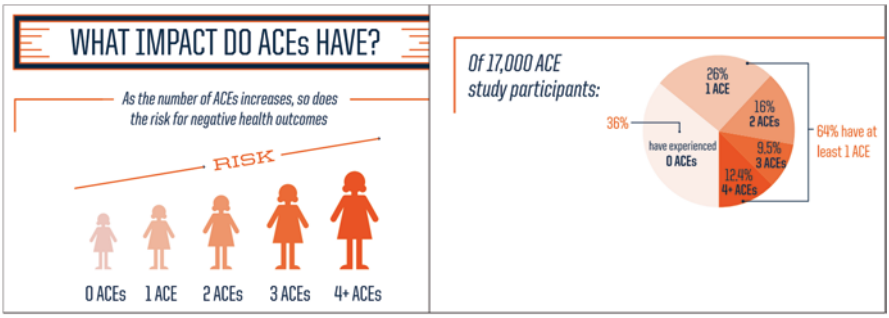


Fig. 1.6 The graded response to ACEs exposure. (Robert Wood Johnson Foundation (2013). The Truth About Aces Infographic. https://www.rwjf.org/en/library/infographics/the-truth-about-aces.html#/download)

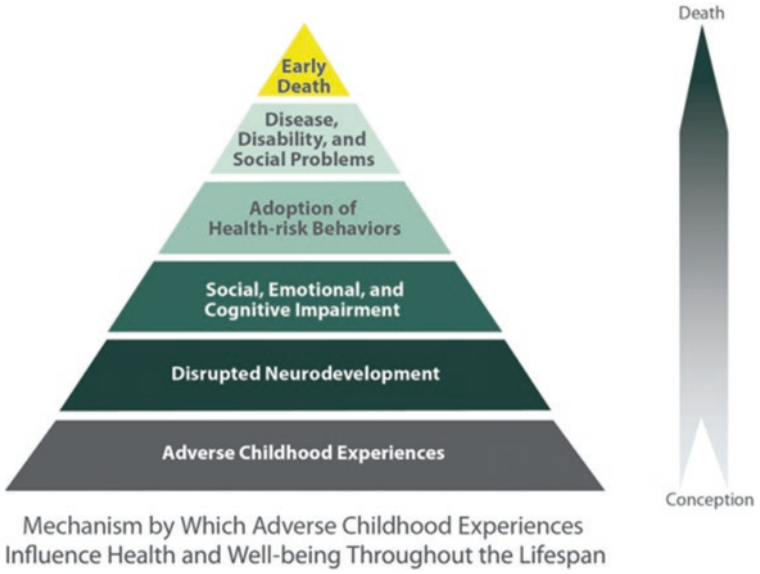


Fig. 1.7 Adverse Childhood Experiences Pyramid. (From the Centers for Disease Control and Prevention: https://www.cdc.gov/violenceprevention/acestudy/about.html)

The ACEs work has led to a life course-type approach to understanding the connection of early adversity in childhood to later poor health and early mortality captured in a graphic called the ACE pyramid (see Fig. 1.7).

Shonkoff et al. (2012) in an American Academy of Pediatrics technical report summarized advances in multiple fields including neuroscience, genomics, epidemiology, and developmental psychology as well as others to describe an emerging understanding of health and disease across the life span that connects the early

exposure to ACEs with later observed adult health problems. They defined a type of stress called toxic stress that is pervasive, leads to a strong prolonged stress response in the child that affects neurodevelopment, and has the potential for lifelong impacts. In the authors' words:

> Although much research remains to be performed in this area, there is a strong scientific consensus that the ecological context modulates the expression of one's genotype. It is as if experiences confer a "signature" on the genome to authorize certain characteristics and behaviors and to prohibit others. This concept underscores the need for greater understanding of how stress "gets under the skin," as well as the importance of determining what external and internal factors can be mobilized to prevent that embedding process or protect against the consequences of its activation. (Shonkoff et al. 2012)

Researchers, policymakers, and clinicians have long been intrigued by the question of whether or not a "cycle of violence" exists wherein exposure to child abuse and neglect might be seen as leading to adult criminal behavior. Widom and Maxfield (2001) reported on a longitudinal study of 908 substantiated cases of child maltreatment drawn from a metropolitan area in the Midwestern United States and processed by the courts from 1967 to 1971. Substantiated cases of abuse were compared to a group of 667 nonmaltreated children who were matched according to gender, age, ethnicity, and family socioeconomic status. Analyzing arrest records from 1994, when the average age of the subjects was 32.5 (the peak years for committing violent offenses are 20–25 years of age), the study found that while many individuals in both groups had no juvenile or adult criminal record, those who were maltreated had an increased likelihood of arrest as a juvenile by 59% and as an adult by 28%. Additional key findings included the following (Widom and Maxfield 2001):

- Maltreated children were younger at the time of their first arrest.
- Maltreated children committed nearly twice as many offenses and were arrested more frequently.
- Physically abused and neglected (versus sexually abused) children were the most likely to be arrested later for a violent crime.
- Newer results indicated that abused and neglected females were also at increased risk of arrest for violence as juveniles and adults.
- White abused and neglected children were no more likely to be arrested for a violent crime than their nonabused and non-neglected white counterparts.
- Black abused and neglected children showed significantly increased rates of violent arrests compared with black children who were not maltreated.

Widom and Maxfield (2001) observed that while exposure to physical abuse had the highest percentage of arrests for violent crimes at 21.1%, those exposed to neglect were not far behind at 20.2%, and those exposed to sexual abuse had the lowest percentage of arrests for violent crimes at 8.8%. See Fig. 1.6. Thus, exposure to child abuse and neglect must be seen as a significant problem that has the potential for widespread and serious social consequences that include a childhood delinquency, adult criminality, and the potential for violent criminal behavior, with almost half of the abused and neglected individuals having had an arrest for a nontraffic offense (i.e., 49% overall). Widom, Czaja, and Dutton (2008) conducted a

Exhibit 5. ***Does only violence beget violence?***

Abuse Group	Number of subjects	Percentage Arrested for Violent Offense
Physical Abuse Only	76	21.1
Neglect Only	609	20.2
Sexual Abuse Only	125	8.8
Mixed	98	14.3
Control	667	13.9

Fig. 1.8 Association of type of abuse with arrest for violent crimes. (Widom and Maxfield. (2001). from http://www.ncjrs.gov/pdffiles1/nij/184894.pdf)

later analysis focused on the risk for revictimization in which the study participants, both maltreated and nonmaltreated, were interviewed between 2000 and 2002 when these participants had a mean age of 39.5 years. They found that abused and neglected individuals reported a higher number of victimization experiences than did nonmaltreated controls and that all types of maltreatment including physical abuse, sexual abuse, and neglect were associated with an increased risk for lifetime revictimization (Widom et al. 2008). Furthermore, childhood victimization increased the risk for the following: physical and sexual assault, kidnapping, being stalked, having a family friend murdered, or having a family friend commit suicide (see Fig. 1.8).

Early work in the field of child abuse and neglect estimated that approximately 25–35% of children subjected to all forms of child abuse would go on to abuse their own children as compared to controls who were not abused (Kaufman and Ziegler 1987). Although abusive parenting occurs in some cases, abused children do not inevitably become abusive parents. Martin and Elmer (1992) found that although some abused children are at risk of becoming abusive toward their own children, the majority of such survivors do not go on to abuse their children.

It is important for healthcare professionals to appreciate that children who are abused are not "doomed" and that the child needs to be nurtured and supported in a safe environment for healing and normal development to occur. One of Widom and Maxfield's final recommendations addressed the need for early intervention to help children who have been maltreated avoid a myriad of problems that in addition to delinquency and criminality include poor educational performance, mental health problems, and generally low levels of achievement.

These updated findings reinforce the need for police, teachers, and healthcare workers to recognize the signs of abuse and neglect and make serious efforts to intervene as early as possible. The later the intervention, the more difficult the change process becomes. It is suggested that special attention be paid to abused and neglected children with early behavior problems. These children show the highest risk of later juvenile and adult arrest, as well as violent criminal behavior (Widom and Maxfield 2001, p. 7).

The AAP's Committee on Child Abuse and Neglect issued clinical report that called attention to the ongoing challenge of understanding the behavioral and emotional consequences from exposure to child maltreatment (American Academy of Pediatrics et al. 2008; Sege et al. 2012). The 2008 AAP report, issued in collaboration with the American Academy of Child and Adolescent Psychiatry and the National Center for Child Traumatic Stress, reminded practitioners that children who experience child abuse and neglect may later manifest significant mental and behavioral problems including emotional instability, depression, and a tendency to be aggressive or violent with others (American Academy of Pediatrics et al. 2008). The 2012 AAP report updated the 2008 report and incorporated the insights from the 2012 technical report by Shonkoff et al., referred to above. The pervasive effects of maltreatment as well as other adversities on adult health and functioning are better understood and are motivating a great deal of attention on prevention and intervention efforts directed at mitigating or even eliminating the negative impact on the victims' life course. Reflecting back on the Shonkoff et al. (2012) technical report:

> Advances in neuroscience, molecular biology, and genomics have converged on 3 compelling conclusions: (1) early experiences are built into our bodies; (2) significant adversity can produce physiologic disruptions or biological memories that undermine the development of the body's stress response systems and affect the developing brain, cardiovascular system, immune system, and metabolic regulatory controls; and (3) these physiologic disruptions can persist far into adulthood and lead to lifelong impairments in both physical and mental health. (p. e243)

Early work from Briere (1992) described a framework from which to view the mental health implications of abuse and neglect that identifies three stages of potential impact of maltreatment on the child: (a) initial reactions that include post-traumatic stress, alterations in normal development, painful affect, and cognitive distortions; (b) accommodation to ongoing abuse, including coping behaviors intended to increase safety and/or decrease pain; and (c) long-term effects and ongoing accommodation that reflect on the initial reactions and accommodations and that are rooted in the ongoing coping responses. Briere (1992) described a number of serious mental health problems found in abused survivors that, at the extreme, include post-traumatic stress disorder (PTSD) and dissociative disorders. Although the majority of survivors of abuse will not experience the most extreme impairment, Briere (1992) contended that a large number of victims experience some level of dysfunction. The 2012 AAP clinical report called attention to the broad range of response to maltreatment that may be seen in children exposed to abuse and neglect that may include "signs of intense emotional and physiologic distress, disturbed sleep, difficulty paying attention and concentrating, anger and irritability, withdrawal, repeated and intrusive thoughts, and extreme distress…" (p. e3).

The mental health consequences from exposure to maltreatment appear to occur along a continuum from passivity and withdrawal to aggression and violence. The continuum depends on the tendency of the child or adolescent toward internalizing or externalizing emotions and behaviors (Goldman et al. 2003). Children and adolescents who have been maltreated may demonstrate a myriad of symptoms and

conditions including low self-esteem, depression, anxiety, PTSD, attachment difficulties, eating disorders, sleep disturbances, poor peer relations, and various self-destructive behaviors including substance abuse and suicide attempts (Goldman et al. 2003). However, not all children who experience maltreatment go on to manifest significant behavioral or emotional disorders (Giardino and Harris 2006). Such capacity for "resilience" relates to the presence of various protective factors that mitigate and buffer the child from developing the severe negative consequences (Heller et al. 1993). Among the protective factors are (1) personal characteristics inherent in the child or adolescent, including a sense of optimism, high self-esteem, high intelligence, and a general hopeful outlook and perspective, and (2) environmental characteristics such as a supportive social network that includes supportive caregivers, interested relatives and professionals, and social supports that are accessible and available (Goldman et al. 2003).

Therapeutic efforts that are focused on the coping strategies of the child or adult can help the survivor's healing process (Briere 1992). The AAP's report called on healthcare professionals to assist in the recovery of the maltreated child by helping those responsible for their care to recognize the abused or neglected child's likely altered responses to environmental stimuli, to assist caregivers in formulating more effective coping strategies, to mobilize all available community resources to support the child, and to effectively respond to the child's immediate and ongoing needs (American Academy of Pediatrics et al. 2008; Sege et al. 2012).

In summary, physical abuse and neglect may have far-reaching implications for the child victim. Research describing outcomes from abuse and neglect shows that deleterious effects from exposure to child abuse can be mitigated if supportive people and systems respond to the child victim in a substantive manner.

Costs

In addition to the impact on the child and family, child abuse and neglect also impacts the community and society as well. At the most basic level, the costs to society of child abuse and neglect can be economically quantified in terms of direct and indirect costs (Wang and Holton 2007). Gelles and Perlman (2012), using this direct and indirect cost model, produced 2012 cost estimates for child maltreatment in the United States. Direct costs are defined as those associated with the immediate needs of the maltreated children and include such items as hospitalizations, mental health services, child protection, and law enforcement. Indirect costs are those associated with the long-term needs of the maltreated children. Indirect costs include those related to special education, juvenile justice, physical healthcare, mental healthcare, adult criminal justice, and the lost productivity to the society. According to Gelles and Perlman, the total societal costs of child abuse and neglect using the 2012 dollar value would be over $80 billion/year with direct costs in 2012 estimated to be $33,333,619,510 and indirect costs estimated to be $46,926,791,578.

This staggering cost works out to nearly $220 million per day. Using a different methodology, Fang, Florence, and Mercy (2012), in 2010 dollars, estimated average lifetime costs per nonfatal child maltreatment victim to be:

- $210,012, composed of the following:
  - Childhood healthcare costs: $32,648
  - Adult medical costs: $10,530
  - Productivity losses: $144,360
  - Child welfare costs: $7728
  - Criminal justice costs: $6747
  - Special education costs: $7999

After examining these cost figures, Fang et al. (2012) concluded their analysis with a call for prevention:

> Compared with other health problems, the burden of CM [child maltreatment] is substantial, even after conservative assumptions are used, indicating the importance of preventing and treating CM. Although the evidence base for effective strategies to address CM is limited, a promising array of prevention and response programs have great potential to reduce the economic burden of CM…For such programs to be successful, an ongoing commitment to implementation science will be needed to ensure that the full programs – upon which the positive results rest – are imparted with fidelity and include ongoing monitoring and supervision, and sustained resourcing… **Given the substantial economic burden of CM, the benefits of prevention will likely outweigh the costs for effective programs.** (p.163; emphasis added)

In Brief

- Child maltreatment is categorized into (a) physical abuse, (b) sexual abuse, (c) emotional/psychological abuse, and (d) neglect.
- There is no single cause of physical abuse and neglect.
- The result of abuse and neglect is a child who either sustains injury or is at risk for injury and whose growth and development may be impeded.
- Maltreatment primarily occurs in the family setting and is a problem firmly rooted in the caregiving environment.
- Corporal punishment ends and child abuse begins when the punishment inflicted by the parent causes bodily harm.
- When a child manifests the signs of abuse, the healthcare provider is legally mandated to report the caregiver for physical abuse regardless of the caregiver's intention.
- Healthcare professionals are mandated reporters of suspected child abuse and neglect and are obligated in all jurisdictions to comply with the law.
- Healthcare providers must understand and comply with the definition of child abuse in the state laws governing the geographical area in which they practice.
- Healthcare providers understand that children who are abused need to be nurtured and supported in a safe environment for healing and normal development to occur.

- Injured or neglected children experience physical consequences that vary in severity depending on the type of injury, tissues involved, and extent of damage.
- Therapeutic efforts focused on the child's and/or adult's coping strategies can help the survivor live in a satisfying and productive manner.
- Estimates for the total annual costs for child abuse and neglect in the United States are $80 billion, or nearly $220 million per day, which clearly frames a call to action around prevention to shift the dollars spent from treating the problem to actually preventing the problem before it happens.

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Chapter 2
Evaluation of Physical Abuse and Neglect

Sheela L. Lahoti, Rebecca G. Girardet, and Angelo P. Giardino

Approach to the Medical Evaluation

It may be difficult to identify children who are victims of physical abuse. Many injuries are not pathognomonic, and the diagnosis may not be obvious (Kellogg and the Committee on Child Abuse and Neglect 2007). The history given by the caregiver may be misleading or incomplete, causing a delay or mistake in diagnosis. In addition, victims of abuse often are too young to provide a history. Although only a small percentage of injuries seen by health-care professionals are the result of abuse, there are a number of historical and physical findings that should raise the suspicion of nonaccidental trauma.

Diagnosing child abuse requires knowledge of child development, the epidemiology of trauma, mechanisms of injury in children, and the differential diagnosis of various forms of injury. The medical evaluation includes a history, physical examination, indicated laboratory and diagnostic studies, and observation of the caregiver–child interaction. Careful attention to the possibility of child maltreatment in the differential diagnosis generated when evaluating children for injuries is essential. There is a growing body of evidence highlighting the devastating consequences of cases in which an initial evaluation fails to diagnose abuse only to present again for care later with additional injuries. These later injuries could have been prevented had the child been accurately diagnosed as having been maltreated when they first

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presented on the initial or previous evaluations (Jenny et al. 1999; Skellern et al. 2000). Of note, Jenny et al. (1999) retrospectively reviewed medical records from a 5-year period of time of children presenting with head trauma, and of 173 abused children, 54 (31.2%) had been seen by a physician after the abusive head trauma injury, and the diagnosis was not recognized (Jenny et al. 1999). Fifteen of the children (27.8%) sustained additional injury after the diagnosis was missed, and 22 (40.7%) experienced medical complications related to the failure to diagnose the abuse. The authors conclude that four of five deaths in the group of unrecognized abusive head trauma might have been prevented had the maltreatment been recognized upon earlier presentation (Jenny et al. 1999). The recognition of abuse stems from the "building block" approach, which synthesizes data from each part of the clinical evaluation to develop and confirm a suspicion of abuse (Ludwig 2005; Wood and Ludwig 2010) (see Figs. 2.1, 2.2, and 2.3). Completing a detailed history and physical examination is paramount because many cases of abuse are first detected by identifying discrepancies between the history and physical findings. It is ideal for two individuals, such as a physician and nurse or social worker, to obtain a history together. The likelihood that important questions will be missed decreases if more than one person is present to interview the family. In addition, information can be recorded by one person while the other asks questions. After the interview, the questioners can review information for accuracy.

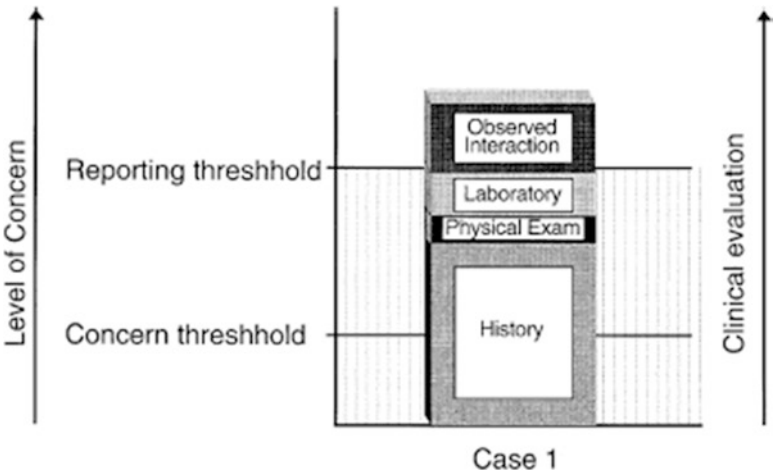

Fig. 2.1 Building block approach to diagnosis of child maltreatment. Each component of the clinical evaluation is viewed as a building block that, as they are stacked during the process of the evaluation, can lead to higher and higher levels of concern. At a certain point, the stack of blocks may lead to a reporting threshold for the clinician. (Source: Ludwig 2005 used with permission)

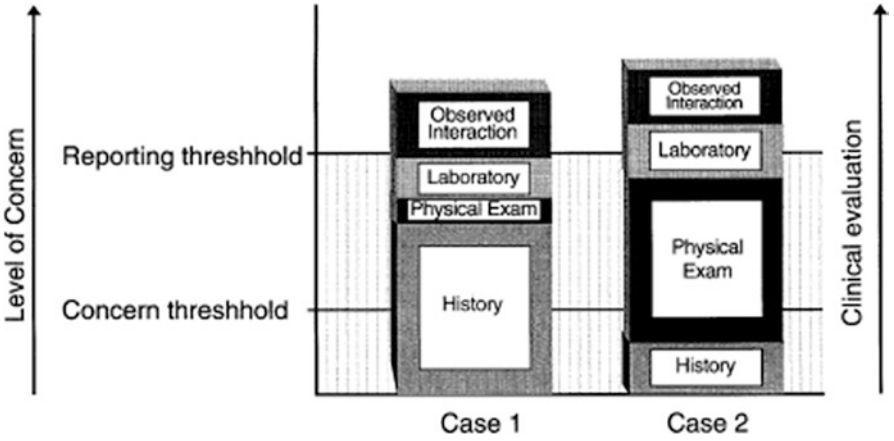

Fig. 2.2 Building block approach to diagnosis of child maltreatment. The blocks may be of different sizes depending on how much of a concern the information is that is uncovered during that component of the evaluation. In Case 1, the history is very much of a concern for abuse and contributes a great deal toward reaching the clinician's reporting threshold. In Case 2, the history is of minimal concern, but the physical examination contributes a great deal toward reaching the clinician's reporting threshold. (Source: Ludwig 2005 used with permission)

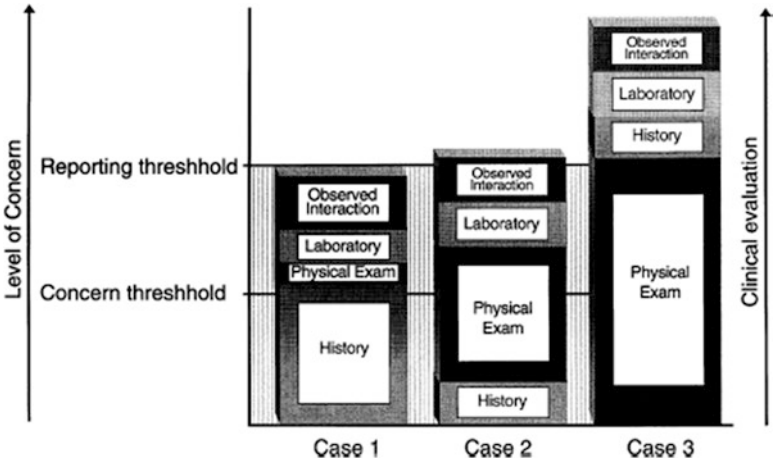

Fig. 2.3 Building block approach to diagnosis of child maltreatment. Case 3 demonstrates how one component can be so much of a concern that it alone causes the clinician to reach a reporting threshold (e.g., the physical findings of loop marks on a child's skin). (Source: Ludwig 2005 used with permission)

The History and Interview

A complete history elicited by the health-care provider helps determine whether an injury is the result of abuse or an accident. Professionals who evaluate injured children and their families consider the possibility of abuse when evaluating all pediatric injuries. Although the majority of childhood injuries seen by medical personnel are accidental, missing a case of child abuse puts the patient at great risk for future injury (Kellogg and the Committee on Child Abuse and Neglect 2007). In a comprehensive review of injury biomechanics research, Pierce and Bertocci call attention to child maltreatment being the leading cause of trauma-related death in children under 4 years of age and specifically state: "…many of these children present for medical care with earlier warning signs of maltreatment where the diagnosis of abuse was missed or the significance of the injury was not recognized" (Jenny et al. 1999; Letson et al. 2016; Lindberg et al. 2015; Pierce and Bertocci 2008; Skellern et al. 2000; Sheets et al. 2013).

It is important to be thorough yet nonaccusatory during the evaluation (Kellogg and the Committee on Child Abuse and Neglect 2007). Health-care providers conduct an unbiased health-care evaluation and are not investigators. The health-care history or interview is conducted professionally, without displays of anger or reproach that may alienate the caregiver and may result in less thorough gathering of historical information.

Documentation

It is essential to complete a detailed medical record in cases of suspected physical abuse. A standardized form can be used to document the evaluation (see Appendix). Health-care providers are asked to justify the medical diagnosis more commonly in child abuse cases than for almost any other pediatric condition. County social workers, law enforcement officials, and attorneys often become involved in cases of child abuse, and details regarding the medical findings are necessary for their investigations. Health-care professionals are often asked to testify in criminal or civil court regarding the child's injuries and the basis for the diagnosis of abuse (see Chap. 15).

A complete and thorough medical record is critical because court proceedings may occur 1–2 years after the child is injured. Although the health-care professional may have some independent memory of the case, it may be difficult to recall details months or years after the examination was completed. A health-care provider who has had the painful experience of reviewing a record in court that is incomplete or substandard recognizes the need for meticulously documented information as it relates to the abused child.

The details of the history and interview are documented in the record using quotes to indicate exact responses of the child whenever possible. Because the record is a legal document that may be used in legal and court proceedings, it is

necessary that statements reflect the non-leading and unbiased nature of the questions asked in the history, interview, and examination. The record is written clearly to document all significant history related to past and present occurrences of abuse or neglect. The record should contain the date and time of injury, the identity of the caregivers who bring the child for care, and any reasons offered for or denials of any known trauma to the child.

The Caregiver–Child Interaction

An essential component of the child abuse evaluation is the observation of how the caregiver and child interact with one another (Schmitt et al. 1976). Of great concern to the health-care provider are caregivers who seem unaware of the seriousness of the child's injuries, are indifferent to the child's needs, or appear unsupportive of the child. Additional concern arises when the caregiver belittles the child, is overly directive in his or her communication, and is inattentive to the child's requests. Children who interact with their caregiver in an unusual manner and do not look to their caregiver for emotional support are also of concern. Caregivers and children vary in their response to stress and trauma and may not be behaving normally in an emergency setting. Caution is taken to avoid overgeneralizing and attributing meaning or blame to these observations in the acute clinical setting.

History Related to Injuries

The history is integral in establishing the diagnosis of child abuse. A thorough approach to history taking in all cases of trauma identifies injuries that may have been inflicted. A standard format for gathering medical data is used that includes chief complaint, history of present illness, review of symptoms, and past medical and psychosocial history. Family history related to bleeding disorders, osteogenesis imperfecta, or other injury-related disorders is important to include. Children who are verbal often can provide a history of injury, unless they are developmentally impaired, in a great deal of pain, or frightened. As a general rule, separating the caregivers and verbal child helps to obtain a more reliable history from the child. For injured infants and young children, it is common for the caregiver to provide the history. The improvement of verbal abilities in children as they reach school age is reflected in the details that the child describes regarding an injury. A school-aged child would be expected to know some of the details surrounding the circumstances around a significant injury unless a clinical reason exists for lack of memory such as a head injury.

Regardless of who provides information, the history begins by asking for a narrative of the injury. The interviewer then asks questions to clarify confusing statements and fill in missing details in the story. It is important to ask open-ended,

Table 2.1 Central questions related to the injury

What were the date and time of the injury?
Where did the injury occur?
Who was caring for the child at the time of the injury? Did the caregiver witness the injury?
What events preceded the injury?
What was the child's reaction to the injury?
What did the caregiver do after the injury occurred?

non-leading questions. The following are questions that should be explored in all evaluations (see Table 2.1).

1. *What were the date and approximate time that the injury occurred?* In some cases, a history of injury cannot be provided, either because the adult with the child was not present at the time of the injury or because there was no known trauma to the child. In this situation, it is important to know when the child last seemed perfectly well. For example, an infant who sustained a femur fracture may have been injured by a parent prior to being dropped off at the babysitter, only to be recognized by late morning, when the caregiver noted swelling of the leg. A history of irritability throughout the morning would support this scenario, whereas a history of playfulness and well-being all morning would not.
2. *Where did the injury occur?* Abusive injuries are most commonly sustained in the privacy of the home rather than in public places. Accidental injuries that occur in public often have been witnessed by unrelated adults who may provide information to police or emergency medical technicians (EMTs). This information can corroborate an accidental mechanism of injury.
3. *Did the caregiver witness the injury?* In an attempt to provide a history of trauma, caregivers sometimes provide a likely scenario for an injury they did not actually witness. Determine whether the injury was witnessed or unwitnessed. Both can be accidental. Ask detailed questions regarding the injury, such as approximate distance the child fell, the surface onto which the child fell, the position in which the child landed, parts of the body that appeared to be injured, and whether there were any objects in the path of the fall.
4. *What events preceded the injury?* What were the child and caregiver doing just before the injury? Search for signs of chaos or stress, which may be related to abusive injuries. For example, an infant who sustains abusive head injury may have kept a tired caregiver up all night and then refused a bottle that was meant to quiet the baby. Beware of claims that a child with major injury went for hours or days without pathology or changes in behavior.
5. *What was the child's reaction to the injury?* Determine whether the child's reported behavior after the injury is compatible with the disability or pain caused by the injury.
6. *What did the caregiver do after the injury?* Determine when the caregiver first noted the injuries and what treatment was given to the child prior to being seen by a health-care provider.

7. *How much time elapsed between the injury and the time the child arrived for medical care?* If significant time elapsed, determine what occurred during that time and the reason for the delay. If there was a delay in seeking care, determine why the caregiver chose this time to bring the child for evaluation.

Past Medical History

The past medical history of the child may help to identify suspicious injuries and medical conditions that can be mistaken for abuse. In evaluating suspicious injuries, the interviewer asks about the child's health to reassure the caregiver that he or she is interested in the child's well-being and not merely trying to apportion blame for an injury. The interviewer explores the child's general health, previous hospitalizations, operations, and any past significant trauma. Carefully document the caregiver's initial history regarding the injury with attention to any recent or past trauma to the child. It is essential to obtain phone numbers and addresses of the caretakers and family members for future reference.

In cases of child abuse, there may be evidence of old and unexplained injury. It is important to determine former injuries that the child sustained and where the child was treated. This is accomplished by asking the caregiver and by checking past records within the same hospital, at other hospitals, and at facilities or offices where the child has been treated. The history uncovers whether the child receives regular health care with a single provider or has been to multiple physicians. Abusive caregivers often bring children with inflicted injuries to multiple medical care providers in an attempt to avoid the recognition of abuse. The interviewer explores reasons for using multiple health-care providers and then reviews old records.

The past medical history includes information about the mother's pregnancy and the child's birth. Family history explores the health of family members and inheritable diseases that may affect the diagnosis of the child such as osteogenesis imperfecta, bleeding and bone disorders, and Ehlers–Danlos syndrome.

A developmental history of the child is obtained that includes the child's present level of abilities and the age at which the child reached standard developmental milestones. For school-aged children, it is important to know if the child requires any special education and how the child functions in school. An understanding of normal child development is essential in evaluating injuries that are said to be self-inflicted. In addition, a child's slow development may be a source of frustration and stress for a caregiver, thereby increasing the risk for abuse in some situations (see Table 2.2).

Finally, the social history of the family is explored, including family composition and individuals living in and outside the home. The social history includes financial and emotional supports for the family and recent or chronic family stresses. Caregivers are screened for alcohol and/or drug abuse and a history of domestic violence (see Chaps. 11 and 14).

Table 2.2 Developmental milestones

Age	Physical characteristics	Social–emotional intellectual characteristics
0–3 months	Raises head and chest when lying on stomach Supports upper body with arms when lying on stomach Stretches legs out and kicks when lying on stomach or back Opens and shuts hands Pushes down on legs when feet are placed on a firm surface Brings hand to mouth Takes swipes at dangling objects with hands Grasps and shakes hand toys *Vision* Watches faces intently Follows moving objects Recognizes familiar objects and people at a distance Starts using hands and eyes in coordination *Hearing and speech* Smiles at the sound of your voice Begins to babble Begins to imitate some sounds Turns head toward the direction of sound	Begins to develop a social smile Enjoys playing with other people and may cry when playing stops Becomes more expressive and communicates more with face and body Imitates some movements and facial expressions
3–7 months	*Movement* Rolls both ways (front to back, back to front) Sits with, and then without, support on the hand Supports whole weight on the legs Reaches with one hand Transfers object from hand to hand Uses hand to rake objects *Vision* Develops full color vision Distance vision matures Ability to track moving objects improves	Enjoys social play Interested in mirror images Responds to other people's expressions of emotion and appears joyful often
	Cognitive Finds partially hidden object Explores with hands and mouth Struggles to get objects that are out of reach *Language* Responds to own name Begins to respond to "no" Can tell emotions by tone of voice Responds to sound by making sounds Uses voice to express joy and displeasure Babbles chains of sounds	

(continued)

Table 2.2 (continued)

Age	Physical characteristics	Social–emotional intellectual characteristics
8–12 months	*Movement* Reaches sitting position without assistance Crawls forward on belly Assumes hands-and-knees position Creeps on hands and knees Gets from sitting to crawling or prone (lying on stomach) position Pulls self up to stand Walks holding on to furniture (cruising) Stands momentarily without support May walk two or three steps without support	Shy or anxious with strangers Cries when mother or father leaves Enjoys imitating people in his play Shows specific preferences for certain people and toys Tests parental responses to his actions during feedings Tests parental responses to his behavior May be fearful in some situations Prefers mother and/or regular caregiver over all others Repeats sounds or gestures for attention
	Cognitive Explores objects in many different ways (shaking, banging, throwing, dropping) Finds hidden objects easily Looks at correct picture when the image is named Imitates gestures Begins to use objects correctly (drinking from cup, brushing hair, dialing phone, listening to receiver) *Language* Pays increasing attention to speech Responds to simple verbal requests Responds to "no" Uses simple gestures, such as shaking head for "no"	Finger-feeds himself Extends arm or leg to help when being dressed
	Babbles with inflection (changes in tone) Says "dada" and "mama" Uses exclamations, such as "Oh-oh!" Tries to imitate words *Hand and finger skills* Uses pincer grasp Bangs two objects together Puts objects into container Takes objects out of container Lets objects go voluntarily Pokes with index finger Tries to imitate scribbling	

(continued)

Table 2.2 (continued)

Age	Physical characteristics	Social–emotional intellectual characteristics
13–24 months	*Movement* Walks alone Pulls toys behind her while walking Carries large toy or several toys while walking Begins to run Stands on tiptoes Kicks a ball Climbs onto and down from furniture unassisted Walks up- and downstairs holding on to support	Imitates behavior of others, especially adults and other children More aware of herself as separate from others More excited about company of other children Demonstrates increasing independence Begins to show defiant behavior Separation anxiety increases toward mid-year then fades
	Cognitive Finds objects even when hidden under two or three covers Begins to sort by shapes and colors Begins make-believe play *Language* Points to object or picture when it's named Recognizes names of familiar people, objects, and body parts Says several single words (by 15–18 months) Uses simple phrases (by 18–24 months) Uses 2- to 4-word sentences Follows simple instructions Repeats words overheard in conversation	
	Hand and finger skills Scribbles on his or her own Turns over container to pour out contents Builds tower of four blocks or more Might use one hand more often than the other	

(continued)

Table 2.2 (continued)

Age	Physical characteristics	Social–emotional intellectual characteristics
25–36 months	*Movement* Climbs well Walks up- and downstairs, alternating feet (1 ft per stair step) Kicks ball Runs easily Pedals tricycle Bends over easily without falling *Cognitive* Makes mechanical toys work Matches an object in her hand or room to a picture in a book Plays make-believe with dolls, animals, and people Sorts objects by shape and color Completes puzzles with three or four pieces Understands concept of "two" *Language* Follows a two- or three-part command Recognizes and identifies almost all common objects and pictures	Imitates adults and playmates Spontaneously shows affection for familiar playmates Can take turns in games Understands concept of "mine" and "his/hers" Expresses affection openly Expresses a wide range of emotions By 3, separates easily from parents Objects to major changes in routine
	Understands most sentences Understands placement in space ("on," "in," "under") Uses 4- to 5-word sentences Can say name, age, and sex Uses pronouns (I, you, me, we, they) and some plurals (cars, dogs, cats) Strangers can understand most of her words *Hand and finger skills* Makes up-and-down, side-to-side, and circular lines with pencil or crayon	
	Turns book pages one at a time Builds a tower of more than six blocks Holds a pencil in writing position Screws and unscrews jar lids, nuts, and bolts Turns rotating handles	Imitates adults and playmates Spontaneously shows affection for familiar playmates Can take turns in games Understands concept of "mine" and "his/hers" Expresses affection openly Expresses a wide range of emotions By 3, separates easily from parents Objects to major changes in routine

(continued)

Table 2.2 (continued)

Age	Physical characteristics	Social–emotional intellectual characteristics
37–48 months	*Movement* Hops and stands on 1 ft up to 5 s Goes upstairs and downstairs without support Kicks ball forward Throws ball overhand Catches bounced ball most of the time Moves forward and backward with agility *Cognitive* Correctly names some colors Understands the concept of counting and may know a few numbers Tries to solve problems from a single point of view Begins to have a clearer sense of time Follows three-part commands Recalls parts of a story Understands the concepts of "same" and different Engages in fantasy play	Interested in new experiences Cooperates with other children Plays "Mom" or "Dad" Increasingly inventive in fantasy play Dresses and undresses Negotiates solutions to conflicts More independent Imagines that many unfamiliar images may be "monster" Views self as a whole person involving body, mind, and feelings Often cannot tell the difference between fantasy and reality
	Language Has mastered some basic rules of grammar Speaks in sentences of five to six words Speaks clearly enough for strangers to understand Tells stories	
49–60 months	*Movement* Stands on 1 ft for 10 s or longer Hops, somersaults Swings, climbs May be able to skip *Cognitive milestones* Can count ten or more objects Correctly names at least four colors Better understands the concept of time home (money, food, appliances) *Language* Recalls part of a story Speaks sentences of more than five words Uses future tense Tells longer stories Says name and address Hand and finger skills Copies triangle and other shapes Draws person with body Prints some letters Dresses and undresses without help Uses fork, spoon, and (sometimes) a table knife Usually cares for own toilet needs	Wants to please friends Wants to be like her friends More likely to agree to rules Likes to sing, dance, and act Shows more independence and may even visit a next-door neighbor by herself Aware of gender Able to distinguish fantasy from reality Sometimes demanding, sometimes eagerly cooperative

Adapted from "Caring for Your Baby and Young Child: Birth to Age 5" by Shelov et al. (1998, 2004, 2014) by the American Academy of Pediatrics

Histories That Raise the Concern for Abuse

There are a number of historical clues that raise suspicion of abuse (Kellogg and the Committee on Child Abuse and Neglect 2007). None is used in isolation to diagnose maltreatment. The health-care professional considers the complete history when evaluating children with injuries. The following are factors that raise the suspicion for abuse:

- History of trauma that is incongruous, inconsistent, or not plausible with the physical examination
- History of minor trauma with extensive physical injury
- History of no trauma with evidence of injury (unexplained injury)
- History of self-inflicted trauma that is incompatible with child's development
- History of the injury changes with time
- Delays in seeking treatment
- Caregiver ascribes blame for serious injuries to a young sibling or playmate

History Incongruous with the Physical Examination

History of Minor Trauma with Extensive Physical Injury

Infants and young children are relatively resistant to injuries from both common household falls and free falls of low–moderate heights. *A history of minor trauma that results in serious or life-threatening injury to a child should be suspected, and an evaluation for possible abuse should be performed.* A number of studies have examined the consequences of minor trauma (Bertocci et al. 2004; Chadwick et al. 2008; Chiaviello et al. 1994; Helfer 1977; Joffe and Ludwig 1988; Johnson et al. 2005; Lyons and Oates 1993; Khambalia et al. 2006; Nimityongskul and Anderson 1987; Tarantino et al. 1999). Joffe and Ludwig (1988) analyzed pediatric stairway injuries. Of 363 consecutive children seen in a pediatric emergency department after falling downstairs, none had life-threatening injuries or required intensive care. A majority of patients sustained minor soft tissue injuries such as abrasions and contusions. Seven percent of the children fractured one bone, most commonly the skull or a distal extremity. Only three children required hospitalization, all for observations after head trauma. Stairway falls did not result in abdominal visceral injuries, multiple fractures, intracranial hemorrhages, or cerebral contusions. Overall, stairway injuries resulted in occasional significant injuries but much less than free falls of the same vertical distance. Severe, truncal, and proximal extremity injuries did not occur in this population. Chiaviello et al. (1994) reviewed 69 children less than 5 years of age who fell down the stairs. The majority of injuries were minor and involved the head and neck. Injuries to more than one body area did not occur. In contrast to Joffe and Ludwig's (1988) findings, a few children sustained significant head injury including one child with a subdural hematoma, one with a C-2 fracture,

and two with cerebral contusions. Further evidence for the typical minor nature of common household injuries comes from Warrington and Wright and colleagues who used a large regional database from the United Kingdom to assess the characteristics of injuries to non-ambulatory infants over their first 6 months of life and based on 11,466 parental responses to a mailed questionnaire. Surprisingly, 22% of infants (2554 children) had experienced a fall, 53% from a bed and 12% from caregiver's arms. Injuries were infrequent and "generally trivial" (p. 107) with only 14% reporting a visible injury almost always to the head, with 56% suffering a bruise and less than 1% suffering a serious injury described as a concussion or fracture (Warrington et al. 2001).

In one of the largest studies of short falls to date, Chadwick and colleagues reviewed injury databases, peer-reviewed articles, previous literature reviews, and other published materials to calculate the risk of death resulting from falls of less than 1.5 m among children up to 5 years of age. They arrived at an overall incidence of less than 0.48 deaths per one million children and discovered no reliable reports of short fall deaths among children in day care centers (Chadwick et al. 2008). Similarly, a systematic review by Khambalia of risk factors for unintentional injuries due to falls in children 0–6 years of age concluded that it is uncommon for children to suffer serious injury from falls of less than 5 ft (Khambalia et al. 2006).

Tarantino, Dowd, and Murdock studied the medical records for 167 infants and found significant injuries in 25 (15%), which included skull fractures, other skeletal fractures, and 2 children with intracranial bleeds. The children with intracranial bleeds were later determined to have been abused. After excluding these two children, the only risk factor found to be independently associated with injury was being dropped by the caretaker as opposed to rolling off of a bed or other object (Tarantino et al. 1999). In separate studies, Helfer (1977), Lyons and Oates (1993), and Nimityongskul and Anderson (1987) reviewed injuries sustained to children who fell out of bed while in the hospital. Of approximately 450 children who fell out of beds or cribs from a height of less than 4.5 ft, none was seriously injured. Most sustained no identifiable injuries. All injuries were minor such as contusions, small lacerations, or an occasional skull or clavicular fracture.

Whereas falls from single beds result in minimal injury, bunk bed injuries tend to be more severe. Selbst, Baker, and Shames (1990) prospectively studied children seen in a pediatric emergency department after bunk bed injuries. Lacerations (40% of patients) and contusions (28% of patients) were the most common injuries. One percent of patients sustained a concussion, and 10% of patients fractured a bone. Although 9% of patients required hospitalization, no life-threatening, internal-abdominal, neck, or genital injuries or deaths resulted from bunk beds in this study.

A number of studies examined the relationship between the height of free falls and injury and death in children. These studies show that the predominant injury in falls from heights occurs to the head and skeleton. Using a test dummy to simulate feet-first free falls of a 3-year-old child, Bertocci and colleagues found a low risk of contact-type head injury for short distance falls, regardless of surface type, and less head acceleration for falls onto playground foam as compared to wood, linoleum, or padded carpet. However, playground foam was associated with a higher incidence of bending of the lower extremities, likely because the dummy foot was more likely

to stick to the foam upon landing (as opposed to sliding free) (Bertocci et al. 2004). Musemeche, Barthel, Cosentino, and Reynolds (1991) reviewed the outcomes of children who fell more than 10 ft (or at least one story). Of the 70 records reviewed, the majority of children fell from one to three stories. Head (54%) and skeletal (33%) trauma were common, but no deaths occurred. Chadwick, Chin, Salerno, Landsverk, and Kitchen (1991) reviewed the outcome of 317 children with a reported fall who were seen at a pediatric trauma center. Interestingly, 7 of the 100 children who reportedly fell less than 4 ft died of their injuries, whereas no deaths occurred in 65 children who fell between 5 and 9 ft, and only one child died who fell between 10 and 45 ft. Further analysis of the data showed that the seven children who died from short falls were victims of abuse whose caretakers falsified their history. In contrast to these reports, Plunkett concluded that it is possible for children to die in falls of less than 3 m, based on a case series of 18 deaths reported to the National Electronic Injury Surveillance System (NEISS). However, many of the falls in this series were either unwitnessed or supported by unclear histories, and several involved rotational forces such as falls off of swings. One child had a platelet count of 24,000 at the time of hospital admission for his fall (Plunkett 2001). Estimating the population base for the NEISS sample to be approximately 400,000 for children 0–5 years and determining that among the 9 deaths in young children only 3 appeared to have truly represented short fall deaths, Chadwick and colleagues concluded that the risk of death in the Plunkett sample was 0.625 cases per one million young children per year (Chadwick et al. 2008). Williams (1991) studied 106 children younger than 3 years of age who sustained free falls and whose history was corroborated by a person other than the caregiver. Other than three children who sustained depressed skull fractures from falls less than 10 ft, no life-threatening or other serious injuries (intracranial hemorrhage, cerebral edema or contusion, ruptured organ, or compound or comminuted fracture) occurred from falls from this height. Severe injuries occurred in 11 patients who fell between 10 and 40 ft. One child died from a fall of 70 ft. These data again show *that falls of less than 10 ft are unlikely to produce life-threatening injury or death.*

A History of No Trauma with Evidence of Injury (Unexplained Injury)

In most cases of accidental injury, the history of trauma can be explained by a caregiver or a verbal child. Minor injuries, such as small bruises, minor scrapes, or lacerations, are often unexplained. The trauma associated with these injuries is often minimal and not remembered. It is important to distinguish between unwitnessed and inflicted trauma because not all accidental trauma is witnessed. Children may sustain injuries when they are out of sight of their caregivers. In cases of significant unwitnessed injury to preverbal children, the health-care provider obtains historical details related to specific events surrounding the time of the injury. For unwitnessed trauma, determine the child's condition before and after the event. It is important to

determine the position in which the child was found and to describe any changes in behavior after the incident, such as refusal to walk. The history also includes the sequence of events from the time of the injury until the child was taken for medical care. For example, a toddler fracture (spiral tibial fracture in a young child) may result from a simple fall (Mellick and Reesor 1990). The caregiver states that the child ran into the next room and soon screamed. He was found sitting on the floor, crying. After being held, he refused to bear weight on his leg. The caregiver sat him on the couch and gave him juice to calm him down. After an hour, he still refused to bear weight on his leg and was brought for medical evaluation. This scenario is consistent with the finding of a toddler's fracture.

Caregivers describe various scenarios to explain identified injuries. They may provide a false history or deny that the child sustained any trauma. It is the norm that children with significant injury have some history related to a traumatic event. Children with "unexplained injuries," that seemingly occur spontaneously, are likely to be victims of abuse. *In cases of unexplained injury, the suspicion of abuse generally increases as the age of the child decreases.* Infants in the first 6 months of life are not developmentally capable of self-inflicting significant trauma. Depending on the severity of injury and the age and developmental abilities of the patient, unexplained injuries may be either pathognomonic of abuse or just one factor to consider in evaluating for the possibility of maltreatment.

A History of Self-Inflicted Trauma Incompatible with the Development of the Child

The possibility of child abuse is considered when the history of trauma is discordant with the child's developmental abilities. Caregivers may claim that injuries to abused children are self-inflicted (or inflicted by peers or siblings). In some cases, the child is developmentally incapable of injuring him- or herself in the manner described. Therefore, knowledge of infant and child development is essential to the evaluation of pediatric injuries.

Children develop increasingly complex motor abilities during the first years of life. Although the acquisition of new skills follows a predictable sequence, the rate and, to some extent, the order in which children reach new developmental milestones vary (see Table 2.2). As infants and young children gain new motor skills, the risk of self-inflicted injury increases as they explore their environment.

Whenever there is a report of a child with a self-inflicted injury, the health-care provider considers the compatibility of the child's development and the history of the injury provided. A history of self-inflicted injury requires careful evaluation. Most self-inflicted injuries in young children are minor, although serious and life-threatening injuries can occur. Toddlers, for example, can pull hot liquids off of stove tops or counters and can crawl out of unprotected windows (Barlow et al. 1983; Finkelstein et al. 1992).

A careful and detailed history is obtained to determine whether a child's developmental ability conflicts with the history of trauma. Always ask open-ended, non-

leading questions. The caregiver's ability to provide precise descriptions may vary, causing an erroneous suspicion of abuse. For example, a 1-month-old infant brought for medical care because of irritability after "rolling off the couch" is found to have a linear parietal skull fracture. The history is suspicious because of the apparent discrepancy between the "rolling" and the motor abilities of most 1-month-old infants. Further history reveals that the baby actually squirmed off the couch when the mother left him to answer the phone on the other side of the room. The history is now more reasonable with regard to the child's development and the suspicion of an inflicted injury lessened.

Caregiver Blame for Serious Injuries on a Young Child

Caregivers may falsely ascribe an injury to an incident with a sibling or young child in an attempt to protect themselves. Verbal children are sometimes coerced into blaming a sibling for an injury out of fear of losing a parent or of further injury if the truth is discovered. On occasion, a child may seriously injure a sibling. A decades old case series by Rosenthal and Doherty (1984) reports on ten preschool children who either seriously injured siblings or attempted to do so. They described skull and leg fractures, extensive bruising, lacerations, and stab wounds. Although siblings do fight and injuries can result, serious or life-threatening injuries are not commonly attributable to young children. Children with multiple or serious injuries are not often injured by another young child, and the possibility of abuse should be raised in this situation.

History of Injury Changes with Time

It is common for an abusive caregiver to provide a false history of injury or illness and to expand or change the history. *Documented histories that change over time increase the suspicion of abuse and support the diagnosis.* However, to obtain a complete and detailed history, the health-care provider asks for detail and clarification of confusing statements. The caregiver of a seriously injured child initially may be overwhelmed and too upset to provide a coherent, detailed history. More detailed information obtained later during the evaluation may be misinterpreted as a changing history.

Delay in Seeking Treatment

Caregivers who have abused a child sometimes delay a medical visit until the injuries have partially resolved. Some children are brought for immediate medical care by either the abusive caregiver or an unrelated adult, whereas others are brought for care only when an adult uninvolved with the abuse recognizes the injury to the

child. Some seriously injured children are never taken for medical care and may die of their injuries. The suspicion of abuse arises when there is a delay in seeking appropriate treatment.

There are a number of factors to consider in determining whether a delay in seeking care is reasonable (Jenny and the Committee on Child Abuse and Neglect 2007). The more symptomatic the child is, the more of a concern a delay in seeking care becomes. For example, it is inappropriate to delay care in symptomatic children with life-threatening injuries such as severe closed head injury or abdominal visceral injury. Children with bone fractures may be symptomatic at the time of the injury, yet the seriousness of the injury may not always be recognized immediately. Some examples include clavicle fractures and "toddler's fractures," where the initial symptoms may be nonspecific. (See Chap. 4 for further discussion of fractures.)

In evaluating delayed treatment, it is important to ask about the child's behavior from the time of the injury. For example, a child with a broken tibia may refuse to walk on the leg or will limp and be in pain. It is suspicious when the history does not reflect these facts. Caregivers may delay seeking treatment when symptoms are nonspecific, as in young infants with closed head injury. In such cases, the history reflects a change in the behavior of the child and may help to date the injury.

A skull fracture may not be recognized for a number of days. The initial scalp hematoma associated with the fracture may expand so rapidly as to have a bony consistency. It is not until the hematoma softens that the caregiver feels the swelling and brings the child for care (Ludwig 2005).

Caregivers may delay bringing a child for medical care until a home remedy fails to cure the patient. Burns that require medical attention are occasionally treated at home until they fail to heal or become infected. Not all of these burns are inflicted, although some professionals would categorize this type of care as neglectful. It must be noted that accidents due to neglect or lack of supervision are reportable as neglect on the part of the caregivers.

Finally, some caregivers do not bring an injured child for timely care because of true and/or perceived barriers to care. These include financial constraints, lack of transportation, work obligations, and child care problems (McCullock Melnyk 1988). Using an ecological framework, Jenny and the AAP's Committee on Child Abuse and Neglect call attention, especially in cases involving adolescents, to the role of the child's attitudes and behavior as a potential factor affecting adherence to medical regimens, particularly in situations where the child or adolescent is attempting to assert his or her independence by not complying with medications, treatments, or special diets (Jenny and the Committee on Child Abuse and Neglect 2007). Although a delay in seeking care is often a flag for child abuse, each case is evaluated carefully with respect to all identified factors.

See Table 2.3 for an overview of the steps of the history taking/interview process.

Table 2.3 The interview process at a glance

Introductions
Determine how the caregiver is related to the child
Obtain names, address, phone numbers of history givers and child
Narrative of the child's injury or medical problem (history is dependent on whether there is a history of trauma)
With history of trauma
Date and time of the injury
Where did the injury occur?
Where did the injury occur?
What were the events leading up to the injury?
Did the caregiver witness the injury?
Did anyone else witness the injury?
What was the child's reaction to the injury?
What was the caregiver's response to the injury?
With no history of trauma
When was the last time the child appeared well?
When did the child become ill? How did the illness begin and progress?
Who was caring for the child when he or she first developed symptoms?
Who were the child's caregivers in the days (hours) before the child became ill?
What are the child's symptoms? How have the symptoms progressed?
Was the child given any treatment?
***Clarify* any confusing statements/fill *in* missing details upset or confused caregiver may add to or change details of the history**
Note any discrepancies in the history
Note time between onset of symptoms and arrival for evaluation
With excessive delay, note amount of time that reportedly has elapsed
Reasons for the delay
Caregiver treatment for the child prior to being seen. Child's behavior since the injury (or onset of symptoms)
Reasons for bringing the child for care at this time
Past medical history
Child's general health, including prenatal and birth history
Child's doctor
Previous hospitalizations
Previous injuries
Treatment sites for previous injuries
Immunization status
Developmental history
Present developmental level
Age of developmental milestones
History of behavior problems
School history, need for special education
Family/social history

(continued)

Table 2.3 (continued)

Family composition
Health of family members
Child's caregivers. Include those living both in and outside of the home
Evidence of family stress
Financial supports of the family
Emotional supports for the caregivers
History of domestic violence
Screen for caregiver drug and alcohol use
Previous involvement with social services

The Physical Examination

The purpose of the examination of the physically abused child is to identify trauma and injuries. It is important to maintain the child's modesty during the examination because it can be embarrassing for the child to be completely undressed. However, the whole body should be inspected with the child wearing an examining gown or by using appropriate draping. The examination proceeds from the least to most invasive procedure, saving the obviously injured areas for last. In severe injury, pediatric life support is instituted first and then followed by a systematic assessment of the trauma.

Documentation of the physical examination includes a general description of the child, followed by plotted growth parameters. Record the location of each injury, and describe each in detail. Even minor injuries are important. Include in the description any appropriate negatives such as "abdomen was not tender," rather than using the phrase "within normal limits." Likewise, do not use the descriptor *normal* when more specific words or terms can be used. Document the color, size, and shape of each bruise. Burn descriptions include location, size, patterns, lines of demarcation, and the approximate thickness of the burn. Use accurate terms such as *abrasions*, *lacerations*, *ecchymoses*, *hematomas*, and *scars*. Carefully drawn diagrams are an extremely useful adjunct to written description. Standard forms that contain anterior and posterior line drawings of the body are helpful in documenting injuries (see Appendix).

The abuse evaluation emphasizes the following areas:

1. *Growth*. Measure the child's weight, height or length, and head circumference (when indicated) and record on a standard pediatric growth chart. If available, old growth points are plotted to evaluate the child's growth over time (see Chap. 7 for more detailed discussion).
2. *Skin*. Note bruises, burns, scars, or rashes and describe the injury in detail. Record the following characteristics of bruises: the measured size, location, pattern (if applicable), and color. Note the precise location of burns, including small splash marks, lines of demarcation, or patterns.
3. *Head*. Palpate for areas of swelling, bogginess, or cephalohematomas. Note step-offs or depressions overlying fractures. Observe for avulsed hair and

bruises. Feel the fontanel to assess for increased intracranial pressure. It is often difficult to see scalp bruising because of the overlying hair. The scalp can be examined further during hair shampooing if the patient is admitted to the hospital.

4. *Ears*. Note bruises to the outer ear, and check behind the ear for Battle's sign (bleeding in the subcutaneous tissue of the mastoid area due to a basilar skull fracture). Note the presence of foreign bodies and the condition of tympanic membranes. Examine the middle ear for blood (hemotympanum) or infection.
5. *Eyes*. Note evidence of direct trauma such as edema, scleral hemorrhage, hyphema, or bruises. Assess scleral color, because blue sclera may be associated with osteogenesis imperfecta (see Chap. 4). A fundoscopic examination is an essential part of the workup of an infant or young toddler who has sustained a shaking or impact injury, because up to 80% of these patients have retinal hemorrhages (Levin 1990). It is not always possible to see the fundus well. A complete examination by an ophthalmologist is essential. Indirect ophthalmoscopy by an ophthalmologist is indicated as soon as possible in children suspected of a shaking injury.
6. *Nose*. Examine for edema, nasal bleeding, septal deviation, foreign bodies, and CSF rhinorrhea.
7. *Mouth/pharynx*. Examine for evidence of trauma. Labial or lingual frenulum lacerations (tears of the tissue that connects the gums to the midline of the upper or lower lips or the tongue to the base of the mouth) are nearly pathognomonic of child abuse in young infants. Older infants and young toddlers can sustain these injuries accidentally by falling and hitting their mouths. The patient's teeth should be examined for trauma and caries (see Chap. 8).
8. *Chest/cardiac/lungs*. Feel for signs of healing rib fractures. Assess for tachycardia, murmurs, flow murmurs secondary to anemia, and signs of cardiac instability.
9. *Abdomen*. Listen for bowel sounds. Assess for indications of abdominal trauma, including abdominal tenderness, guarding, and rebound tenderness. Look for bruises, burns, or patterned marks.
10. *Back*. Look for bruises and unusual midline masses (which may represent vertebral injuries).
11. *Genital/anus/rectum*. Assess for signs of trauma, including erythema, bleeding, bruising, bite marks, lacerations, abnormal anal tone, and signs of infection (see Photo 2.1). Retract labia majora and minora and assess external structures. Note Tanner Stage of development.
12. *Extremities*. Assess for soft tissue swelling, point tenderness, and function.
13. *Neurologic*. For patients with significant trauma, the Glasgow Coma Scale provides a quick assessment of neurologic impairment. (Modifications in the scale are made to account for the abilities of infants and children.) A neurologic exam to evaluate for focal deficits and to assess for cerebral or spinal injury is indicated in all children with possible head trauma.
14. *Development*. A developmental screening examination is done if the child is clinically stable.

See Table 2.4 for an overview of the physical examination.

Photo 2.1 Scrotum trauma – punch to the scrotum

Table 2.4 Overview of the physical examination

Head and neck
Look for scalp swelling
Assess for areas of bleeding from ears, nose, mouth
Look for bruises
Trunk and extremities
Look for bruises
Feel for tenderness, fractures, joint pain
Assess function
Neurologic
Glasgow Coma Scale
Neurological examination
Development
Assessment done if child is stable

Indicated Laboratory/Diagnostic Evaluation

The history and examination findings of the physically abused child guide the laboratory evaluation. *Laboratory and diagnostic tests help support or confirm the diagnosis of abuse and evaluate medical problems that can imitate abuse*. In cases of multiple system trauma resulting from abuse, laboratory data provide further evidence against alternative medical diagnoses. Medical diagnoses that imitate child abuse must be considered, and part of the thorough evaluation of a child who presents with trauma is to evaluate for alternative medical explanations when clinically indicated. Cases of serious physical abuse sometimes will result in criminal prosecution. It is the responsibility of the medical caregivers to rule out illnesses that a jury or judge may believe would result in the injuries. This can be done by considering all of the medical findings and explaining why traumatic injury is the only reasonable explanation. Specific tests to rule out other causes may add credibility to the testimony.

The laboratory and diagnostic evaluation of the abused child varies depending on the age of the patient and the presenting injuries, and it is tailored to the clinical situation. The following tests are commonly performed when indicated in the evaluation of abuse.

Radiographic Skeletal Survey

A skeletal survey is a series of X-rays taken of the injured child to detect occult or healing fractures (AAP 1991, 2009; ACR 2016). Some fractures identified by skeletal survey in infants and young toddlers are specific enough to diagnose child abuse even without a clinical history. *A skeletal survey is indicated in all infants and children less than 2 years of age who are suspected of being physically abused.* Occult or clinically silent fractures are unusual in the older abused child, and therefore the skeletal survey generally is not a useful screening tool for children over the age of 5. For toddlers between the ages of 2 and 5, the decision to do a skeletal survey is based on the clinical findings and suspicion of bony injury. Belfer, Kelin, and Orr (2001) reviewed the medical records of 203 children ages 2 weeks to 16 years of age who were admitted for suspected child maltreatment over a 30-month period of time. Ninety-six skeletal surveys were obtained, and 25 were positive for at least one clinically unsuspected fracture, and 80% were in children under 1 year of age (Belfer et al. 2001). In addition to the patient's age, the type of suspicious injury was also useful in guiding the decision to obtain a skeletal survey with those presenting with a new fracture or intracranial injury being at higher risk for occult fracture, while those with burn injuries had the lowest yield for occult fracture being detected on the skeletal survey (Belfer et al. 2001).

A skeletal survey is the method of choice for imaging the bones in cases of suspected physical abuse. The American College of Radiology (ACR) and the Society for Pediatric Radiology (SPR) revised the practice guideline for skeletal surveys in children in 2016 (ACR-SPR) (see Table 2.5). All skeletal surveys should consist of a series of X-rays, including specific views of the arms, forearms, hands, femurs, lower legs, and feet, as well as views of the axial skeleton and skull, all on separate exposures. The skeletal survey should not consist of a single image of the patient's skeleton (babygram) because the detail is not sufficient to recognize subtle injuries. It is essential that the X-rays are read by a physician trained to recognize skeletal manifestations of child abuse. Some of the subtle but specific findings of abuse are missed easily by the untrained eye.

The value of performing follow-up skeletal surveys in children strongly suspected of having been abused based on history, physical examination, or various imaging studies including the initial skeletal survey was explored by Kleinman et al. (1996). In a retrospective series of 23 infants and toddlers strongly suspected of having been maltreated (out of 181 skeletal surveys conducted during a 5-year period) who received a follow-up skeletal survey approximately 2 weeks after the initial evaluation, 14 of the 23 follow-up skeletal surveys (61%) yielded additional

Table 2.5 Complete skeletal survey table

Appendicular skeleton
Humeri (AP)
Forearms (AP)
Hands (PA)
Femurs (AP)
Lower legs (AP)
Feet (AP)
Axial skeleton
Thorax (AP and lateral, right and left obliques), to include sternum, ribs, thoracic and upper lumbar spine
Abdomen, to include pelvis (AP)
Lumbosacral spine (lateral)
Skull (frontal and lateral), to include cervical spine (if not completely visualized on lateral skull)

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information with the number of definite fractures increasing from 70 to 89 (a 27% increase) with most of these being the classic metaphyseal lesion and rib fractures (Kleinman et al. 1996). Specifically, the follow-up skeletal survey either detected a missed finding on the initial study (13/19 or 68%) or confirmed a fracture that was initially suspected but of which there was some question on the initial radiographs (6/19 or 32%) (Kleinman et al. 1996). Some of the follow-up skeletal surveys also provided important information regarding the age of the fractures. A prospective study conducted by Zimmerman and colleagues found similar results. Among 74 children with a mean age of 7.4 months (±10.6 months), 48 infants and toddlers returned for follow-up skeletal surveys which revealed additional information in 22 (46%), and in 3 patients (6%) the outcome of the evaluation changed with the diagnosis of child maltreatment being excluded in 1 child, while child abuse was confirmed in the remaining 2 (Zimmerman et al. 2005). The authors concluded that despite the added time, expense, and radiation exposure for follow-up skeletal surveys, routinely ordering this follow-up study is justified in that it identified additional fractures or clarified tentative findings in children who were suspected of having been physically abused. Factors that led to the recommendation for a follow-up survey included (1) multiple fractures present, (2) fractures of varying ages identified, (3) fracture type or appearance inconsistent with history provided, (4) concerning but not diagnostic initial skeletal survey or imaging study, (5) concerning physical examination, and or (6) a radiologic finding consistent with physical abuse (Zimmerman et al. 2005). Kleinman and colleagues (1996) offer a reasoned and cautious recommendation around ordering follow-up skeletal surveys, and in their words: "A follow-up skeletal survey performed approximately 2 weeks after the initial study appears to provide additional information regarding the number, character, and age of injuries inflicted on infants and toddlers. When child abuse is strongly suspected on the basis of the findings of the initial skeletal survey, other

imaging studies, history, or physical examination, a follow-up skeletal survey is recommended to provide a thorough and accurate assessment of osseous injuries" (Kleinman et al. 1996, p. 896). In a prospective multicenter study of 2890 children, 2049 had a skeletal survey and a follow-up skeletal survey (FUSS), and of these children, 174 (21.5%) had new information revealed by the FUSS, including 124 (15.6%) cases with a newly found fracture (Harper et al. 2013).

Radionuclide Bone Scan

The skeletal survey is the method of choice for imaging the bones in cases of suspected abuse. The bone scan (bone scintigraphy) is sometimes used as an adjunct to plain films. A bone scan is most often used in cases of suspected abuse of infants in which the skeletal survey is negative, and more sensitive evaluation may diagnose the abuse with more certainty. A bone scan uses radioisotopes to identify areas of rapid bone turnover. It is more invasive and costly than a skeletal survey but more sensitive for detecting new (less than 7–10 days old) rib fractures, subtle diaphyseal fractures, and early periosteal elevation. A bone scan is not specific for fractures because a positive scan may indicate bone infection or tumor. Bone scans cannot be used to date fractures and do not identify skull or metaphyseal fractures reliably. In a 10-year retrospective review of 124 medical records for children who had both a skeletal survey and a bone scan from the United Kingdom, Mandelstam, Cook, Fitzgerald, and Ditchfield (2003) found that overall 70% of bony injuries were identified on both tests, 20% of injuries were present on the bone scan alone, and 10% were identified on the skeletal survey alone – supporting the complementary nature of skeletal surveys and bone scans in the evaluation of suspected physical abuse in children (Mandelstam et al. 2003) (see Fig. 2.4).

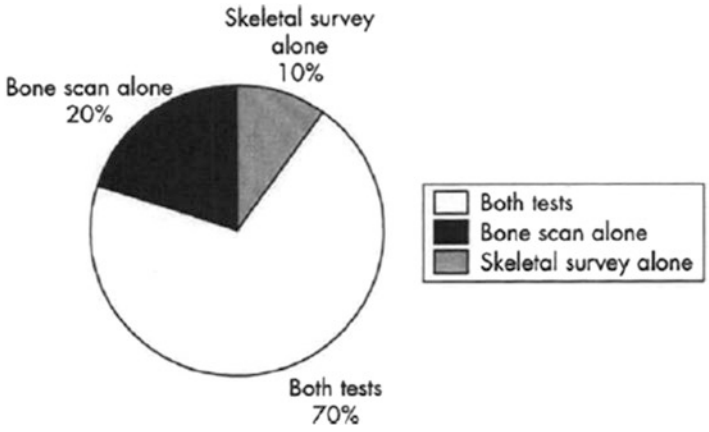

Fig. 2.4 Percentage of boney injuries detected. (Mandelstam et al. 2003 used with permission)

Computed Tomography

CT scans are often an essential part of the child abuse evaluation. They are a series of radiologic images that provide sliced (CT) scan views through the area of the body scanned. CT scans of the head can identify manifestations of abusive head trauma, such as subarachnoid hemorrhage, most subdural hemorrhages, and cerebral edema and infarcts. A CT scan of the head is indicated in any infant or child that may have sustained significant head trauma (Le and Gean 2006; Rubin et al. 2003). Unlike plain X-rays of the skull, CT scans provide images of the brain. Plain X-rays are sensitive indicators of skull fractures, are relatively easy and quick to obtain, and as such remain the test of choice for evaluating potential skull fractures (Cattaneo et al. 2006; Kleinman 1998). CT scans of the chest and abdomen are the most sensitive and effective way to document injuries of the lungs and solid abdominal organs, such as the liver. CT scans are done under sedation because movement will cause artifact and potentially destroy the usefulness of the test. Technological advancements permit the use of various computer imaging techniques that allow the generation of three-dimensional (3D) digital images that capture the 3D aspects of soft tissue and bone injuries that are useful forensically and scientifically (Thali et al. 2003) (Figs. 2.5 and 2.6). These 3D digital images permit further analysis of the suspected injury mechanism, and as the equipment and techniques become more available, one can expect that the 3D documentation of injuries may become more commonplace in the evaluation of suspected child maltreatment-related injuries as well as other non-inflicted injuries (Bruschweiler et al. 2003).

Magnetic Resonance Imaging (MRI)

MRI scans provide sliced views through the body using interactions of hydrogen atoms with a magnetic field to provide an image of the scanned body in any plane desired (Le and Gean 2006). MRI generally is more sensitive than a CT scan (for non-bone injures) and has the added advantage of being better able to identify subdural blood of different ages. MRI can be used instead of CT scans or as an adjunct to the CT scan (Le and Gean 2006; Chan et al. 2003; Parizel et al. 2003). MRI is not universally available, is an expensive study, and takes longer to perform than does a CT scan. Presently, CT scan is typically the first method of imaging used in the acute setting, followed by MRI to further delineate injury or to evaluate injury that is highly suspected but not identified by CT (Eltermann et al. 2007). MRI should be strongly considered in cases with intracranial injury identified by head CT (AAP Section on Radiology 2009).

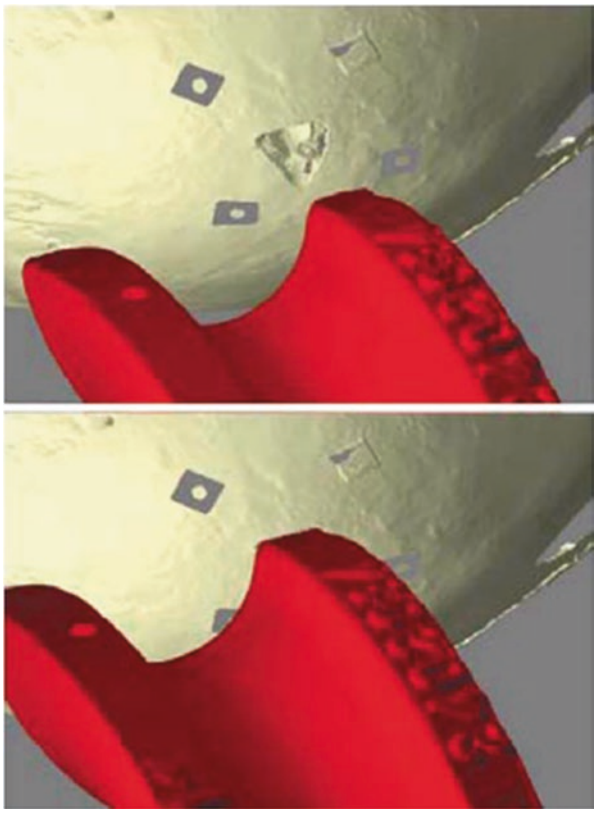

Fig. 2.5 3D visualization of the match and the impact angle of the injury-causing tool with the two impression fractures. (From Thali et al. 2003 used with permission)

Bleeding Evaluation

Children who present with excessive bruising, in whom a hematologic condition is suspected based on history and physical examination, are screened for a bleeding diathesis (Kellogg and the Committee on Child Abuse and Neglect 2007; Khair and Liesner 2006; Lee 2008). Both congenital and acquired bleeding disorders can present with excessive bleeding or bruising that may mimic child abuse (see Chap. 3). The standard screen done on the child with excessive bruising includes a complete blood count (CBC) with platelet count, a prothrombin time (PT), and a partial thromboplastin time (PTT). In the setting of suspected child abuse and neglect, the health-care professional conducting the evaluation may consider obtaining a hematology consultation from a skilled pediatric hematologist in order to refine the evaluation and order the appropriate tests based on the clinical suspicions and findings. In the majority of cases, a thorough history and physical examination, along with normal screening blood work, will rule out medical problems that would cause bruising, including hemophilia, leukemia, idiopathic thrombocytopenic purpura, and others. A detailed history includes symptoms of excessive bleeding from the umbilical stump or following circumcision, surgery or dental procedure, or history of

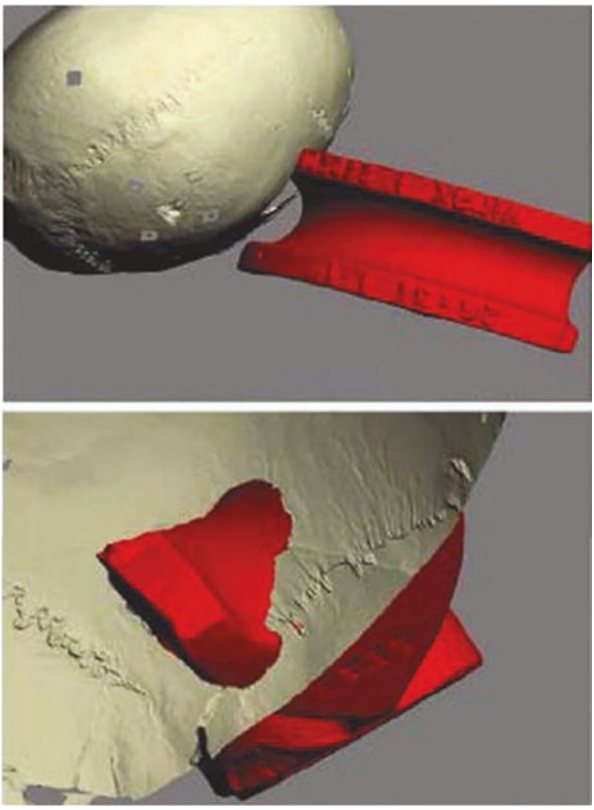

Fig. 2.6 3D visualization of the match and the impact angle of the injury-causing tool with the two impression fractures. The picture at the bottom graphically demonstrates a view of the strike from inside the skull. (From Thali et al. 2003 used with permission)

frequent and prolonged epistaxis (Anderst et al. 2013). The CBC also evaluates for anemia, which may be due to blood loss, toxins such as lead, or nutritional abnormalities such as iron deficiency. If von Willebrand's disease, the most common inherited bleeding disorder, is suspected, a pediatric hematologist familiar with the laboratory capabilities in one's clinical environment would be ideal. Von Willebrand's disease is a heterogeneous condition that has several subtypes resulting from quantitative or qualitative defects in Von Willebrand's factor and presents variably, making the diagnosis of the more subtle forms challenging (Liesner et al. 2004). Historically a bleeding time was the test recommended but this test is notoriously inaccurate and highly dependent on technician skill and experience (Cariappa et al. 2003). More specific tests are available but require access to highly skilled laboratories, typically at referral centers, to obtain accurate results (Liesner et al. 2004).

Toxicology Screens

Childhood ingestion of both legal and illegal substances is a common pediatric problem. Ingestion can be intentional, as with an adolescent drug overdose, or accidental, such as the toddler who ingests iron pills. At times, caregivers poison

children knowingly, as in cases of medical child abuse/Munchausen syndrome by proxy (Rosenberg 1987; Roesler and Jenny 2009), or inadvertently allow ingestion to occur as seen with poor supervision.

An infant or child with unexplained neurologic symptoms, such as seizures, lethargy, change in mental status, or coma, is evaluated with toxicologic screens and blood alcohol level. Urine, blood, and gastric content are available for screening. Variability exists among laboratories related to the drugs tested for on the standard toxicologic screen. See Chap. 9 for further discussion.

Tests for Abdominal Trauma

Studies have shown that abdominal injury as the result of abuse is under-recognized (Coant et al. 1992). Physically abused infants and toddlers with altered mental status and physically abused children who are too ill to give a history of their injuries should be screened for possible abdominal trauma (Lindberg et al. 2013). Elevations in the hepatic transaminases (AST, ALT) suggest liver injury, and an elevated amylase and lipase suggest pancreatic injury. After uncomplicated blunt liver trauma, hepatic transaminase levels are known to rise rapidly in the serum, often within hours, and then to decline predicatabally over the ensuing days following the injury (Baxter et al. 2008). The screen for renal injuries includes a urinalysis to identify hematuria by dipstick and RBCs by microscopy. Occasionally, a dipstick will identify children with hematuria, but no RBCs are seen on microscopy. These children have either myoglobinuria or hemoglobinuria, which have both been reported as a result of abuse (Mukerji and Siegel 1987; Peeples and Losek 2007; Rimer and Roy 1977; Sussman et al. 2012). When measured in the acute setting, an elevated serum myoglobin, creatine phosphokinase (CPK), or urine myoglobin confirms the diagnosis of significant muscle injury (Schwengel and Ludwig 1985). It is essential to order these screening tests immediately in the acute setting because these levels all rapidly return to normal. The tests described serve as a noninvasive, rapid way of identifying possible intra-abdominal injury. More extensive testing will be needed to characterize the extent and type of injuries identified by screening.

Screening tests commonly used in the evaluation of the abused child are mentioned above, though each case is evaluated individually, and not all tests are necessary in every case. For some children, the history and physical examination are all that is needed to diagnose abuse (see Fig. 2.2). Critically ill or injured children will require extensive testing. The above serves as an introduction to the tests that are often used in the evaluation of suspected inflicted injury. Further information regarding laboratory testing is found in the chapters describing specific patterns of injury. See Table 2.6 for an overview of the laboratory/diagnostic evaluation.

Table 2.6 Laboratory/diagnostic evaluation of the physically abused child

Radiographic skeletal survey
Method of choice for screening abused children for bony injury
For all children less than 2 years old with suspected physical abuse
Of limited use in children older than 5
For children 2–5 years old, use clinical findings
Follow-up skeletal survey recommended unless radionuclide bone scan is performed
Radionuclide bone scan
Adjunct to skeletal survey
Most useful if there is high suspicion of bony injury and skeletal survey is negative
Computed tomography (CT) scan
Provides sliced views through internal organs, such as brain and abdominal organs
Essential part of the evaluation of seriously injured children
Initial test used for children with suspected abusive head trauma
Magnetic resonance imaging (MRI)
More sensitive than CT for many injuries
Can provide images in multiple planes
Generally used as an adjunct to CT in the acute setting
Blood tests for easy bruising/bleeding
Complete blood count (CBC)
Prothrombin time (PT)
Partial thromboplastin time (PTT)
Consider hematology consultation for coagulation workup, if indicated
Screening tests for evidence of abdominal trauma
Liver
Alanine aminotransferase (ALT, SGPT)
Aspartate aminotransferase (AST, SGOT)
Pancreas
Amylase
Lipase
Kidney
Urinalysis looking for blood or red cells
Toxicology screens
For children with unexplained neurological symptoms or symptoms compatible with ingestion. Drugs tested for in “tox screen” vary among laboratories
Urine and/or gastric contents are sent for screening (consider blood for targeted substances)
Consider blood alcohol levels for children with altered mental status

Photographic Documentation

Photographic documentation of findings of abuse is part of the comprehensive evaluation and serves as an accurate record of a child’s injuries. Photographs are the only way to preserve physical findings that will undoubtedly disappear as healing occurs. All visible lesions should be photographed. The benefits of photography in the evaluation and description of abuse are multifold. Photographs facilitate review

of the findings by multiple people, provide a standard for comparison during other evaluations, and are a valuable tool used in court to describe abusive findings and condition of the abused child (Ricci and Smistek 2000).

Although photographs are an important documentation tool for injuries, they cannot be used exclusively and cannot replace the written and diagrammed description of the injuries. Cameras and photographers are not foolproof, and the techniques used to photograph the child, including the camera, lighting, and background, will affect the quality of the photograph. Some hospitals have a medical photography department whose employees can take photographs. Law enforcement agencies also have photographers adept at photographing injuries, crime scenes, and so on. However, the replacement of conventional silver-based cameras with digital technology has made it common for medical providers to produce their own images.

Unfortunately, even with relatively "user-friendly" digital cameras, poor-quality images are not uncommon. The photographer needs to be familiar with his or her camera and know how to take pictures that are clear and adequately lighted. Frequently seen errors involve improper placement of measuring devices, such that they cover up part of the injury, are placed at an angle relative to the mark rather than parallel to it, and/or compress the surrounding skin such that distortion is introduced into the image. See Table 2.7 for suggestions regarding photographing suspected victims of child maltreatment. If an American Board of Forensic Odontology (ABFO) 90 degree scale is not available, then a ruler should be photographed both parallel and perpendicular to the mark in question. Photographs of traumatic injuries should include views with and without the measuring device. In addition to close-up shots, images should be taken that include anatomic landmarks, such as a knee, elbow, or umbilicus. A whole-body photograph that shows the child's face helps to match the injuries to the child. A marker that includes the child's identifying information (name, date of birth, etc.) should be placed in the photographs or later added

Table 2.7 Photographing child maltreatment: helpful hints

Photographing suspected victims of physical abuse and neglect
Take two pictures of every view and angle, one for the file and one for court
Photograph the injury with an anatomic landmark. The inclusion of an elbow, knee, belly button, or other body part identifies the location of the wound
Include two pictures of each wound or other injury – one that identifies a landmark and one that provides a close-up (fills the film frame) of the wound
Position the camera so that the film surface or plane is parallel to or directly facing the injury
Vary the perspective of the picture by taking various shots from different angles and distances
Place a measuring device such as an adhesive metric scale directly above or below the injury to ensure accurate representation of the size and depth of the injury. A standardized color bar may be placed in the photographic plane for comparison with the color of the injury
Ultraviolet light is a method of photography in which a standard, high-speed (ISO 800/1600) color slide film is used in conjunction with a high-powered electronic flash. The result of UV photography is an image that may display healed wounds, bite marks, belt imprints, and old pattern-type injuries

Adapted from Ricci and Smistek (2000, pp. 6–7). https://www.ncjrs.gov/pdffiles1/ojjdp/160939.pdf

to the digital files. Straight-on views of an injury demonstrate its extent, whereas views taken from an angle better show depth and texture. For this reason, pictures of bite marks should include perpendicular views. Angled views can also be helpful when light reflection is a problem, as may occur when edema is present. Because the appearance of acute injuries often changes over time, additional photographs on subsequent days are sometimes needed to document the healing process. This is particularly helpful for acute injuries that may be confused with permanent body marks, e.g., a bruise that may initially resemble a nevus. Ultraviolet light can be helpful for improving visualization of fading marks (Ricci and Smistek 2000). See Table 2.8 for suggestions regarding specific injuries in child maltreatment (Photo 2.2).

Some processing issues that arise with digital cameras are compression of information and enhancement and restoration techniques. Many modern cameras automatically compress images into JPEG format, with the unavoidable loss of information. Ideally, the cameras used for forensic photographs remove only redundant and "irrelevant" information. The degree of compression can be lowered prior to storing images when there is a concern that important image content may be lost.

Table 2.8 Photographing specific injuries

Injury type	Suggested methods
Amputation	Photograph the dismembered part alone and then in relation to the body. Close-ups should also be taken of the skin's torn edges, which may help verify the method of amputation in court
Bite marks	Best interpreted by a forensic dentist or pathologist. Can be recorded for punctures, and slashes; but size, shape, color, depth of indentations, and three-dimensional contours need to be documented. Parallel or direct views best depict shape and size, while slanted or indirect views and lighting highlight texture
Bruises	Bruising goes through several stages of development – as time goes on, additional photographs will be needed to document the injury. If a child shows evidence of having old and new bruises, repeated abuse may be suspected. Both old and new bruises should be photographed. To help minimize reflections caused by swelling, take photographs from several angles, then do a follow-up series when swelling has gone down
Burns	Take pictures from all angles *before* and *after* treatment. Accidental burns usually exhibit splash marks or indiscriminate patterns of injury. Intentional burns often show distinct lines or well-defined areas of damaged skin
Facial injuries	If injury is to the mouth, use a tongue depressor to keep the mouth open and injury visible. If injury is to the eye, use a flashlight or toy to distract the child's gaze in different directions to show the extent of the damage to the eye area
Neglect	Child's general appearance should be photographed, including any signs (splinters in soles of feet, hair loss, extreme diaper rash, wrinkled or wasted buttocks, prominent ribs, and/or a swollen belly)
Punctures, slashes, rope, and/or pressure injuries	Take photographs straight on (for overall view of the surface and extent of injury) and at a slight angle (provides depth and texture)

Adapted from Ricci and Smistek (2000, pp. 9–10). https://www.ncjrs.gov/pdffiles1/ojjdp/160939.pdf

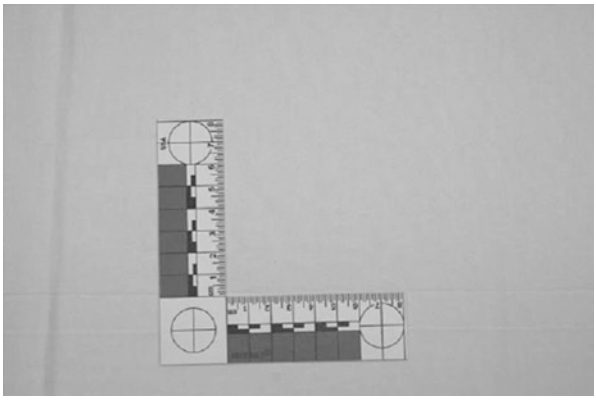

Photo 2.2 An American Board of Forensic Odontology (ABFO) 90 degree scale

Enhancement and restoration techniques are commonly used to improve the appearance of an image and to remove motion or other artifacts, respectively. Specific documentation is usually not required when enhancement techniques involve processes that are comparable to traditional dark-room methods. Traditional enhancement techniques include brightness adjustment, contrast adjustment, color balancing, and cropping. More advanced enhancement techniques need to be documented. Likewise, any restoration efforts applied to an image should always be documented. A copy of the original digital image must be maintained whenever any alteration techniques are used, as all steps in the production of an image are discoverable by a court of law. A digital photography specialist may be consulted to examine images for evidence of manipulation if challenged [International Association for Identification, Scientific Working Group on Imaging Technologies (SWGIT), Recommendations and Guidelines for the Use of Digital Image Processing in the Criminal Justice System (2006)].

It is a common misconception that the ease with which digital images may be manipulated complicates the process of establishing their authenticity in legal settings. In fact, this is rarely the case when the images are properly identified and supported with adequate documentation. Proper accompanying information must identify the location of injuries depicted in the images, as well as the name of the photographer and the date that the photographs were taken. Another common misconception is that image files should be left on the camera's flash drive and made available to the court if requested. Because flash media is designed as temporary storage and is susceptible to corruption by improper handling and storage over time, it is not recommended that it be used for permanent storage. Duplicate images stored onto a hard drive, CD, or DVD are generally admissible as original images in court proceedings (International Association for Identification 2008). Written protocols regarding the process for producing photographic evidence and standardized documentation can help child abuse teams minimize errors that can lead to questions regarding the reliability, reproducibility, and/or security of the images. See Appendix for examples of photos.

In Brief

- The medical evaluation of the abused child includes a history, physical examination, indicated laboratory and diagnostic studies, and observation of the caregiver–child interaction.
- A history of minor trauma that results in serious or life-threatening injury to a child should be suspected, and an evaluation for possible abuse should be performed.
- The recognition of abuse stems from the "building block" approach, which synthesizes data from each part of the clinical evaluation to develop and confirm a suspicion of abuse.
- Knowledge of child development, mechanisms of injury, and the epidemiology of trauma is needed for proper diagnosis of child abuse.
- The diagnosis of physical abuse rests with the professional's ability to obtain a thorough history from the patient or family and to recognize discrepancies between the history and physical findings.
- The physical examination of the injured child should include careful attention to subtle signs of trauma.
- Laboratory data and radiologic studies are important tools used to support the diagnosis of abuse and evaluate for medical conditions that may mimic abuse.
- Meticulous documentation of the history, physical examination, and laboratory data is an integral part of the evaluation of the abused child.
- If taken properly, photographs serve as an accurate record of a child's injuries.

Appendix

Notice the documentation of the injuries, the measuring tape placement, and the identification of the side of the body.

Series 1 Series of photos showing bruising on a child's thighs. Please take note of the various angles and different distance of the photos and the ruler placement (Photos 2.3a, 2.3b, 2.3c and 2.3d).

Series 2 Child with horizontal bruise and overlying abrasion of the left cheek. Notice the various angles and distance of the photos that enhance the description of the injuries (Photos 2.4a, 2.4b and 2.4c).

Series 3 Suprapubic and penile bruising (Photos 2.5a, 2.5b and 2.5c).

Series 4 Photo documentation of injury to the left thigh. Notice the varying distances at which the photos were taken (Photos 2.6a, 2.6b and 2.6c).

Series 5 Photo documentation of injured shoulders. Notice identification of body part along with ruler placement (Photos 2.7a, 2.7b and 2.7c).

Series 6 Adolescent female with multiple bruise on the neck. Notice the different angles from which the photos are taken (Photos 2.8a, 2.8b, 2.8c and 2.8d).

Series 7 Photo documentation of locations of injuries with ruler (Photos 2.9a, 2.9b and 2.9c).

Photo 2.3a Photo of bruising on a child's left thigh

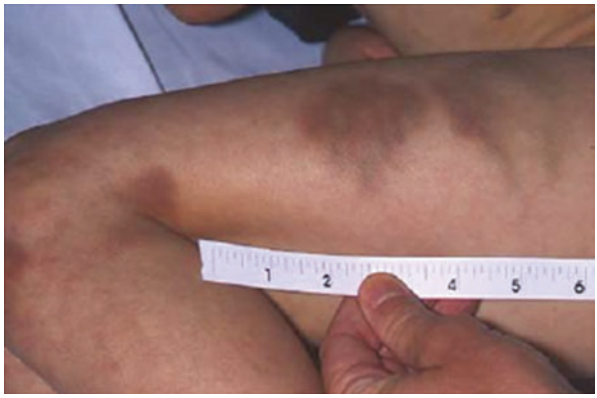

Photo 2.3b Photo of bruising on child's lower thigh from a different perspective

Photo 2.3c Photo from a different angle and distance

Photo 2.3d Photo of same child with bruising of the right thigh

Photo 2.4a Photo of the child with horizontal bruise and overlying abrasion of the left cheek

Photo 2.4b Photo taken straight on of the child with horizontal bruise and overlying abrasion of the left cheek

Photo 2.4c Same patient as in previous image with a similar patterned injury on the right side of the face

Photo 2.5a Photo taken at a distance of suprapubic and penile bruising

Photo 2.5b Photo of patient in 2.5a at a closer distance

Photo 2.5c Photo of patient in 2.5a, with examiner positioning the penis to further demonstrate bruise on tip of the penis

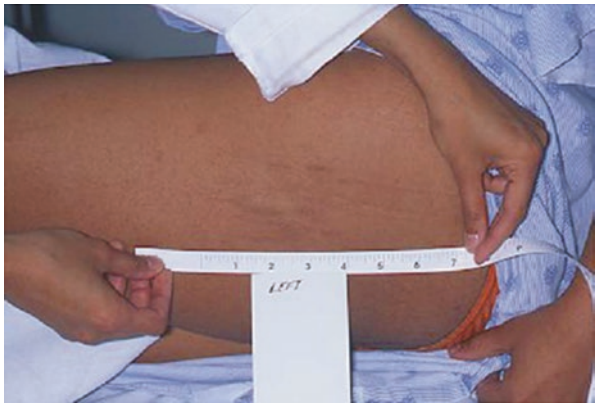

Photo 2.6a Photo of injury to the left thigh. Notice the placement of the ruler with the identification of the side of the body

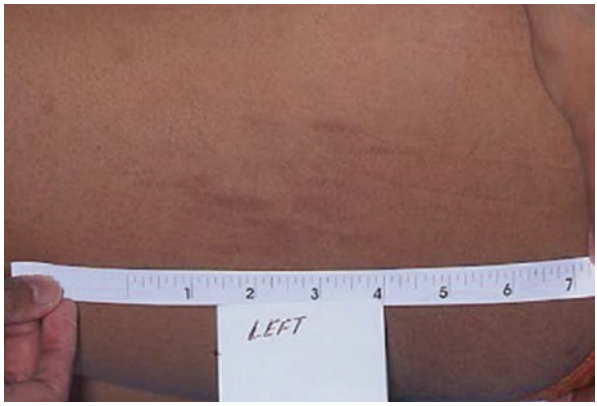

Photo 2.6b Closer view of the injury to the left thigh

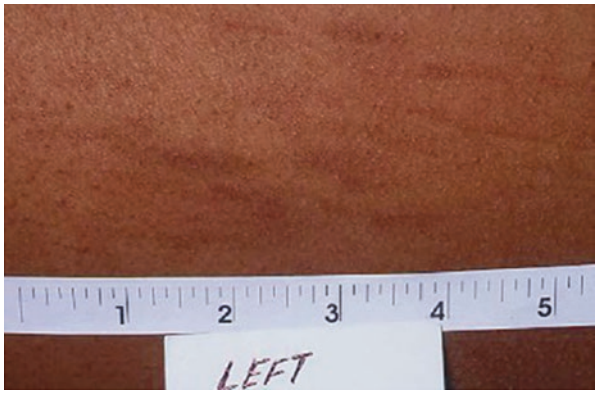

Photo 2.6c Close-up view of the injury to the left thigh

Photo 2.7a Photo of the right shoulder injury

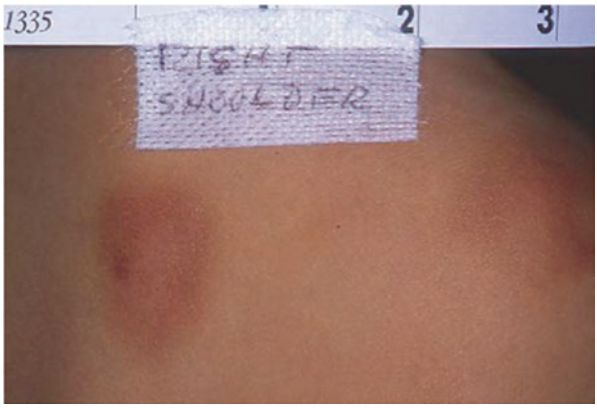

Photo 2.7b Photo of the right shoulder injury taken at a different angle

Photo 2.7c Photo of the left shoulder injury

Photo 2.8a Frontal view of the bruising on the neck

Photo 2.8b Close-up of the bruising on the neck

Photo 2.8c Photo of the right side of the bruising on the neck

Photo 2.8d Photo of the left side of the bruising on the neck

Photo 2.9a Photo of injury on the left side of the neck

Photo 2.9b Closer view of the patient in Photo 2.9a

Photo 2.9c Close-up of the injury to patient in Photo 2.9a on the right side of the neck

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Part II
Specific Injuries

Chapter 3
Skin Injury: Bruises and Burns

Erin E. Endom and Angelo P. Giardino

Introduction

Careful examination of the child's skin is an essential component of the abuse evaluation. Injuries to the skin are common findings in maltreated children and may include (a) contusions (bruises), abrasions, and lacerations; (b) burns from scalding, direct contact with flame or hot objects, and electricity; (c) frostbite (O'Neill et al. 1973); and (d) scars resulting from these injuries (Richardson 1994). In one study examining the injuries of 616 children suspected of having been abused, at least 80% of the 775 primary injuries involved the skin, including (a) bruises/ecchymoses/hematomas (56%), (b) erythema/marks (9%), (c) burns (8%), and (d) abrasions/scratches (7%) (Johnson and Showers 1985). Ellerstein (1979, 1981) noted the importance of cutaneous findings in maltreated children, because the recognition of these easily observed injuries by the child's relatives, neighbors, and schoolteachers may trigger contact with the healthcare provider. Healthcare providers evaluating children with suspicious skin findings need to consider physical abuse and/or neglect as a potential etiology and pursue a thorough evaluation.

O'Neill (1979) documented that soft tissue trauma, essentially skin injuries, is frequently the earliest and most common manifestation of physical maltreatment. He found that many seriously injured children had been evaluated previously for soft tissue injuries such as bruises and burns. Early recognition of minor injuries that may be inflicted may result in intervention and prevention of many serious injuries (O'Neill 1979). In an epidemiologic study of injury variables, Johnson and Showers (1985) suggested that children with evidence of chronic maltreatment,

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such as nonhealed injuries of different ages, were at a 50% risk for further abuse and at a 10% risk for fatal injury.

This chapter focuses on the skin findings most commonly seen in both abused and nonabused children, namely, bruises and burns. Specific attention will be placed on the characteristics of these soft tissue injuries that suggest abuse and/or neglect. As in all cases of suspected maltreatment, the evaluation consists of a comprehensive history of the injury, a thorough physical examination, directed laboratory assessment, psychosocial assessment, and meticulous documentation.

Bruises

Overview

Bruising is the most common type of injury in abused children (Maguire and Mann 2013). Bruises are common injuries in childhood, with all children from time to time having minor accidental bruising. Clinicians expect toddlers and young children to sustain minor bruising owing to the rough and tumble play that occurs during normal exploration and activity. A typical accidental bruise involves the skin overlying bony prominences such as the anterior tibiae (shins), knees, elbows, forehead, and dorsa of the hands. Carpenter (1999) studied the distribution of bruising in 177 nonabused children aged 6–12 months and found that all bruises occurred (1) on the front of the body and (2) over bony prominences. Bruising, especially on the shins, increased with increase in age and mobility. Caregivers typically provide a history of noting the child's bruise after a bump or fall or of noting the bruise incidentally while bathing or dressing the child. The child's physical examination may reveal other minor bruises in expected areas and no other injuries. Accidental bruising is uncommon on the ears, back, buttocks, hands, forearms, upper arms, face, abdomen, hips, backs of the legs, and feet (Maguire et al. 2005; Patel and Butterfield 2015; Maguire and Mann 2013). Deviation from the typical childhood pattern of accidental bruising, such as to areas on the posterior aspect of the body (buttocks), soft areas (cheeks), or protected areas (genitals, upper legs, pinnae), raises the healthcare provider's suspicion of possible child maltreatment (see Photo 3.1).

A recent study describing patterns of bruising in disabled children found bruising on the feet, thighs, hands, arms, and abdomen, possibly related to the use of mobility aids; however, bruising was rarely noted on the ears, neck, chest, and genitalia (Maguire and Mann 2013).

Inflicted injuries to the child's skin also may cause bruising. However, patterns of abusive bruising overlap with "expected" patterns found in accidental bruising. Although inflicted bruises may be differentiated from accidental bruises by their location, age, shape, number, and severity, few bruising patterns are pathognomonic for child abuse (Sussman 1968), with the exception of bruises carrying the clear imprint of the implement used (Maguire et al. 2005; Patel and Butterfield 2015).

Photo 3.1 Child with old bruises to the axilla and body

Photo 3.2 Bruises and swelling on the earlobe, behind the ear; also notice blood in the canal

Pascoe, Hildebrandt, Tarrier, and Murphy (1979) found that bruises to the soft, relatively protected skin sites on the cheeks, neck, trunk, genitals, and upper legs were seen significantly more often in children suspected of having been abused or neglected (see Photo 3.2). Other bruising patterns that may raise concern for maltreatment include bruises in the young (premobile) infant, multiple bruises of different ages, multiple bruises in clusters, multiple bruises of uniform shape, bruises and marks that have geometric shapes suggestive of the object used to strike the child, cluster bruises (three or more injuries in the same body location) (Patel and Butterfield 2015; Christian 2015), and/or severe bruising that is not explained by the

history provided (Maguire et al. 2005). The mnemonic "TEN 4" has been used to identify bruises at high risk of being inflicted: T = torso; E = ear; N = neck; and 4 = children less than 4 years of age or in **any** infant less than 4 months of age (Christian 2015).

Pathophysiology

A bruise or black-and-blue mark generally results from the application of a blunt force to the skin surface that results in the disruption of capillaries (and possibly larger blood vessels, depending on the force applied). As the bruise forms, subcutaneous blood leaks from the disrupted capillaries into the unbroken overlying skin (Wilson 1977). A multitude of factors account for the size and depth of a bruise. These factors include (a) force of impact, (b) size of the disrupted blood vessels, (c) vascularity and connective tissue density of the injured tissue, and (d) fragility of the blood vessels involved (Ellerstein 1979; Kornberg 1992; Richardson 1994). For example, the periorbital area is a well-vascularized tissue with relatively loosely supported blood vessels that may bruise extensively if subjected to blunt force.

The depth and location of the vessels and the arrangement of fascial planes in the surrounding tissue are also a consideration when assessing the extent and age of a bruise. Injury depth is a factor in when the bruise appears. Relatively deep injuries may not be apparent for hours to days (Johnson 1990; Langlois and Gresham 1991). For example, a powerful blow applied to the thigh may result in injury to deep structures and may not be apparent for a day or two until bleeding from the deep vessels tracks toward the more superficial areas and becomes visible through the overlying unbroken skin.

What Is an Inflicted Bruise?

In 2002, the American Academy of Pediatrics Committee on Child Abuse and Neglect released a guideline regarding skin injuries serious enough to be considered abusive (American Academy of Pediatrics Committee on Child Abuse and Neglect 2002):

1. The injury is inflicted.
2. The injury is nonaccidental.
3. The injury pattern fits a biomechanical model of trauma that is considered abusive (handprint, instrument pattern such as a loop cord injury).
4. The history of injury is inconsistent with the child's developmental stage.
5. The history of injury is inconsistent with the injury itself.
6. The injury is significant if it produces visible tissue damage that lasts more than 24 h. (i.e., beyond temporary redness of the skin).

Evaluation for Abuse

History

The evaluation of suspicious bruises begins with a history that includes the explanation of the injury, evaluation for medical conditions associated with easy bruisability or those that mimic bruising, and a history of prior allegations of maltreatment.

A. History of Injury

1. How and when was the bruising noted? By whom?
2. What is the explanation for the bruise(s)?
3. If age appropriate, what is the child's explanation of the bruise?
4. Was the injury witnessed?
5. Was the bruise attributed to the child's self-injury or to the actions of a sibling or playmate?
6. Is the explanation for the bruising implausible because of the age or developmental ability of the child?
7. Do explanations change over time, or are disparate accounts rendered by different caregivers?
8. If the injury is serious, is there a delay in seeking treatment after the injury? If so, why?
9. With a significant injury or suspicious bruising pattern, is there a lack of appropriate concern over the seriousness of the child's condition?

B. Medical and Family History

1. Does the child have a medical condition associated with easy bruisability or that mimics bruising? Is the child receiving any medications that might interfere with clotting?
2. Is there a history of unusual bleeding or bruising, such as extensive bleeding with circumcision, deep muscle bleeds with immunizations, recurrent nosebleeds, or excessive gum bleeding with dental care?
3. Is there a family history of any of the above?

C. History of Prior Maltreatment

1. Is there a prior history of maltreatment or frequent visits for injury?
2. Is the family known to social services for previous concerns of maltreatment?

An implausible history to explain the bruising should immediately alert the healthcare provider to the possibility of abuse. Basic knowledge of child development is essential in determining the plausibility of a history. For example, 6-month-old children are not developmentally able to climb onto furniture, raising the suspicion of abuse when the caregiver explains this as the cause of a baby's bruised back or neck (Kornberg 1992).

Physical Examination

The physical examination of the bruised child includes a detailed description of each injury, identification of bruising patterns that are suggestive of abuse, and a search for other injuries (see Photo 3.3). Bruises are potentially a subtle manifestation of more severe internal injury, especially in the infant or young toddler. Faint bruises, or those that are not visible to the naked eye, may be enhanced with a Wood lamp, enabling not only detection but digital photographic documentation (Vogeley et al. 2002).

A. Describe Each Bruise Carefully

1. Size of the bruise as measured with a millimeter ruler
2. Location of the bruise
3. Shape of the bruise (see below)
4. Color of the bruise (see below for dating of bruises)

B. Bruising Patterns (note characteristics of the bruises identified)

1. Do the bruises appear to be of different ages?
2. Are the bruises in centrally located or protected areas?
3. Do the bruises appear to be older or younger than disclosed in the history?
4. Does the pattern of bruising differ from the history provided?
5. Does the pattern of bruising suggest an inflicted mechanism (e.g., handprints, geometric shapes, loop marks)?
6. Are multiple body surfaces bruised from a single episode of trauma?

C. Identification of Other Signs of Inflicted Injury

1. Examine for underlying bone or internal organ injury.
2. Assess for signs of physical neglect.

Photo 3.3 Bruises on the back and buttocks

Shape

The shape of the bruise may help distinguish accidental from nonaccidental injury. A bruise may assume the shape of the object used to injure the child (Johnson 1990; Patel and Butterfield 2015) (see Fig. 3.1). Identifiable marks may be left from corporal punishment using instruments, such as a belt, cord, or paddle, depending on how the instrument is held as it is used against the child's skin (Kornberg 1992). A cord folded over and used to strike a child will customarily leave ecchymotic loop marks which are essentially pathognomonic for physical abuse. A belt produces a broad band of bruising, possibly including a horseshoe shape at one end from the buckle; puncture marks may be present from penetration of the skin by the tongue of the buckle. Restraint of a child's limbs during abuse may cause circumferential ligature marks around the ankles and wrists (Kornberg 1992); gag marks (bruising at the corners of the mouth) may also be seen. The perpetrator's hand may leave an impression upon the child's skin when sufficient force is used to either grab or slap the child (Kessler and Hyden 1991); the imprint may appear negative (an outline of the hand with bruising between the fingers, rather than at the actual point of impact of the fingers themselves) due to capillary rupture as blood is pushed away from the point of impact (Reece and Ludwig 2001).

Bite marks produce a characteristic roughly circular or oval shape, consisting of two opposing arches separated by open spaces at their bases; the mandibular teeth are usually more clearly defined than the maxillary teeth (Reece and Ludwig 2001; American Board of Forensic Odontology 2000; Hinchliffe 2011). Central bruising may be present (Hinchliffe 2011). The distance between the canine teeth can help to differentiate adult bites from bites by other children: an intercanine distance less

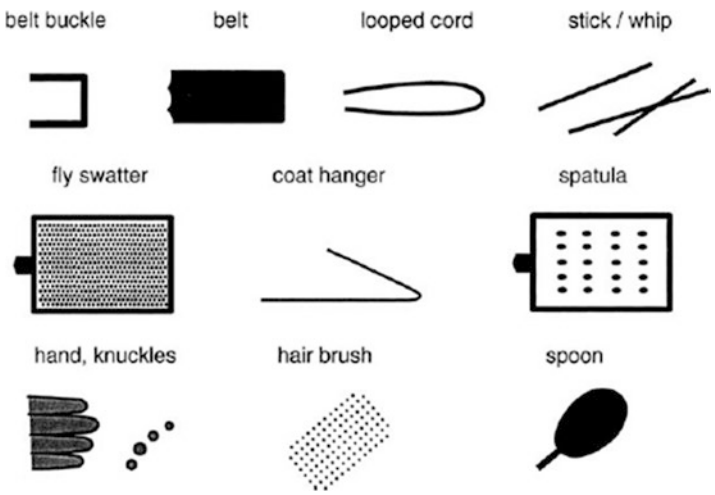

Fig. 3.1 Marks left by objects on child's skin. (Johnson 1990. Used with permission. Pediatric Clinics of North America. 37:791–817, Copyright © Elsevier 1990)

Photo 3.4 Slap on the face with imprint of the hand

than 2.5 cm is consistent with the deciduous teeth of a young child, 2.5–3 cm either a child or a small adult, and 3–4.5 cm an adult (Kemp et al. 2006).

Bruises taking on the shape of objects are rarely accidental and require thorough investigation and protection of the child from further harm (Johnson 1990; Kornberg 1992; Richardson 1994; Patel and Butterfield 2015) (see Photo 3.4).

Dating of Bruises

Bruises undergo visible color changes as they heal (see Photo 3.5). Although clinicians are frequently asked to "date" injuries based on the progression of color changes seen in bruised skin, current literature cautions the accuracy of the dating criteria (Schwartz and Ricci 1996; Maguire and Mann 2013). Knowledge of bruise pathology and the basis for color changes helps practitioners understand the pathophysiologic process and provides reason for caution in trying to date the age of a bruise. Detailed color changes occur as a bruise progresses through various stages of healing (Richardson 1994; Wilson 1977). However, there may be no clearly predictable order or chronology of color progression in the healing process even though certain patterns seem to emerge (Schwartz and Ricci 1996). However, shortly after impact, the bruise is a deep red, blue, or purple (Langlois and Gresham 1991). Swelling is common for approximately 2 days until the serum is reabsorbed (Richardson 1994). With time, the blood collection separates into serum and a fibrin mass clot, and swelling decreases with the resorption of the serum from the injured area. Pigmented breakdown products of free hemoglobin, deoxygenated hemoglobin, biliverdin, and bilirubin are believed to account for the "play of colors" that the bruise undergoes over the next 2–4 weeks, as hemoglobin in the clot degenerates and is reabsorbed (Cotran et al. 1989). The bruise may progress from a deep reddish purple to a more bluish color and then develop a greenish coloring that fades into a yellowish brown coloring prior to full resolution. Bruises with yellow coloring are generally older than 18 h. (Langlois and Gresham 1991), although yellow coloration may appear "earlier than most forensic charts indicate" (Schwartz and Ricci 1996, p. 255). The amount of time for each color change to occur depends on the

Photo 3.5 Child with multiple bruises in various stages of healing

amount of blood involved, distance of the bruise from the skin, and baseline skin pigmentation of the individual. All combine to create the colors seen at the surface. Because of inherent limitation of efforts to estimate the age or date of injuries, Wilson (1977) suggests that clinicians document that the appearance of a bruise is consistent with a given estimated age rather than stating an exact age. Schwartz and Ricci (1996) caution that the bruise literature does not support any certainty in determining the age of a bruise because of the varied factors in bruise development and the healing process. Nuzzolese and Di Vella (2012) have proposed the use of a colorimetric scale to assist in estimating age ranges of bruises.

The Differential Diagnosis of Bruising

The differential diagnosis of a child who appears bruised includes accidental trauma; inflicted trauma (physical abuse); and a variety of dermatologic, hematologic, vasculitic, and infectious conditions, as well as congenital defects in collagen synthesis (Bays 1994; Coffman et al. 1985; Davis and Carrasco 1992; Ellerstein 1979; Johnson 1990; Kornberg 1992; Richardson 1994; Saulsbury and Hayden 1985; Wissow 1990; Metz et al. 2014; Patel and Butterfield 2015). A 2014 study found that 2.4% of children referred for evaluation of child abuse were found to

have cutaneous mimics; a small but significant number of these children (4%) had findings of physical abuse as well (Schwartz et al. 2014).

Congenital dermal melanoses, also known as Mongolian spots, are blue-gray areas of hyperpigmentation, usually located over the lower back and buttocks but also on the occiput, face, upper back, and extremities, which are frequently noted in infants of African-American, Asian, Native American, or Hispanic descent (Gupta and Thappa 2013; Patel and Butterfield 2015). They may be mistaken for bruises, but lack associated swelling or tenderness, and do not evolve over days as do bruises.

Disorders of coagulation span a wide range of possible defects in hemostatic function, including (a) congenital and acquired abnormalities of platelet function, such as thrombocytopenia- absent radius syndrome (TAR) and idiopathic thrombocytopenia purpura (ITP); (b) congenital and acquired abnormalities of coagulation factors, such as hemophilia (factor VIII deficiency) and vitamin K deficiency; and (c) congenital and acquired vascular abnormalities, such as hereditary hemorrhagic telangiectasia and a variety of vasculitides. Henoch-Schönlein purpura, a self-limited IgA-mediated vasculitis, is the most common vasculitic disorder of childhood; it presents with palpable purpura, which may occur anywhere on the body but are most concentrated on the legs and buttocks; other findings may include joint pain and swelling, abdominal pain, and hematuria (Gedalia 2004).

In addition, folk-healing practices may cause bruising and raise the concern of possible abuse. Coining (cao gio), also known as quat sha, gua sha, scraping, or spooning, is an East Asian practice which involves rubbing the skin with the edge of a coin or other objects in order to relieve symptoms of illness; it produces a characteristic ecchymotic pattern on the skin that may be mistaken for abuse (Nielsen et al. 2007; Look and Look 1997) (see Photo 3.6a, b). Cupping may be mistaken for either bruises or burns and is discussed in detail in the "Burns" section below.

As in all differential diagnoses, the history, physical examination, and laboratory assessment are crucial to the inclusion and exclusion of diagnoses and guide the assessment and workup. Bays (1994) and Schwartz et al. (2014) have made comprehensive reviews of the medical literature on conditions reportedly mistaken for child abuse. Note that children with medical conditions that cause easy bruisability tend to bruise most in common locations. Furthermore, children with hematologic or other medical conditions associated with bruising and bleeding are not immune to maltreatment (Johnson and Coury 1988; Schwartz et al. 2014). Careful consideration of the possible conditions that mimic abuse serves the child's interests and prevents the misdiagnosis of abuse (see Table 3.1).

Forensic and Laboratory Evaluation

The clinician interprets the plausibility of the injury in conjunction with the past medical history, noted bruises, developmental factors, and laboratory data (Richardson 1994). A child with bruising may not automatically require laboratory evaluation to assess for a hematologic disorder. However, it is important to focus on

Photo 3.6 (**a**) Coining (Used with permission. American Academy of Pediatrics. Visual Diagnosis of Child Abuse on CD-ROM. 2nd Edition. Elk Grove Village, Ill. 2003) and (**b**) Cupping: a cultural practice that may be mistaken for child abuse. (Used with permission. American Academy of Pediatrics. Visual Diagnosis of Child Abuse on CD-ROM. 2nd Edition. Elk Grove Village, Ill. 2003)

a screening history and physical examination for such disorders that guide the selection of indicated laboratory studies (Rapaport 1983). After eliciting a thorough history and performing a complete physical examination, the healthcare provider may conclude that (a) the screening information is complete and consistent with normal clotting; no further workup is necessary; (b) the screening information is incomplete (or insufficient); further workup is necessary to ensure normal clotting; or (c)

Table 3.1 Differential diagnosis of bruising

Dermatologic	
Congenital dermal melanosis (Mongolian spots)	Slate blue patches of the skin commonly seen in pigmented skin
	Approximately 90% of African Americans have such spots
	Congenital, commonly found on the lower back and buttocks (may occur anywhere)
	Fade early in life (in most cases, completely faded by age 5 years)
	Evolve and disappear over years rather than weeks as in bruise healing (Gupta and Thappa 2013)
Hemangioma	Visible vascular malformations
	Capillary hemangiomas (strawberry marks), composed of capillaries
	Congenital
	Characteristic growth pattern: (a) rapid growth in the first few months of life, followed by slower growth and eventual involution (Patel and Butterfield 2015)
Eczema	Atopic skin condition
	Reddened, dry areas on the child's skin
	Pruritic, frequently associated with a family history for other atopic conditions such as asthma and hay fever, and occur episodically in "flares"
	Responsive to topical steroids such as hydrocortisone
Erythema multiforme (EM)	Acute hypersensitivity skin condition whose hallmark is red, target-like lesions
	Occurs in response to a number of drugs, foods, immunizations, and infections with both bacterial and viral agents (Mudd and Findlay 2004)
	Severity of EM ranges from a minor form that is self-limited to a major form, Stevens-Johnson syndrome, which has serious systemic consequences, involves mucous membranes, and manifests large areas of epidermal necrosis and sloughing
	Variable in appearance, classically symmetric, may involve the palms and soles, and has variable lesions that typically progress from dusky red to a target-like character occurring in crops and resolving in 1–3 weeks
Phytophotodermatitis	Skin reaction to psoralens, chemical compounds found in citrus fruits such as limes
	Skin in contact with psoralens upon exposure to sunlight manifests red marks that appear as bruises and, if severe, as burns
	History contains information related to contact with psoralens followed by exposure to the sun (Coffman et al. 1985)
"Tattooing"	Dye from fabric such as denim discolors the child's skin, giving the appearance of a bruise; lightens or fades with rigorous washing

(continued)

Table 3.1 (continued)

Dermatologic	
	History should reveal contact with dyed fabric that became wet and "ran"
Alopecia areata	Areas of hair loss may be mistaken for hairpulling (Schwartz et al. 2014)
Pityriasis rosea	May be mistaken for human bite wounds (Hinchliffe 2011)
Hematologic Disorders of hemostasis, congenital and acquired hemophilia (factor VIII and IX deficiency)	A plasma coagulation disorder
	In the neonatal period, cord separation or circumcision may result in prolonged bleeding (hemophilia; approximately 50% of affected males having such a bleeding history)
	Bruising may become more pronounced as the child begins to cruise and walk, owing to falls and bumps
	Bruising may have a nodular or firm consistency secondary to the deep bleeding into soft tissues seen in hemophilia
	Hemophilia suggested by prolonged PTT
	Consultation with a qualified pediatric hematologist necessary (Casella 1990)
Von Willebrand's disease	Heterogenous group of disorders that results in decreased platelet adhesiveness, impaired agglutination of platelets in presence of ristocetin, and prolonged bleeding time
	Patients have mild to moderate bleeding tendency typically involving mucous membranes
	Easy bruising, nosebleeds, and prolonged bleeding after dental procedures are hallmarks (Casella 1990)
Vitamin K deficiency	May be secondary to malabsorption (e.g., cystic fibrosis)
	Hemorrhagic disease of the newborn might be expected in an infant who failed to receive prophylactic vitamin K at birth (Sankar et al. 2016). Breast-fed children born at home are most at risk. Presentation is typically in the first few days of life, and a high percentage occur with a catastrophic intracerebral bleed (Bays 1994; Sankar et al. 2016)
	Acute, usually self-limited
Idiopathic thrombocytopenic purpura (ITP)	Platelets are peripherally consumed via an immunologic mechanism
	Follows a viral illness in approximately 70% of cases
	Petechiae and bruising are noted approximately 2–4 weeks after the minor illness resolves
	Physical examination reveals petechiae or bruising and normal lymph node, spleen, and liver size
	CBC reveals a low platelet count
	Resolution typically occurs in 8–12 weeks in more than 75% of cases

(continued)

Table 3.1 (continued)

Dermatologic	
	Bone marrow becomes progressively infiltrated with neoplastic cells
	Systemic signs and symptoms are typically present.
Leukemia	CBC is markedly abnormal
	Coagulation studies may also be aberrant depending on the stage of the illness
Anticoagulant ingestion	Children may ingest anticoagulants from either medications in the household or those contained in commercial rat poison (Bays 1994; Johnson and Coury 1988)
	May be seen in MSBP (see Chap. 8)
Vasculitis	
Henoch-Schönlein	Palpable purpura and petechiae
Purpura (HSP)	Notable for (a) a variable purpuric rash that often involves the buttocks and lower extremities; (b) arthralgia/arthritis; (c) abdominal pain; (d) renal disease; and (e) occasionally subcutaneous, scrotal, or periorbital edema (Trnka 2013)
	Tends to develop acutely, is usually self-limited, and runs its course over a 6-week period of time
	Most common in children older than 1 year but younger than 7 years
	Up to 50% of affected children may have recurrences; these tend to be in older children
	Purpura without a low platelet count is essential for the diagnosis
Infections	May be associated with the appearance of petechiae and/or purpura (e.g., rickettsial disease)
	Severe infections may result in complications such as disseminated intravascular coagulation (DIC) and purpura fulminans
	History, physical examination, and laboratory evaluation confirmatory of serious infection
Collagen synthesis defects Ehlers-Danlos (ED) syndrome	
	Congenital defect in collagen synthesis, may lead to easy bruising
	At least ten forms are identified
	Involves a variety of unique basic defects and inheritance patterns
	Basic clinical triad that each variant shares to a greater or lesser extent: (a) skin hyperextensibility, (b) joint hypermobility, and (c) skin fragility
Osteogenesis imperfecta (OI)	Congenital abnormality in quantity or quality of type I collagen synthesis
	Heterogenous disorder with four subtypes

(continued)

Table 3.1 (continued)

Dermatologic	
	OI type I associated with easy bruising. Hallmarks include blue sclera, hearing impairment (35% of children after first decade), osteopenia, fractures, bony deformities, and excessive laxity of joints (Marini et al. 2017)
	Punch biopsy of the skin for analysis of collagen synthesis in children with repeat fractures when other historical and examination findings are not consistent with abuse (Bays 1994)
	Consultation with metabolic specialist and geneticist required
Folk-healing practices: Coining	Described in Asian cultures as healing method
	In coining, warmed oil is applied to the child's skin, which is then rubbed with the edge of a coin or a spoon in a linear fashion, usually on the chest or back
	The repetitive rubbing leads to linear bruises and welts (Mudd and Findlay 2004)
Cupping	Described in Asian and Mexican cultures
	In cupping, a cup is warmed and placed on the skin. A vacuum is created between the cup and the child's skin as the cup cools, which leads to a bruise (Mudd and Findlay 2004)
	Coining and cupping are not done to injure the child but to comply with cultural beliefs that view them as necessary to help the child heal or recover from minor illnesses. Parental education is needed to assist the parent in understanding the injurious nature of these practices

the screening information suggests a medical condition that is associated with easy bruisability or bleeding; further workup is necessary (Casella 1990).

Screening for bleeding problems includes platelet count, prothrombin time (PT), partial thromboplastin time (PTT), and bleeding time. Additional tests are indicated for abnormal screens and are best obtained through consultation with a qualified pediatric hematologist. Regardless of how complex the workup becomes, tests are ordered based on what the history and physical examination suggest rather than a random effort to exclude unlikely possibilities.

In addition to screening for other etiologies of apparent bruising, evaluation for rhabdomyolysis and ensuing acute kidney injury may be indicated, particularly in the setting of extensive injury to the buttocks and/or lower extremities. Dipstick urinalysis is positive for blood, without significant numbers of red blood cells on microscopic examination; this result is produced by cross-reactivity of the dipstick reagent with myoglobin. Other laboratory findings include elevated serum creatine phosphokinase and potassium, released from damaged myocytes; elevated blood urea nitrogen, creatine, and transaminases may be seen as well (Peebles and Losek 2007; Sussman et al. 2012; Lazarus et al. 2014).

Bite marks may require special analysis, including careful measurement of the vertical and horizontal size, along with the distance between the maxillary canines if this can be determined, and photography of the wound with a distance scale in the

frame for forensic matching with the teeth of the perpetrator. The injury may also be swabbed to obtain saliva traces for DNA analysis. Sweet et al. have described a reliable technique for bite wound swabbing, known as the double swab method: the skin is swabbed first with a wet swab, followed by a dry swab; both swabs are air-dried before being submitted for analysis (Sweet et al. 1997). A control buccal swab should be obtained from the victim to exclude his/her DNA (Hinchliffe 2011).

Burns

Overview

Burns represent a major public health problem for children. Each year, approximately 30,000 children are hospitalized for serious burns, and a significant number suffer disability, permanent disfigurement, and death (Ahlgren 1990; Meagher 1990; Hodgman et al. 2016). The mortality rate for burns ranks second behind automobile deaths and accounts for approximately 3000 pediatric deaths each year in the United States. For burns involving more than 40% of body surface area, the mortality rate is close to 90% (Hathaway et al. 1993). Eighty percent of burn injuries occur in the child's own home, and approximately 5–25% of pediatric burns are a result of abuse (O'Neill 1979; Purdue et al. 1988; Hodgman et al. 2016); 6–20% of abusive injuries to children are burns (Peck and Priolo-Kapel 2002). In a recent study, mortality in abusive burns was 5.4%, compared to 2.3% in accidental burns (Hodgman et al. 2016).

Burns, whether accidental or inflicted, occur more frequently in children under 5 years of age, with the highest incidence occurring in infants and toddlers under 3 years of age (Feldman 1987; Johnson and Showers 1985; Showers and Garrison 1988; Hodgman et al. 2016). Burn injuries are classified as scalds (hot liquid), flame, contact (hot solid object), electrical, and chemical (Meagher 1990; Hodgman et al. 2016; Saeman et al. 2016). Scalding accounts for the majority of childhood burns, including both accidental and inflicted burn injuries, and accounts for >40% of all pediatric burn admissions (Ahlgren 1990; Saeman et al. 2016; Pawlik et al. 2016).

Pathophysiology

Human skin sustains injury from contact with heat. Human skin is composed of three layers: epidermis, dermis, and subcutaneous tissue. The deepest cells in the dermis are called the basal layer, and they serve to replenish the skin cells as they are sloughed or injured (see Fig. 3.2). Cells that make up the skin contain protein and enzymes that function within limited temperature ranges. Permanent damage to the skin occurs when the proteins are subjected to temperature extremes that cause denaturation and an inability of the cellular mechanism to function.

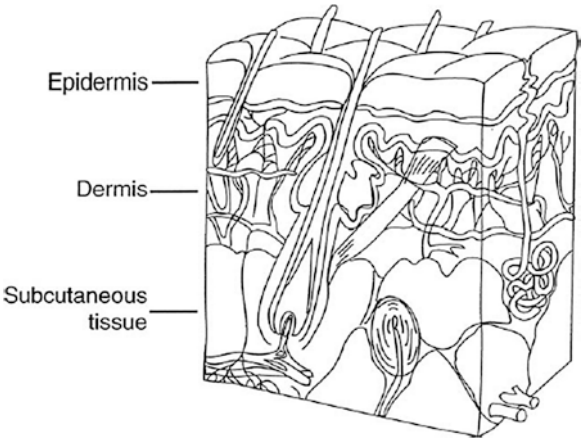

Fig. 3.2 Skin layers. The skin is divided into layers. The uppermost or most superficial layer is the epidermis. The dermis is deeper, is composed mainly of structural proteins, and contains skin appendages such as hair follicles, sweat glands, and nerve endings. These appendages contain reserves of skin cells that serve to aid in the healing process after injury. Finally, the subcutaneous tissue layer serves as an underlying support structure composed of fibrous bands and fat

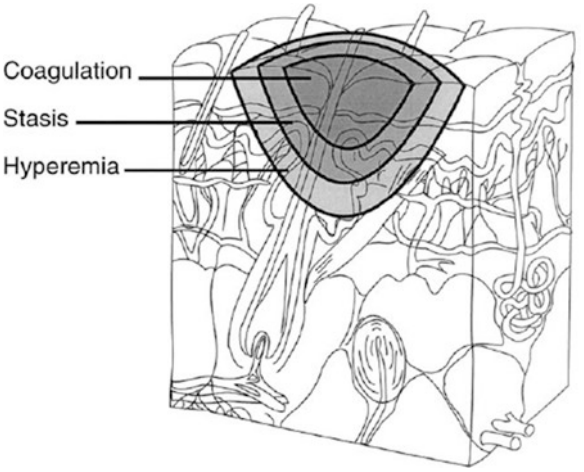

Fig. 3.3 Concentric zones of thermal injury. The zone of coagulation is the area in most direct contact with the heat source and sustains irreparable damage. Extending outward is the zone of stasis, which, although injured, retains some ability for cellular repair. Finally, the zone of hyperemia is the least injured area and has the greatest likelihood of repair and healing. (Adapted from Robson and Heggers 1988)

At the cellular level, burn injuries consist of three concentric zones of affected tissue (Jackson 1953; Robson and Heggers 1988) (see Fig. 3.3). The first zone consists of skin that has the most direct contact with the heat source. This area,

known as the zone of coagulation, undergoes immediate coagulation necrosis with denaturation of proteins and no potential for cellular repair. Cells in the second zone, the zone of stasis, are exposed to direct injury from the heat source but retain some ability to repair themselves. Tissue in this zone is ischemic, and cells usually necrose in 1–2 days after the injury unless the burn is treated properly. Finally, cells in the third zone, called the zone of hyperemia, have sustained minimal direct injury and usually recover from insult over a 7–10-day period.

As cells die in the various zones, they release inflammatory mediators that may lead to further progression of injury. Furthermore, necrotic tissue that accumulates within the wound provides an excellent growth medium for microorganisms that have an adverse effect on the healing process.

Burn injuries are classified by the depth of the skin injured. The size of a burn is calculated as a percentage of body surface area involved. The depth of burns has historically been described as first-, second-, third-, and fourth-degree burns. Currently, the terms *superficial*, *partial*, or *full thickness* are used to describe the depth of the burn. Partial thickness burns are further classified as either superficial partial thickness (not to be confused with the simple "superficial" burn described above) or deep partial thickness.

A superficial burn, analogous to a first-degree burn, is the least severe. A common example is sunburn. The burned area involves only the uppermost layers of the epidermis and presents as reddened, painful skin without blister. Within a few days, the superficial layers of injured skin slough and heal as healthy cells are produced from the underlying skin cells. No scarring is expected from a superficial or first-degree burn.

A partial thickness burn, analogous to the second-degree burn, causes blistering of the skin and is painful because nerve endings are exposed. Partial thickness burns are deeper than the simple superficial burn and extend past the epidermis into the dermis. Because of blood vessel disruption, these burns have a beefy red appearance. Depending on the depth of the dermis involved, the partial thickness burn may be categorized further as either a superficial partial thickness or deep partial thickness burn. The superficial partial thickness burn extends just past the epidermis and minimally involves the dermis. The deep partial thickness burn is more extensive and goes deeper into the dermis. Healing in partial thickness burns progresses as healthy cells deep in the dermis replenish injured cells. Superficial partial thickness burns usually heal completely in approximately 2 weeks if infection does not occur. The deep partial thickness burn may heal in 3–4 weeks. Healing of partial thickness burns may result in scarring and hypertrophic changes, especially with deeper injury. Deep partial thickness burns may compromise the dermis's basal layer of cells and progress to a full thickness burn injury if not treated properly. Thus, observation over several days is necessary prior to final classification of burn depth.

A full thickness burn (analogous to third and/or fourth degree depending on depth of involvement) is the most severe and extends through the entire skin surface, past the epidermis and dermis to underlying tissues such as subcutaneous tissue

(third degree) or muscle and bone (fourth degree). The entirety of the overlying skin has been destroyed, including the basal layer of the dermis. Full thickness burns present as white and anesthetic because of complete destruction of blood vessels and nerve endings. Such a profoundly injured area cannot regenerate its own skin cells. Healing occurs through inward growth of the skin from tissues surrounding the wound or surgically by way of skin grafting from nonburned areas of the body. Significant scarring and disfigurement occur as the full thickness burn heals.

Burns and Abuse

Inflicted burns have been recognized since the early years of professional inquiry into child maltreatment (Gillespie 1965). Although estimates vary depending on the population studied, approximately 5–10% of children hospitalized for burns are believed to have sustained inflicted injury (Feldman 1987; Meagher 1990; Purdue et al. 1988; Hodgman et al. 2016). These children tend to be young and have a higher mortality than do comparable children who were accidentally burned. Although few burn mechanisms are pathognomonic for abuse, certain patterns have a higher association with abuse than do others. For example, tap water scalds are more commonly seen in abusive burns than in accidental burns.

Investigators have studied specific historical and physical patterns associated with inflicted burns (Ayoub and Pfeiffer 1979; Hammond et al. 1991; Hight et al. 1979; Keen et al. 1975; Lenoski and Hunter 1977; Stone et al. 1970; Kos and Shwayder 2006; Maguire et al. 2008; Hodgman et al. 2016; Pawlik et al. 2016) and have developed criteria that raise the suspicion of abusive burns. These criteria include:

1. Implausible history to account for burn based on child's development, age of burn, and/or pattern of burn identified on examination
2. No history for burn provided by caregivers because child was "found" with the burn (magical injury)
3. Caregiver responsible for child at time of burn not present with child during medical evaluation
4. Burn attributed to sibling or playmate
5. Patterns of burns that imply restraint during burn injury
6. Burns on areas of the body that are "targets" for abuse, including the dorsum of the hands, feet, legs, perineum, and buttocks (see Photo 3.7)
7. Unexplained delay in seeking treatment
8. Other suspicious injuries, such as bruises and scars of varying age and at different stages of healing
9. Evidence of neglect, such as poor hygiene or malnutrition
10. History of prior injury

Photo 3.7 Child with healing burns to buttocks

Scalds

Scalding is the most common mechanism of burn injury for abused children who are admitted to the hospital (Showers and Garrison 1988; Shields et al. 2013; Maguire et al. 2008; Hodgman et al. 2016; Pawlik et al. 2016). Scalding occurs when a hot liquid comes in contact with the child's skin. Some hot liquids responsible for scalds are (a) boiling water; (b) tap water; (c) water-like liquids, such as tea or coffee; and (d) thicker liquids, such as soups or grease. Scald burns are classified as (a) splash/spill (hot liquid falls, is poured on, or is thrown at child), (b) immersion (child falls into or is submerged in hot liquid), and (c) forced immersion (pattern of burn suggests that restraint was used to plunge and hold child in the hot liquid).

Splash/spill burns may occur either in an accidental or in an inflicted manner. Overlap exists in the physical findings for both mechanisms of injury. Accidental scalds often occur in kitchen accidents as a child explores his or her environment and reaches unknowingly for containers of hot liquid that have been left within reach. Pots of boiling water and cups of hot beverages are likely culprits in such accidents. An accidental mechanism of injury is expected to give rise to a typical burn pattern. For example, if the child is looking up and reaching for a container, the hot liquid will fall first upon the child's cheek, neck, shoulder, upper arm, and upper chest. This area will be most severely burned, and as the spilled liquid runs down the body, it cools and leaves a less severe injury going outward from the points of initial contact (see Fig. 3.4). Clothing holds the hot liquid in close contact to the skin, which makes the burn more severe. As the liquid falls on the child, splash marks may also appear as droplets of the hot liquid fall on the child in other areas separate from the point of maximal contact.

Splash/spill burns also may occur in an abusive manner. Hot liquids may be poured or thrown at the child. Depending on the circumstances, the injury pattern of the burn may help differentiate an inflicted burn from an accidental spill/splash burn. For example, if a child is running from a perpetrator, the liquid may be thrown at his or her back and give rise to a burn pattern that is inconsistent with a history of

Fig. 3.4 Typical spill burn pattern. The typical pattern for a spill burn where a child reaches up and pulls a container of hot liquid on top of him- or herself. The hot fluid usually falls on the child's face and shoulder first, causing the most severe burn at the point of initial contact (expressed by the *darkest shading*). As the liquid runs down the body and cools, the burn becomes narrower and less severe at the perimeter (expressed by lighter shading)

the child looking up and pulling a pot of boiling water on top of him- or herself. However, if the perpetrator pours the hot liquid on top of the child, the injury pattern may be similar to that described for the accidental burn and may not be useful in identifying the abusive origin of the injury. Other aspects of the medical evaluation will be necessary to diagnose abuse in such a case where burn patterns overlap.

Immersion burns occur when parts of the child's body become submerged in a hot liquid, and the burns may be accidental or inflicted. Such burns are commonly seen in abusive burning. Abusive immersion burns may occur at any age but are more common in infants and toddlers. For example, a typical immersion burn occurs when the child is held vertically by the arms or upper torso and then immersed in the hot water. In this scenario, the toes and feet come in contact with the hot water first. The child reflexively withdraws his or her lower limbs by flexing the knees and hips and assuming a cannonball-like position. The caregiver then immerses the genitals and buttocks (Figs. 3.3, 3.4, 3.5, 3.6, and 3.7). Depending on the size of the child and the depth of the water in the container, the child's feet and lower legs are burned, and the buttocks and genital area are also burned. Distinct lines of demarcation will separate the burned from nonburned areas, and splash marks may be limited. Such inflicted immersion burns are often related to toileting accidents or other activities that dirty a child and require that the caregiver clean the child. The pattern of burn injury described above would be inconsistent with an accidental injury, such as what would occur if the child wandered over to and fell into a tub of water or if the child was playing in an empty tub and turned on the hot water faucet (see Photo 3.8).

Fig. 3.5 Forced immersion burn as child is forced into hot liquid. (Daria et al. 2004. Used with permission)

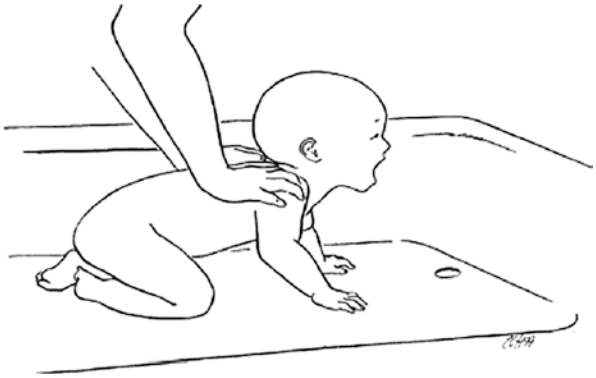

Fig. 3.6 Forced immersion burn as child is forced into hot liquid. (Daria et al. 2004. Used with permission)

A forced immersion burn has a pattern of injury that is consistent with the child being restrained by the perpetrator while submerged in the hot liquid. Forced immersion burns are among the most severe and extensive burns seen in abused children. A forced immersion pattern of injury occurs when the caregiver holds the child in such a way that certain areas of the skin are forced against the relatively cooler surface of the container or tub and are protected from the more extensive burn sustained by the skin that is in full contact with the hot liquid (see Figs. 3.5, 3.6, 3.7, 3.8, and 3.9). For example, this pattern results when a child is plunged into scalding hot water and is held in such a way that his or her buttocks are forcibly held against the relatively cooler tub bottom. In this scenario, the scalding water surrounds the submerged skin, while the buttocks skin in contact with the bottom of the tub is somewhat spared. Therefore, the resulting burn that is less severe on the buttocks manifests as the so-called "hole in doughnut" sparing pattern. In addition, as the child is forcibly held in the water, areas of the skin that are held tightly opposed,

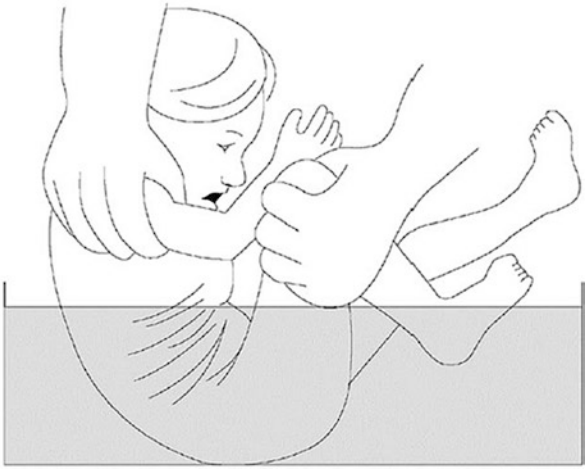

Fig. 3.7 Forced immersion burn as child is forced into hot liquid. (Stratman and Melski 2002. *Archives of Dermatology*. March, 138;319. Copyright © 2002. Used with permission)

Photo 3.8 Healing burn to the foot with stocking distribution; notice line of demarcation on the lower leg

such as in the femoral areas and the backs of the flexed knees, may be spared as well because the hot water is unable to seep into this space to burn the skin. The resulting burn shows thermal injury where the water was in contact with the skin and relative sparing where the hot water was unable to come in contact with the skin.

Stocking and glove burns, circumferential burns of lower and upper limbs, are another immersion burn pattern pathognomonic of abuse. An extremity submerged in hot liquid causes a burn of the distal aspect of the extremity that has a clear upper line of demarcation separating the uniformly burned area from the nonburned area. The palms and soles may appear to be spared because the thicker skin there burns more slowly. Symmetric stocking and glove burns are highly suspicious for inflicted

Fig. 3.8 Forced immersion burn as child is forced into hot liquid. (Stratman and Melski 2002. *Archives of Dermatology*. March, 138;319. Copyright © 2002. Used with permission)

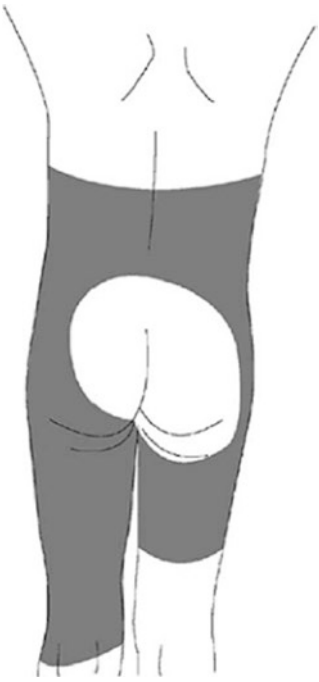

Fig. 3.9 Forced immersion burn as child is forced into hot liquid. (Stratman and Melski 2002. *Archives of Dermatology*. March, 138;319. Copyright © 2002. Used with permission)

burn injury because few plausible histories could explain why a child would submerge both extremities equally into a hot liquid.

Tap Water: A Special Case

Tap water burns are associated with accidental, neglectful, and inflicted injuries. Injury prevention literature discusses the danger to children as well as to debilitated adults that is posed by hot tap water, depending on the temperature of the water and the duration of exposure (Baptiste and Feck 1980; Shields et al. 2013). Early research done in the 1940s outlined the temperatures and duration of exposure at which adult skin suffers burns (Moritz and Henriques 1947). The adult's thicker skin and the child's thinner skin are at significant risk for scalding injuries from a variety of common household sources. Comfortable water temperature for bathing occurs at approximately 101 °F, and hot tubs are typically set at 106–108 °F (Feldman 1987). Water becomes painfully hot at 109–118 °F. Adult skin can tolerate being in water at a temperature of 113 °F for approximately 6 h prior to sustaining a partial thickness burn (Feldman 1983). Higher temperatures produce burns in shorter time periods. Adult skin placed in water that is at 127 °F would suffer a full thickness burn in approximately 1 min. At three degrees higher, 130 °F, only 30 s of exposure causes a full thickness burn, and a full thickness burn occurs in only 2 s at 150 °F (Feldman 1987; Moritz and Henriques 1947) (see Table 3.2 and Fig. 3.10). Feldman (1987) noted that a child's thinner skin suffers similar burns in a shorter period of time. It is recommended that home water heaters be set at 120 °F to reduce the frequency, morbidity, and mortality of tap water burns in children (Erdman et al. 1991). While water heater manufacturers adopted a voluntary standard in the 1980s to reset maximum temperatures to 120 °F (48 °C), continuing high numbers of tap water scald injuries indicate that temperatures remain dangerously high. Temperatures in water heaters vary due to difficulties in maintaining constant temperatures. Risk factors include gas rather than electric water heating, rented rather than owned homes, and < 30-gallon heater capacity per person (Shields et al. 2013).

Table 3.2 Effects of water temperature

Water temperature	Effect
101 °F	Comfortable for bathing
106–108 °F	Typical hot tub temperature
109–118 °F	Pain threshold for adult
113 °F	Partial thickness burn in 6 h
127 °F	Full thickness burn in 1 min
130 °F	Full thickness burn in 30 s
150 °F	Full thickness burn in 2 s

Source: Adapted from Moritz and Henriques (1947) and Feldman (1987).

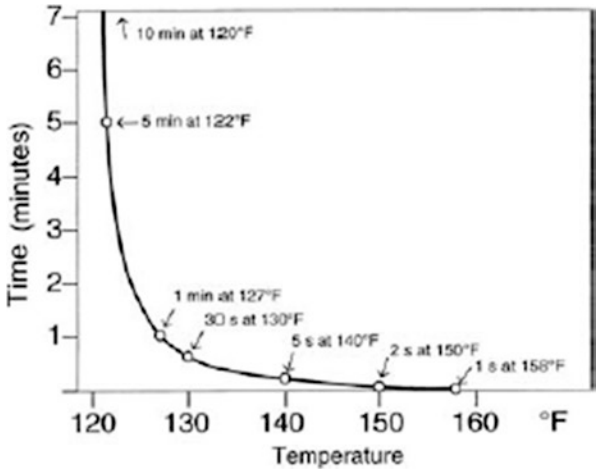

Fig. 3.10 Relationship between water temperature and full thickness skin burns. Graphic representation demonstrating the relationship between water temperature and the amount of skin contact time needed to result in a full thickness burn. (Adapted from Moritz and Henriques 1947; Richardson 1994)

Contact Burns

Contact (or dry) burns are another type of burn seen in physical abuse cases (Feldman 1987; Hodgman et al. 2016). A dry burn occurs when the child's skin is placed in contact with a hot object, such as an iron, heating grate, or the mouth of a handheld hair dryer (Feldman 1987; Lenoski and Hunter 1977; Darok and Reischle 2001). The resulting burn frequently forms in the shape of the hot object being touched (see Figs. 3.11 and 3.12). Whereas inflicted contact burns are often geometric, accidental burns tend to be less geometric in shape because of the more glancing, brief contact between the exposed body part and the hot object (Feldman 1987). For example, cigarette burns have different characteristics depending on whether or not they are accidental or inflicted. Accidental cigarette burns occur when the child brushes up against a lit cigarette. This causes a glancing contact, with the child quickly retracting from the cigarette as his or her skin senses the heat, and it results in an irregularly shaped, superficial burn. Inflicted cigarette burns occur as the lit cigarette is forcibly held in contact with the child's skin. This gives rise to a uniform depth, a "punched-out" appearance with well-defined rolled edges, and a diameter of approximately 8–10 mm (Swerdlin et al. 2007). Inflicted burns are more likely than accidental ones to appear on areas of the body usually protected by clothing, such as the back, chest, and buttocks, or on "target" areas of abuse, including the palms, soles, and genitals (Faller-Marquardt et al. 2008). There are two types of microwave-associated burns: (1) scald-type burns from food or liquid heated in a microwave, which may involve the lips, oral cavity, or throat or present as a spill-type scald, and (2) much less common burns involving very young infants

Fig. 3.11 Contact burn. The child is held against a hot object such as a heating grate, which leaves a characteristic pattern

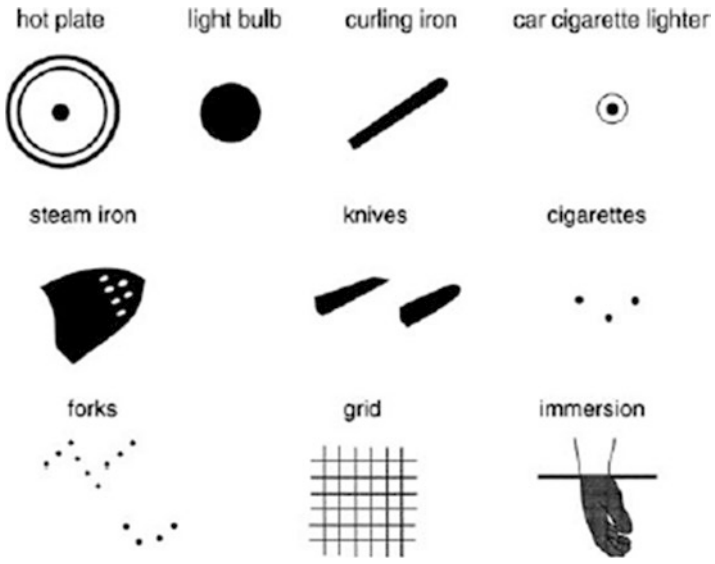

Fig. 3.12 Hot objects that may leave identifiable shapes and patterns. (Johnson 1990. *Pediatrics Clinics of North America*. 37:791–817. Copyright © Elsevier 1990. Used with permission)

(1–2 months old) who are placed in microwaves, which are then turned on. This second type of injury may or may not be lethal and produces a characteristic burn pattern on histologic or pathologic examination, involving burning of the skin and muscle (tissues containing large amounts of water), with relative sparing of the subcutaneous fat layer between them (fat contains much less water) (Surrell et al. 1987; Alexander et al. 1987). Electrical, flame, and chemical burns also may be inflicted upon a child. Although these are less common modes of injury, any child sustaining such injury requires careful evaluation.

Evaluation for Abuse

The history and physical examination are important in determining if abuse or neglect is the cause of the child's burn. The child's developmental ability, plausibility of the explanation, rapidity of seeking treatment, and extent and characteristics of the burn are important aspects of the evaluation of the child.

History

In all possible abuse cases, the history elicited from the caregiver, and from the child if verbal, is vital to the evaluation for maltreatment. The responses of the caregiver(s) to the healthcare provider's questions are noted and considered in the diagnostic process. Table 3.3 lists questions that are asked when a child has been burned.

Physical Examination

The physical examination may offer clues in addition to the presenting burn to suggest the possibility of abuse. Table 3.4 lists the areas assessed in the physical examination. Interestingly, in a 2007 study of six children with inflicted burns, all six (100%) were burned on either the left upper or left lower extremity, or both; this is presumably because a right-handed abuser seized the parallel limb of a child facing him/her (Ojo et al. 2007).

Indicated Laboratory Assessment

The diagnosis of a burn is essentially a clinical diagnosis. No specific laboratory or diagnostic study is indicated to diagnose a burn. Specific laboratory or diagnostic tests may be indicated depending on the severity of the burn or other diagnostic

Table 3.3 Evaluation of history of burned child

A. History of injury
1. How did the burn occur?
(a) How did child come in contact with burning agent? Who noted the burn?
(b) For how long was child in contact with burning agent? Was skin covered or uncovered?
(c) Was the burn "magical"? (Child was discovered burned and no one saw the actual situation)
(d) What was the child's reaction to being burned? (cried, etc.)
2. What is the temperature of tap water in the house? Was the water standing or running?
B. Caregivers' response to injury
1. Was the child taken for medical care immediately? What is the reason given for any delays in seeking treatment?
2. Was the child taken for care by an adult other than the one supervising the child at the time of the burn? Why?
3. Was the burn attributed to the actions of a sibling, playmate, or the child him- or herself?
4. Is explanation of the burn implausible because of the age or developmental ability of the child, the age of the burn, or the pattern of the burn?
5. Do the explanations change over time, or do different caregivers render differing accounts?
6. What is the caregiver's reaction to the situation? (Is there a lack of appropriate concern over the seriousness of the injury?)
C. Medical history and examination
1. Does the child have a medical condition that mimics burning? What is the location and configuration of the burn? How deep is the burn?
2. Are there other signs of abuse?
D. History of prior maltreatment
1. Is there a prior history of maltreatment or frequent visits for injury?
2. Is the family known to social services for previous concerns of maltreatment?

possibilities suggested by the history or physical examination. Children 2 years of age and younger with suspected nonaccidental burns should undergo skeletal surveys to look for occult fractures (Hicks and Stolfi 2007; Christian 2015).

Differential Diagnosis of Burns

The differential diagnosis of a burned child includes accidental injury, inflicted injury, a variety of dermatologic and infectious disorders, and folk-healing practices (Bays 1994; Davis and Carrasco 1992; Ellerstein 1979; Johnson 1990; Kornberg 1992; Richardson 1994; Wissow 1990) (see Table 3.5).

The history, physical examination, and, to a lesser extent, laboratory assessment guide the assessment and workup and are crucial to the inclusion and exclusion of possible diagnoses. Comprehensive reviews of the medical literature exist on conditions reportedly mimicking burning (Bays 1994; Saulsbury and Hayden 1985; van den Bosch et al. 2014). Bacterial infections are common mimickers of burn injuries

Table 3.4 Physical examination for burns

A. Description of each burn
1. Type of burn(s): Superficial, partial (either superficial or deep), full thickness
2. Amount of body surface area (BSA) involved (use Fig. 3.9 for this estimation in the pediatric patient)
B. Burn characteristics and pattern
1. Do burns appear older than disclosed in history?
2. Is the distribution of the burn consistent with the history provided?
(a) Burn incompatible with the events as described (e.g., cigarette burn in normally clothed area, burn on area different from what would be expected to burn, isolated perineal and genital burns)
3. Note signs of restraint
(b) During immersion in hot fluid (stocking and glove demarcation on extremities, sparing of flexure areas)
(c) Implausible splash marks or lack of them
(d) "Hole-in-doughnut" pattern
C. Identification of other signs of inflicted injury
1. Presence of injuries such as bruises, fractures, or other burns of differing ages
2. Evidence of maltreatment such as scars or malnourishment
3. Injuries related to restraint such as multiple bruises mimicking fingers and hands on upper extremities (Ayoub and Pfeiffer 1979) or ligature marks

in children. One of the most common is bullous impetigo, a common bacterial skin infection which may be mistaken for cigarette burns. In contrast to inflicted burns, which are usually deep and uniform in size and depth, impetiginous lesions involve only the superficial skin layers, are frequently of different sizes, are associated with crusting (classically honey-colored), and, if necessary, can be cultured for bacteria. They heal with antibiotics, without scarring. Other causes of burn-mimicking skin lesions include staphylococcal scalded skin syndrome, a toxin-mediated condition resulting in desquamation of the epidermis (Nields et al. 1998); streptococcal toxic shock syndrome with ecthymatous lesions overlying necrotizing fasciitis (Heider et al. 2002); congenital bullous connective tissue diseases such as epidermolysis bullosa (Patel and Butterfield 2015); and eczema (Porzionato and Aprile 2007).

Phytophotodermatitis presents with skin erythema and bulla formation and is caused by exposure to the sun of skin that has contacted psoralens in the juices of particular plants, such as limes, lemons, parsley, celery, carrots, or figs (Coffman et al. 1985; Hill et al. 1997; Mill et al. 2008). The lesions present in patterns such as drip marks (from dripping juice) or handprints (occurring when a child is handled by an adult with the juice on his/her hands). The history should specifically target contact with plants and plant juices, as well as exposure to sunlight.

Senna, a common ingredient in laxatives, may cause an irritant contact dermatitis (consisting of erythema and desquamation) following ingestion of large doses by young children, when diarrheal stool containing the laxative contacts the buttocks

Table 3.5 Differential diagnosis of burns

Condition	Comments
Accidental burns	May be difficult to differentiate from abusive burns
	History and physical examination should support the caregiver's explanation of what took place prior to and at the time of the burn
Dermatologic	
Epidermolysis bullosa (EB)	Group of blistering skin conditions that vary in terms of inheritance pattern, presentation, histopathology, and biochemical markers and may mimic burns
	Characteristic feature is the development of blisters and erosions in response to mechanical trauma
	Congenital presentation for some of the milder forms may be later in onset, and discovery of some may not be until later childhood or even in adulthood
Miscellaneous	Dermatitis, such as seen with a severe diaper rash mimicking the denuded skin seen in scald burns
	Chemical burns from contact of the skin with irritating chemicals, such as analgesic creams
	Drug eruptions may have the appearance of a burn
	Phytophotodermatitis, in addition to the red, bruise-like lesions discussed above, may also give rise to a blistered appearance
Infections	
Impetigo	Superficial bacterial infection of the skin typically caused by *Staphylococcus aureus* or group A beta-hemolytic streptococcus
	Lesions tend to begin as pustules and then form crusts
	Lesions are of different sizes
	Local adenopathy is common, lesions tend to spread locally and are pruritic, and other family members may be affected
	Lesions respond to oral or topical antibiotics and heal without scarring
	Differentiate cigarette burns from streptococcal impetigo; cigarette burns cause scarring (Richardson 1994)
Folk-healing practices	
Coining	The skin may be eroded, causing linear lesions resembling burns
Cupping	The cup may be overheated, causing circular burns to the child's skin
Moxibustion	A variant of acupuncture in which sticks of incense or other materials are burned near or on the skin at specific therapeutic points
	The skin may become reddened, or if the heat is too intense, actual burning may result (Feldman 1983)
	Parental education is necessary in these cases to help engage parents in less injurious healthcare practices

during passage or is contained in contact with the buttocks by a diaper. This burn may be mistaken for an immersion burn but is characteristically diamond-shaped and follows the edges of the diaper; the gluteal cleft and perianal tissue are typically spared, and no burns to the lower extremities occur. Lesions are less severe in toilet-trained children than in those wearing diapers, presumably because diapers extend the time of contact with the irritant (Leventhal et al. 2001; Spiller et al. 2003; Durani et al. 2006; MacDuff et al. 2016).

Cupping and moxibustion are two forms of folk medicine that can cause superficial burns to the skin and be diagnosed as abuse; the difference is that they are intended to be therapeutic to the patient, not to harm him or her. Cupping consists of a heated glass placed on the skin; a vacuum forms as the air inside cools, producing circular burns, possibly accompanied by bruising or petechiae. Moxibustion involves burning of small pieces of the moxa herb (mugwort) on the skin, producing small circular burns (Look and Look 1997; Reinhardt and Ruhs 1985).

Congenital pain insensitivity syndromes may result in severe burns, as well as fractures, lacerations, oral and digital mutilation, and other injuries that may be interpreted as abusive. Anhidrosis and absence of a flare reaction on intradermal histamine testing can differentiate these very rare syndromes from abuse (van den Bosch et al. 2014).

It must be borne in mind that children with disorders that may be confused with burns are not immune to maltreatment (Bays 1994; Johnson and Coury 1988). Careful consideration of the possibility of conditions that mimic abuse serves the child's interests and avoids the misdiagnosis of abuse (see Table 3.5).

Treatment: Overview

The treatment and management of children who have burn injuries is complex. The reader is referred to medical texts that offer comprehensive discussion of such burn-related care (Ellison and Samuels-Kalow 2016; Hendry 2015).

When presented with any child who has a burn, whether or not in the context of maltreatment, the healthcare provider initially determines if the burn injury is (a) minor, (b) major, or (c) critical (Ahlgren 1990). Initial treatment strategy depends on the extent and severity of the burn as well as the stability of the patient. The extent of the burn is based on an accurate assessment of the amount of the child's body surface area (BSA) that has been burned. Figure 3.13 offers one approach to calculating the BSA in children. Superficial burns (first degree) are not included in the BSA calculation. As an approximation, a child's palm including fingers can be used to estimate 1% of the total BSA (Palmieri 2016).

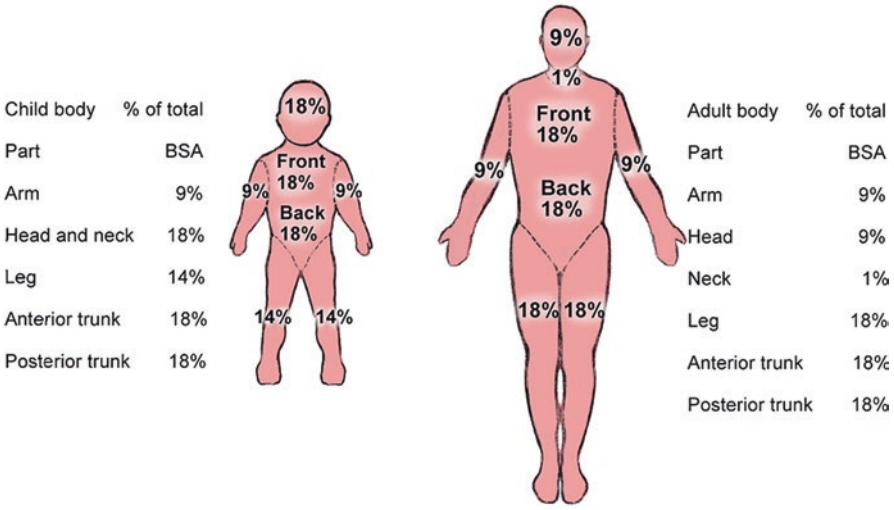

Fig. 3.13 Rule of nines. (Fabia 2016. https://reference.medscape.com/article/934173-overview. Used with permission)

Critical Burn

A critical burn is the most severe and, in general, involves more than 20% of the child's BSA and/or has an associated inhalation injury. The ABCs of cardiopulmonary life support may be required. This is a life-threatening situation, and the skills of a trained burn specialist/trauma surgeon are required. Referral to a regional burn center is recommended.

Major Burn

A major burn involves more than 10% of BSA or is at least 2% full thickness. Children with major burns require hospitalization after initial treatment. Initial management includes (a) attention to ABCs, (b) fluid management, (c) analgesia, (d) wound debridement and dressing, and (e) tetanus prophylaxis. Antibiotics are used to treat infection; prophylactic antibiotics are generally discouraged.

Hospitalization may be indicated in children with less than major burns if they are under 2 years of age and/or have burns involving the face, hands, perineum, or feet (Meagher 1990). Of particular concern are circumferential burns of the extremities and chest, which may require emergency escharotomies.

Minor Burns

Finally, minor burns are those that involve less than 10% of the BSA and are less than 2% full thickness. After evaluation and initial management, minor burns may be treated in the outpatient setting with exceptions for the following situations: (a) children under 2 years; (b) burns on the face, hands, feet, and/or perineum; and (c) if abuse is the cause. Initial management includes (a) cooling the burn with water or ice; (b) careful cleansing of the wound with sterile saline, debriding large, hemorrhagic, or ruptured blisters and devitalized tissue, but leaving smaller blisters intact; (c) wound dressing with silver sulfadiazine (avoid on the face as it can produce tissue hypopigmentation) or bacitracin; (d) tetanus prophylaxis; (e) pain control; (f) no routine systemic antibiotics; and (g) close follow-up with scheduled revisit in 24–48 h. At the revisit, dressing supplies may be prescribed if the burn appears to be healing and no signs of infection are present. Periodic reassessment by the clinician is suggested to adequately monitor compliance.

In Brief

- Examination of the child's skin is among the most important components of the suspected physical abuse and neglect evaluation.
- The history, physical examination, and laboratory assessment guide the assessment and workup of bruises and burns.
- The most common soft tissue injuries associated with physical abuse and neglect are bruises and burns.
- The differential diagnosis of a bruised child includes accidental trauma; inflicted trauma (physical abuse); a variety of dermatologic, hematologic, vasculitic, and infectious conditions; and congenital defects in collagen synthesis.
- Injuries to relatively protected areas such as the genitals, buttocks, proximal extremities (thighs, upper arms), neck, and back are suspicious of abuse.
- A bruise may take on the shape of the object used to injure and then heal with a scar that preserves the shape of the object.
- The history of a child who presents with bruising is an important part of the clinician's attempt to differentiate accidental from nonaccidental trauma.
- Attention to the pattern of injury helps the healthcare professional differentiate bruises caused by abuse from those that occurred accidentally.
- The differential diagnosis of a burned child includes accidental or inflicted injury, dermatologic and infectious conditions, and folk-healing practices.
- Scalds are the most common mechanism of burn injury found in children hospitalized for maltreatment.
- Approximately 4–10% of children hospitalized for burns are believed to have sustained abusive injury.

Appendix

Series 1 Bruising of the buttocks and upper high (Photos 3.9a, b, c and 3.9d).

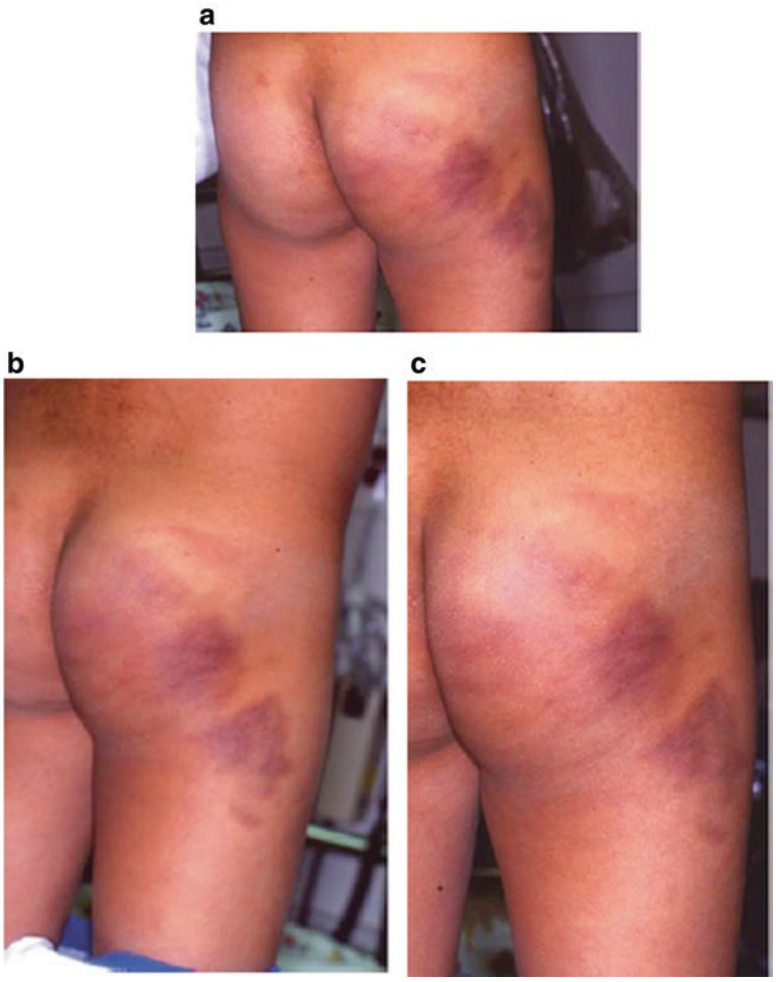

Photo 3.9 a, b, and c Photos taken at different distances showing bruises on the left thigh and buttock

Photo 3.9d Photo of bruises on the thigh taken from a different angle

Series 2 Child with bruising of ears (Photos 3.10a, 3.10b, and 3.10c).

Photo 3.10a Photo of patient's right ear from a distance

Photo 3.10b Photo of the right ear exposed from behind

Photo 3.10c Photo of the left ear exposed from behind

Series 3 Lacerations/abrasions to the abdomen (Photos 3.11a, 3.11b, 3.11c, and 3.11d).

Photo 3.11a Photo taken at a distance showing the lacerations/abrasions on the patient's abdomen

Photo 3.11b Photo of patient in 3.11a at a closer distance

Photo 3.11c Photo of 3.11a taken at a different angle to capture a side view of the laceration/abrasion

Photo 3.11d Photo of patient 3.11a with injury to the right upper thigh

Series 4 Burns of the right hand with denuded skin and lower torso. Please take note of the various angles of the photos (Photos 3.12a, 3.12b, 3.12c, 3.12d, 3.12e and 3.12f).

Photo 3.12a Photo taken from the side angle of the right hand with denuded skin

Photo 3.12b Photo of the dorsum of the burned right hand

Photo 3.12c Photo of the burned right palm with denuded skin

Photo 3.12d Photo of patient in 3.12c at closer view

Photo 3.12e Photo taken from the side angle of burned right hand

Photo 3.12f Photo of patient in 3.12e showing burned right thigh

Series 5 Child with burns on the surfaces of both feet and the left hand (Photos 3.13a, 3.13b, 3.13c, 3.13d, 3.13e, 3.13f, 3.13g, and 3.13h).

Photo 3.13a Photo of burns on the dorsum of the burned left foot

Photo 3.13b Photo of the left foot with burns on the plantar surface

Photo 3.13c Photo taken at a different angle of the burns on the left foot

Photo 3.13d Photo taken at a different angle of the left foot showing the burns on plantar surface

Photo 3.13e Photo of burns on dorsal surface of the right foot

Photo 3.13f Photo taken at a different angle of the burns on dorsal surface of the right foot

Photo 3.13g Photo of the burns on plantar surface of the right foot

Photo 3.13h Photo of the same patient in Photo 3.13a with a burned left hand

Series 6 Circumscribed burns which may be confused with infections such as impetigo (Photos 3.14a, and 3.14b).

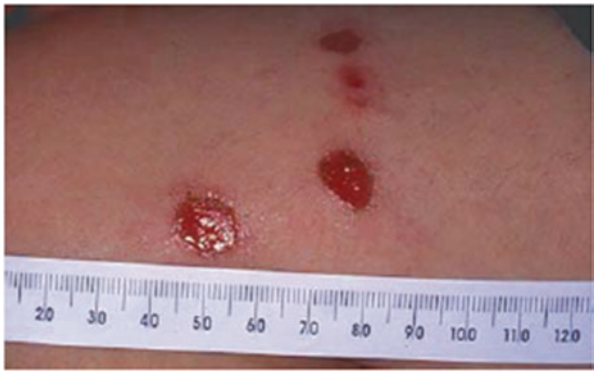

Photo 3.14a Circumscribed burns which may be confused with infections such as impetigo

Photo 3.14b Photo from a distance of circumscribed burns

Series 7 Child with burns to the body including the face, shoulders, and chest (Photos 3.15a, 3.15b, 3.15c, 3.15d, 3.15e, 3.15f, 3.15g, 3.15h, 3.15i, 3.15j, and 3.15k).

Photo 3.15a Photo of burns on the left shoulder

Photo 3.15b Photo taken from a closer distance of burns on the left shoulder

Photo 3.15c Photo of burns on child's right upper back

Photo 3.15d Photo of burns on child's right upper back taken at a closer distance

Photo 3.15e Photo taken at a different angle and distance of burns on child's right upper back

Photo 3.15f Photo of burns on child's left upper back and neck

Photo 3.15g Photo of patient with burns to the body including the face, shoulders, chest, and right hip area

Photo 3.15h Photo of the burn on the right hip taken at a closer angle

Photo 3.15i Photo taken from a different view of burn of the right hip

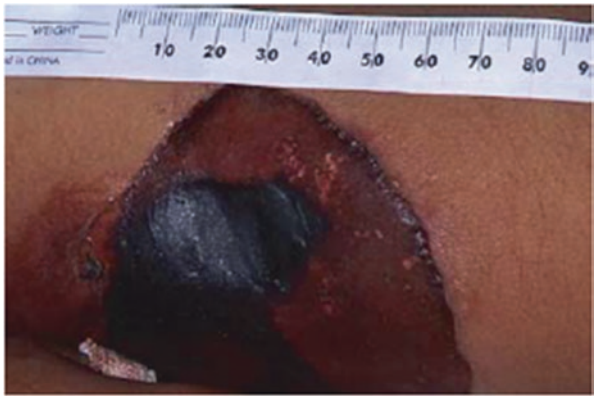

Photo 3.15j Photo taken at a closer distance of injury in Photo 3.15i

Photo 3.15k Photo of burns of the lower abdomen

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Chapter 4
Fractures and Skeletal Injuries

Angela Bachim and Nancy S. Harper

General Principles

The identification of a skeletal injury may be the first indication of abuse. Estimates of the frequency of fractures in abused children vary from approximately 10–50%, depending on the population studied, the type of diagnostic imaging used to detect fractures, and the age of the patients seen (Ebbin et al. 1969; Herndon 1983; Leventhal et al. 1993). Recently, large population-based studies have been used to estimate the incidence of inflicted skeletal trauma. While the majority of fractures are still attributed to falls, child abuse accounts for 12% of fractures in children less than 36 months of age (Leventhal et al. 2008). Infants and young children sustain significantly more abusive skeletal injuries than do older children, with the majority of inflicted fractures occurring in children under 12 months of age (Leventhal et al. 2008, 2010; Loder and Feinberg 2007; Sibert et al. 2002). Fractures of the ribs, arm, and leg account for over half of the inflicted skeletal injuries in young children (Leventhal et al. 2008; Starling et al. 2007). These injuries are often occult and detected only with detailed skeletal imaging.

Determining whether a fracture is abusive versus accidental is not an easy task. One study found that over 20% of children under 3 years of age who presented with an abusive fracture had been seen by another medical provider for the same injury

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in which the diagnosis of abuse was missed (Ravichandiran et al. 2010). If abuse is not on the differential diagnosis when evaluating a fracture in an infant or child, it cannot be diagnosed. The presence of a fracture does not prove abuse. A comprehensive medical evaluation that includes clinical examination, past medical history including development, and a history of the injury with the application of biomechanics (force, stress, bone tolerance, etc.) will help to differentiate accidental from non-accidental injuries. A detailed review of biomechanics is not included in this chapter (Pierce et al. 2004).

Bone Anatomy and Fracture Description

The anatomic and physiologic characteristics of the immature skeleton affect the frequency, type, location, and healing of pediatric fractures. Bones such as the femur are comprised of two types of bone: compact (cortical) bone and trabecular (spongy, cancellous) bone. Cortical bone has multiple concentric rings of lamellae housing the haversian canals. Mineralization and thickness of the cortical bone contribute to its strength and stiffness. Developing and cancellous bone is more porous than cortical bone, affecting both the stiffness and flexibility of the bone, as well as the extent and type of fractures seen in children. Less dense, porous bone may help stop the propagation of a fracture line, but this quality also makes the bone more vulnerable to compression. This is well-demonstrated in the metaphyseal region where the thinner porous cortex surrounding the trabecular bone makes compression injury and buckle fracture more likely. This region where the metaphysis transitions to cortical bone has been referred to as the internal "stress riser" (Pierce et al. 2004) (Photos 4.1 and 4.2). The strength of the bone is related to its mineralization. The bones of children are less mineralized, less stiff than adult bone, but are more elastic.

The periosteum is the fibrous membrane that covers the surface of a bone. It is quite vascular, supplying nutrients to the bone. It is loosely adherent to the diaphysis and tightly adherent to the metaphysis and epiphyseal region contributing to the formation of the bone collar (Pierce et al. 2004). The periosteum of the child is more osteogenic or bone forming. The diaphyses of a child are formed through intramembranous bone formation. The periosteum retains this ability and can form bone without a cartilage scaffold (Shopfner 1966). Bone healing is much more rapid in children than in adults and more rapid in infants than in older children. For example, the healing of a midshaft femur fracture may take only 3 weeks in an infant but 20 weeks in a teenager (Ogden 1990). This difference is mostly due to the contribution of the periosteum in the healing of young bones.

The morphological features of the fracture include the bone involved, the location of the fracture within the bone, the type of fracture sustained, and the relationship of the fracture segments (Pierce et al. 2004). The mechanism of the injury as reported by the caretaker is also noted in the fracture assessment. Table 4.1 describes

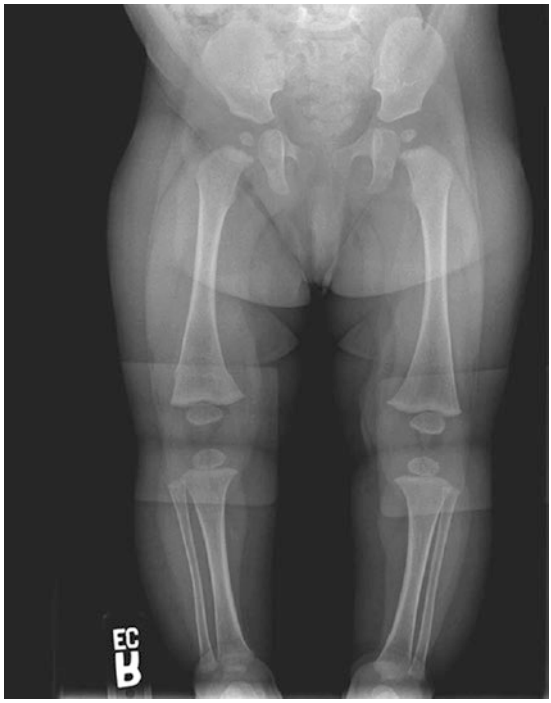

Photo 4.1 A 9-month-old female fell from the arms of her caregiver striking knee on floor. Radiographs notable for a buckle fracture of the distal right femur on anteroposterior views of the lower extremities

the anatomy of the bone, and Table 4.2 describes different types of fractures (see Figs. 4.1 and 4.2).

The history of the injury is important in identifying abusive fractures because historical information should be compatible with the morphological features of the fracture and the mechanics required to cause the fracture (Photos 4.3, 4.4, 4.5, and 4.6). Torsional loading, as seen with twisting or rotation of the extremity, often results in spiral fractures (O'Connor-Read et al. 2007; Pierce et al. 2004) (Photo 4.7). A bending load (both tensile and compressive forces occur) applied to the extremity can result in a transverse fracture, perpendicular to the bone (Photo 4.3). Direct trauma also produces transverse fractures with the degree of fragmentation or comminution (Photos 4.8 and 4.9) associated with the force of the impact. Oblique fractures are likely the result of combination loading (torsional, tensile, and compressive) (Photo 4.10). The buckle fracture, as noted previously, is the result of a failure under compressive forces and typically occurs from axial loading. Immature bone fails in compression first, with the fracture line at the weakest point of the bone. Distal femur buckle fractures occur as the result of the compression of hard, cortical bone into the softer, trabecular bone of the metaphysis (Pierce et al. 2004) (Photos 4.1 and 4.2). The field of biomechanics has advanced the understanding of the association between loading forces, history, and corresponding injuries. Pierce et al. (2005) found that the linear momentum associated with transverse fractures

Photo 4.2 The lateral view of the buckle fracture demonstrates the posterior cortical disruption. This fracture is the result of axial loading of the femur as the knee struck the floor

Table 4.1 Anatomy of the long bone

Bone	Characteristics
Condyle	The rounded articular (joint) surface at the end of a bone
Diaphysis	The shaft of a long bone
Epiphysis	The part of the long bone developed from a center of ossification Separate from the shaft and separated from it by a layer of cartilage (the epiphyseal plate) In infants and young children, not often visualized by radiograph because it is not ossified
Metaphysis	Growth zone between epiphysis and diaphysis, radiographically identified by the flaring portion of the long bone
Periosteum	Thick, fibrous membrane covering surface of a bone and consisting of two layers: inner osteogenic (bone forming) and outer connective tissue layer containing blood vessels and nerves that supply the bone

was almost 10 times greater than that seen with spiral or buckle fractures (Photos 4.1, 4.3, and 4.10).

Fractures resulting from abuse are varied in their presentation. Clinically, the preverbal child may present with signs and symptoms indicative of pain such as irritability, crying with movement of the affected area, and decreased use of a bro-

Table 4.2 Types of fracture

Type of fracture	Characteristics
Comminuted	Bone broken into multiple pieces
Compound	Open fracture (i.e., through the skin)
Depressed	Skull fractures in which a part of the skull is inwardly displaced (toward the brain)
Diastatic	Fracture with significant separation of bone fragments; often used in relation to skull fractures
Distal	Fracture located away from center of body (near the feet or hands when describing fractures of the extremities)
Greenstick	An incomplete fracture—the compressed side of the bone is bowed, but not completely fractured. Young bones are more malleable, porous, and less brittle than an adult's and may bend and only partially break when injured
Hairline	Fracture without separation of the fragments (similar to a thin crack of a vase)
Impacted	A compression fracture
Linear	Resembling a line; often used to describe skull fractures
Oblique	Fracture line angled across long axis of bone (from approximately 30–45 degrees)
Occult	Condition in which there is clinical, but not radiographic, evidence of a fracture. Radiographs repeated in a few weeks show evidence of fracture healing
	May also indicate a fracture seen radiographically but without clinical manifestations (e.g., rib fractures and metaphyseal fractures)
Pathologic	Fracture that occurs in area of bone weakened by an underlying disease
Proximal	Fractures located toward trunk of body (for fractures of the extremities, near the hips or shoulders)
Spiral	Fracture line oblique and encircles a portion of the bone (resembles twist of a candy cane)
Stellate	Fracture lines of break radiate from central point; seen in some skull fractures
Supracondylar	Fracture to area above condyle, typically of the humerus
Torus	Impacted injury specific to children; bone buckles, rather than fracturing completely, and usually involves the metaphysis of the bone
Transverse	Fracture line perpendicular to the long axis of the bone

ken limb. While many children demonstrate immediate signs of injury as described, some children may not cry or will stop crying quickly with more than 10% continuing to use the fractured limb normally (Farrell et al. 2012). The majority of children with accidental injury do not have associated bruising (Worlock et al. 1986). Bruising has been documented in association with fracture in only 8–9% of children, including children with inflicted fractures (Mathew et al. 1998; Peters et al. 2008). Single skeletal injuries are most common. However, the identification of multiple fractures and/or fractures in different stages of healing should raise the suspicion of child abuse.

The identification by a healthcare professional of an inflicted fracture is dependent on multiple factors. They include the ability to obtain a complete and detailed

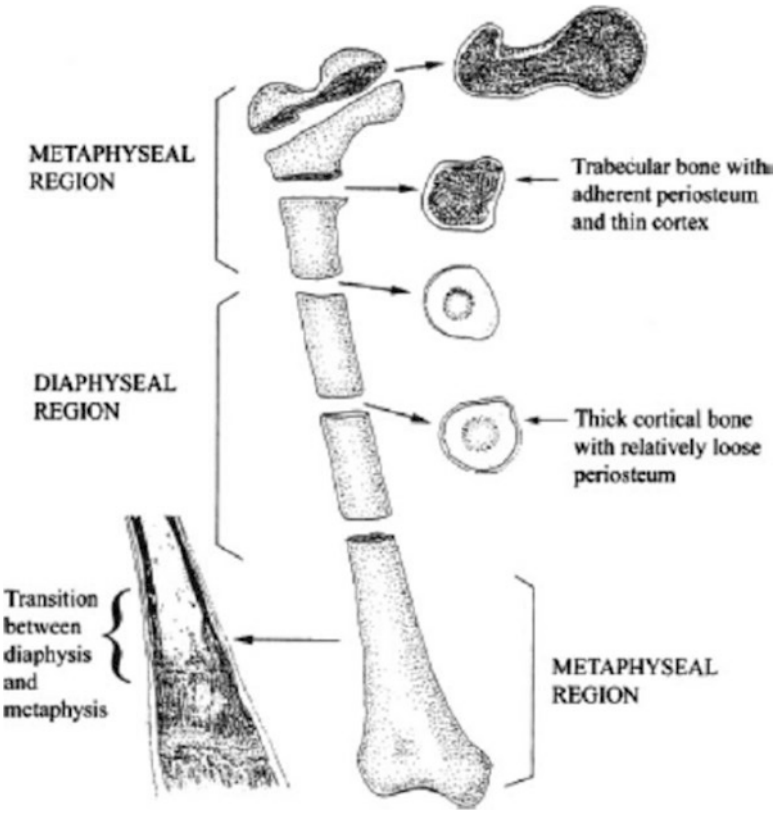

Fig. 4.1 Illustration of bone architecture. (Pierce et al. 2004. Used with permission)

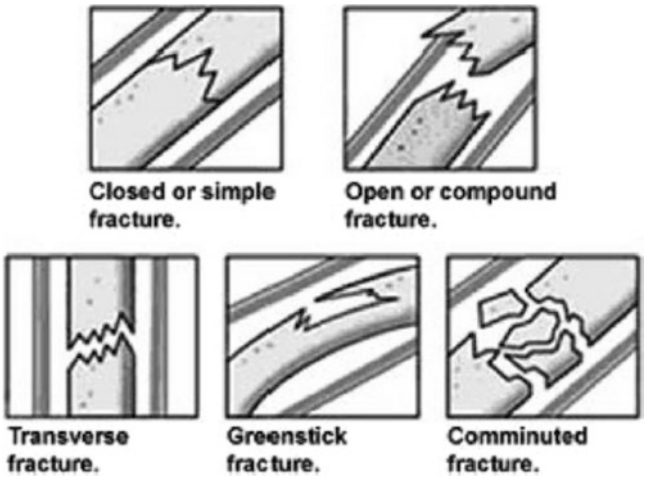

Fig. 4.2 Illustration of fracture types. (Reproduced with permission from Moseley 2009)

Photo 4.3 A 6-week-old male presents with leg swelling. Father reports falling on baby. Skeletal survey notable for right proximal transverse femur fracture with classic metaphyseal lesions of proximal and distal tibia

Photo 4.4 Additional angled lateral view of 6-week-old male's leg shows a "bucket-handle" classic metaphyseal lesion of the proximal right tibia

Photo 4.5 Bruising noted on the right leg of the 6-week-old male appears consistent with grip marks

Photo 4.6 Left leg of 6-week-old-male is notable for multiple fractures including a proximal femur and proximal tibia classic metaphyseal lesions. Extensive traumatic periosteal reaction is seen along the lateral femur extending into the metaphysis. The distal femur has a classic metaphyseal lesion versus physeal fracture

Photo 4.7 A 16-month-old female who presented to the ER with arm swelling and pain with a reported fall. Child had multiple bruises, traumatic alopecia, and failure to thrive. Skeletal survey notable for a left humerus spiral fracture as well as a skull fracture

Photo 4.8 This 4-year-old male fell from window landing on his feet. The lateral view of the tibia and fibula demonstrate comminuted fractures

Photo 4.9 This 18-month-old also has a comminuted fracture of his distal right tibia and fibula and buckling of the fibula in the middle of the diaphysis without a known history of trauma. Both Photos 4.12 and 4.13 show the results of axial loads to the tibia and fibula

Photo 4.10 4 month-old-male found crying in crib lying on chest. Skeletal survey notable for oblique fracture of left humerus

Photo 4.11 This 9-month-old female presented with swelling of her left lower extremity and multiple bruises after being left in the care of the mother's boyfriend. The mother's boyfriend reported tripping on the baby. Multiple extremity fractures were found including the transverse fracture of the left tibia and comminuted fractures of the right tibia and fibula

Photo 4.12 The 9-month-old also had a healing transverse fracture of the distal right radius

history of the trauma causing the fracture, knowledge regarding fracture mechanisms in childhood, an understanding of pediatric development, and a complete and thorough evaluation of children who may have skeletal injuries that are the result of abuse. Male gender, fracture in an extremity (versus axially), and presentation to a primary care or general emergency department (versus pediatric emergency department) are all factors associated with missed diagnosis of abusive fractures (Ravichandiran et al. 2010). There are certain pediatric fractures that, in isolation, are so highly suspicious for child abuse that they raise concern of abuse in the absence of clinical history. These include metaphyseal and rib fractures in infants. Although diaphyseal fractures are the most common fractures that result from abuse, they are not specific for abusive injuries (Photos 4.3, 4.7, 4.10, 4.11, and 4.12).

Imaging Techniques

Skeletal Survey

The diagnosis of skeletal injuries is made by history and physical examination and confirmed by radiographic imaging. Some skeletal injuries may not be apparent by clinical examination. A radiographic skeletal survey is part of the workup in infants and young children suspected of abuse (Photos 4.11 and 4.12). Across all ages, the rate of finding fractures on the skeletal survey is over 10% (Duffy et al. 2011; Lindberg et al. 2014), with the rate around 20% in infants (Barber et al. 2015; Lindberg et al. 2014).

A skeletal survey is a series of radiographs taken of the child's skeleton to look for indications of new or old injury. The skeletal survey is mandatory in cases of suspected physical abuse for all infants and children under 2 years of age (ACR Appropriateness Criteria: Suspected Physical Abuse-Child 2017; Christian and Committee on Child Abuse and Neglect 2015). It is not generally used in patients over 5 years of age. Clinical judgment is used to determine whether a screening survey is indicated for children between the ages of 2 and 5. In this age group, there are a few things to consider when deciding whether to obtain a skeletal survey. If a child is developmentally delayed, either not verbal enough to say if something hurts or not mobile enough to ambulate and move around normally, he or she may benefit from a skeletal survey. If there are distracting painful injuries such as burns, the child would benefit from a skeletal survey. In one study that looked at the frequency fractures were found on skeletal survey in children presenting with burns, nearly one-third of those with inflicted burns also had fractures identified on skeletal survey (Fagen et al. 2015). If the child's level of consciousness or ability to respond to pain on exam is altered due to ingestion or head trauma, a skeletal survey would be useful. In children 2–3 years old, the rate of additional fracture detection in those that receive a skeletal survey is over 10%, similar to children 1–2 years old; therefore, clinicians are encouraged to have a low threshold to obtain a skeletal survey in this age group (Lindberg et al. 2014).

The radiographs must include restricted views of the areas imaged in order to obtain proper quality and resolution of the bones (American College of Radiology 2016). A "babygram" (i.e., a single full body image) is not acceptable. Bilateral oblique views of the ribs (Photos 4.13 and 4.14) were added to the recommended skeletal survey protocol in 2011 by the American College of Radiology, which increases rib fracture detection (ACR Appropriateness Criteria: Suspected Physical Abuse-Child 2017; Maguire et al. 2013; Marine et al. 2014). The following films are included as part of the skeletal survey (ACR Appropriateness Criteria: Suspected Physical Abuse-Child 2017):

1. Anteroposterior view of the arms, forearms, hands, femurs, lower legs, and feet on separate exposures. Some institutions add lateral views to improve the sensitivity for classic metaphyseal fractures. Lateral views can always be obtained if there is a need to further clarify a finding.

Photo 4.13 This 2-month-old female presented with chest wall crepitus and was found to have multiple acute rib fractures. The anterior-posterior chest is notable for a displaced rib fracture posteriorly on the left seventh rib

Photo 4.14 The oblique view for the infant more clearly demonstrates acute displaced fractures of left posterior 5th–8th ribs

2. Lateral and anterior views of the axial skeleton to evaluate for vertebral, sternal, and pelvic fractures
3. Bilateral oblique views of the ribs to add sensitivity to detecting rib fractures
4. Anteroposterior and lateral views of the skull to evaluate for skull fractures

The American Academy of Pediatrics recommends obtaining screening skeletal surveys in siblings less than 2 years of age in cases of suspected abuse (Christian and CoCAN 2015). Siblings and children who share the same care environment in which the abuse occurred are also at risk for having been abused. These children may also have occult skeletal injuries. In one study, nearly 12% of the siblings/household contacts less than 2 years old had occult fractures (without physical exam findings) detected on the screening skeletal survey (Lindberg et al. 2012).

Even when the skeletal survey is performed correctly, it may fail to reveal acute rib fractures and classic metaphyseal lesions. It is recommended that the initial skeletal survey be repeated in approximately 2 weeks to diagnose those fractures that were acute at the time of the first skeletal survey once healing changes have made them easier to detect (ACR Appropriateness Criteria: Suspected Physical Abuse-Child 2017; Christian and CoCAN 2015). The repeat skeletal survey is also useful in clarifying questionable findings on the initial skeletal survey (Harper et al., 2013) and in dating information (Christian and CoCAN 2015). In children with a negative initial skeletal survey, one study found that over 8% had forensically significant findings on the repeat skeletal survey (Bennett et al. 2011). To limit radiation exposure with the repeat skeletal survey, the pelvis, spine, and skull radiographs can be omitted unless further clarification of an injury is needed (ACR Appropriateness Criteria: Suspected Physical Abuse-Child 2017; Hansen et al. 2014; Sonik et al. 2010).

Radionuclide Bone Scan

The radionuclide bone scan is a sensitive test for detecting rib fractures, subtle diaphyseal fractures, and early periosteal elevation. It is sometimes used as an adjunct to plain films. Most fractures can be identified by bone scan within the first 48 h after an injury. Bone scan is not sensitive for the detection of skull fractures or classic metaphyseal fractures and does not allow for the dating of injuries; therefore, it is not used as a substitute for the skeletal survey (Drubach et al. 2010). It is most often used in cases of suspected abuse of infants and young children in which the skeletal survey is negative and a more sensitive (but less specific) test is needed (see Chap. 2). A radionuclide bone scan may be useful when there are questionable findings on a skeletal survey, excluding skull or classic metaphyseal fractures, in the context of time-sensitive decision-making, such as whether protective placement is needed (Bainbridge et al. 2015).

Computed Tomography

Computed tomography (CT) has been traditionally utilized in imaging the head, chest, abdomen, and pelvis for traumatic injuries. With the arrival of multidetector CT scanning (with 16, 32, and 64 slice technology), coronal and sagittal as well as 3D reconstructions can be performed in addition to standard axial imaging. CT reconstruction technology has been useful in the delineation and identification of metaphyseal fractures, rib fractures (Kleinman and Schlesinger 1997; Wootton-Gorges et al. 2008), complex skull fractures, and skull variants in cases of head injury (Culotta et al. 2017; Parisi et al. 2015) (Photos 4.15, 4.16, 4.17, and 4.18). If 3D reconstructions of the skull are being used, plain films of the skull can be omitted from the skeletal survey (Culotta et al. 2017).

Magnetic Resonance Imaging

Magnetic resonance imaging (MRI) is not the best imaging modality to visualize ossified bones. However, there are portions of young children's bones that are not yet ossified. MRI can be helpful for injuries of these unossified portions of bone, such as the epiphysis and/or growth plate (Supakul et al. 2015).

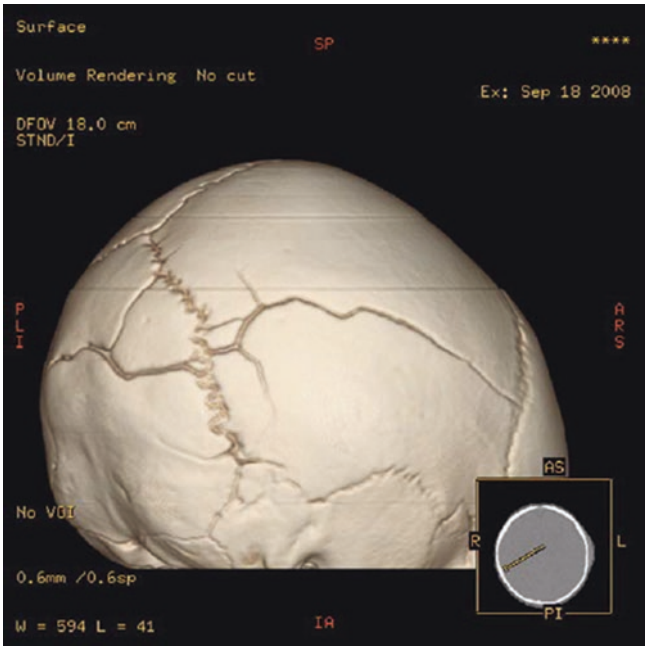

Photo 4.15 A 10-month-old male has a scalp swelling noted at bath time. Only history of trauma is a single fall from a bed. The skeletal imaging and 3D reconstruction of the CT scan is notable for multiple fractures. Photo 4.17 demonstrates a right parietal-occipital complex skull fracture

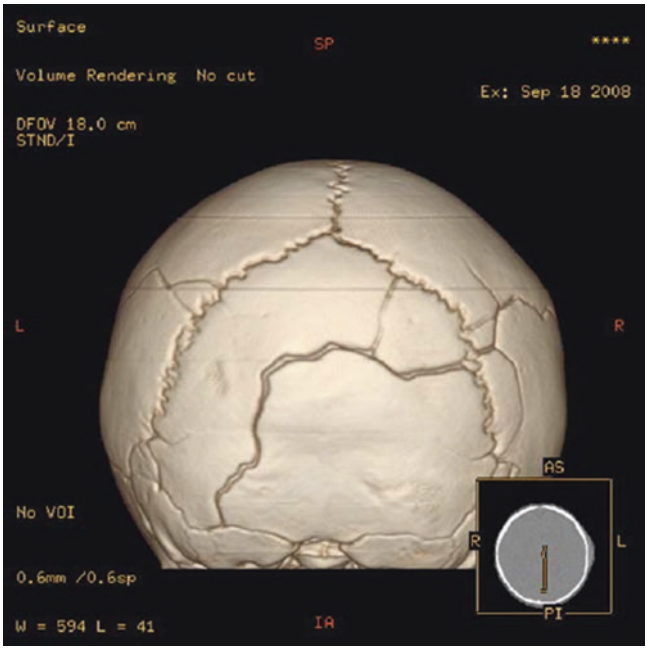

Photo 4.16 Same child with skull fracture crossing into the occipital bone

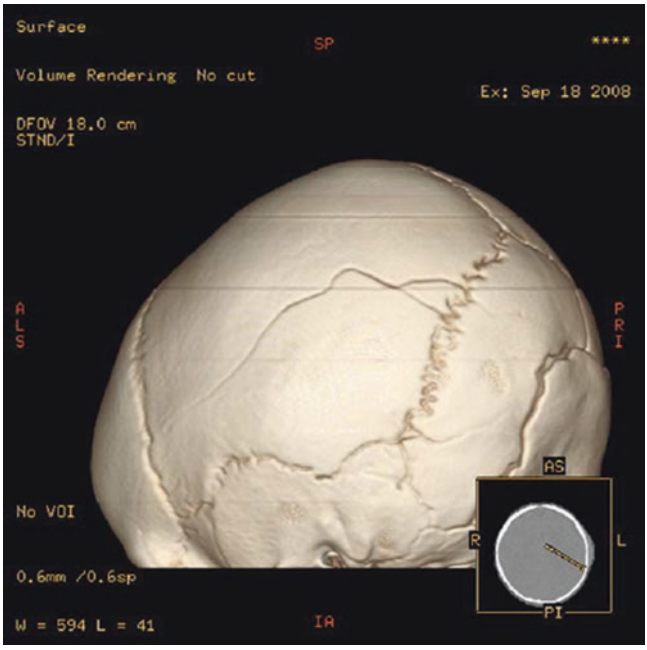

Photo 4.17 Same child with left linear parietal skull fracture as well. Extensive history of violence in the home

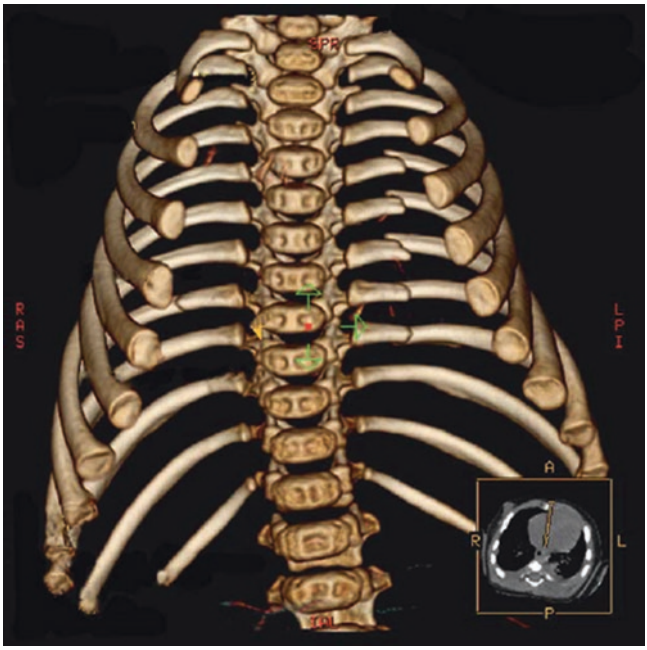

Photo 4.18 The 3D CT reconstruction of the infant shows acute fractures of left posterior 5th–9th ribs as well as the right 8th posterior. Additional fractures were identified on repeat skeletal imaging at 2 weeks. The child's father reported squeezing the child around the rib cage until the child stopped crying on three occasions

Stages of Fracture Healing

The radiographic appearance of bone healing has been divided into stages. These stages are not discrete and exist on more of a continuum, as they vary between individuals depending on age, disease, repeated trauma, immobilization, and surgical fixation. A number of fractures, such as metaphyseal and skull fractures, do not follow these stages and are difficult to date. A retrospective study found that incomplete long bone fractures in infants under 12 months were difficult to date outside of the appearance of periosteal reaction; however, complete long bone fractures had a predictable healing pattern (Warner et al. 2017). The presence of soft tissue swelling on the scalp may help differentiate recent from older fractures. However, the absence of soft tissue swelling does not preclude a recent injury (Ibrahim et al. 2012).

Stage 1: Induction

The radiologic appearance of fractured long bones corresponds to the anatomic and histologic changes that occur with bone healing. Radiographically, soft tissue swelling around the injured bone represents the initial change and may be the only

Photo 4.19 At 3 weeks the 3-month-old has three clearly healing rib fractures with callus and fracture line definition

indication of the fracture. An injury to a bone and the soft tissues around the bone results in immediate hemorrhage and subsequent inflammation. This is clinically represented by swelling and tenderness. The majority of broken bones are not accompanied by associated external bruising or injury (Mathew et al. 1998; Peters et al. 2008; Worlock et al. 1986). The presence of soft tissue swelling is consistent with a fracture less than a week old (Prosser et al. 2012). Soft tissue injuries that do not involve the bone or cartilage are generally limited and resolve within a few days; therefore, if there is swelling that is more extensive or longer in duration than expected, it may suggest an occult skeletal injury (Kleinman 2015). An initial widening of the gap and softening of the fracture margins occurs as the osteoclasts respond to the necrotic ends of the bone with bone resorption (Photo 4.19). This becomes apparent radiographically around 2–3 weeks after injury (Chapman 1992; Islam et al. 2000).

Stage 2: Callus Formation

Callus formation begins with the laying down of periosteal new bone. Hemorrhage and inflammation occurring at the site of injury are osteo-inductive as the periosteum is rich in precursor cells and osteoblasts. Periosteal new bone is not specific for fractures and is laid down in response to a number of different injuries, including infection, inflammation, and nutritional and metabolic conditions (Kleinman 2015).

Periosteal new bone formation occurs approximately 1–4 weeks after an injury and may be earlier in young infants (Islam et al. 2000; Prosser et al. 2005). It starts as single-layered and becomes multi-layered (Walters et al. 2014). The absence of periosteal new bone correlates with a fracture less than a week old (Warner et al. 2017). The presence of periosteal new bone formation without callus formation is consistent with a fracture 5 days to 2 weeks old (Prosser et al. 2012). The initial callus consists of new blood vessels, fibrous tissue, cartilage, and new bone. Calcium deposition begins within a few days of healing, but does not peak for several weeks. The radiographic appearance of callus formation is the result of both the laying of periosteal new bone and the calcification of new cartilage (Kleinman 2015). The presence of periosteal bone formation and soft callus is consistent with a fracture that is 2–3 weeks old (Prosser et al. 2012). In studies of the healing patterns of clavicular fractures caused by birth—which are not immobilized for treatment, making them more similar to abusive fractures not discovered until they are already healing—callus formation is highly unlikely before 9 days and is usually present by 15 days (Fadell et al. 2017; Walters et al. 2014) (Photos 4.20 and 4.21). This is consistent with another retrospective study on long bone fracture healing patterns (Warner et al. 2017).

There is considerable variability in the timing, appearance, and quantity of new bone and callus formation as a result of repetitive injury and/or the degree of immobilization of the injured bone (Kleinman 2015). Femoral fractures in patients with head injuries have an average healing time that is shorter than that of control subjects (Perkins and Skirving 1987). The studies on the dating process of periosteal new bone and callus formation largely involve subjects with immobilized fractures. There is limited published data on the healing process of young infants and children with fractures. In addition, many non-accidental fractures are occult with late presentations for care and continued repetitive injury (Kleinman 2015; Prosser et al. 2005). Callus thickness decreases as the age of the fracture increases as it changes from soft to hard (Walters et al. 2014).

Photo 4.20 Abundant callus formation is seen of the 4-month-old's humerus on imaging performed 3 weeks after injury

Photo 4.21 Left humerus spiral fracture at 20 days with callus formation

The stage of soft callus ends with the bridging of bony fragments. The hard callus stage is characterized by lamellar bone formation with bridging of the fracture line. Hard callus or bridging of the fracture line is consistent with a fracture greater than 2–3 weeks old (Prosser et al. 2012; Warner et al. 2017). However, the timeline of the fracture line appearance may be affected by additional trauma to the fracture site, especially when the fracture is not immobilized (Kleinman 2015). Radiographically, the fracture line resolves, and periosteal new bone becomes incorporated into the adjacent cortex.

Stage 3: Remodeling

During remodeling (Photo 4.22), the original configuration of the bone is restored as the callus is smoothed circumferentially. Long bone fractures in infants can be remodeled by 3 months, but remodeling in fractures in children outside of infancy is highly variable (Kleinman 2015). Some pediatric fractures are unrecognizable by radiograph within months after they occur. The ability to detect an old fracture depends on multiple factors, including the bone injured, the type and extent of the injury, and the care (or lack of care) the child received (Photo 4.12).

Photo 4.22 Left humerus spiral fracture at 4 months with remodeling

Dating of Skeletal Injuries

The dating of fractures estimates the age of injury and can identify multiple episodes of trauma. It is based on the constellation of radiologic findings including the presence or absence of soft tissue swelling as well as the appearance of periosteum, widening of fracture margins, callus formation, periosteal new bone incorporation, and remodeling. There is little published evidence on the dating of fractures in children, especially in the context of potential repetitive injury from lack of immobilization. Recent fractures can be clearly delineated from older fractures. Estimates of the age of older fractures can often be made in weeks rather than days. From the literature that has been published on pediatric fracture healing patterns, there are general rules of thumb for healing (average): subperiosteal new bone formation 10–14 days, fracture line indistinct 14–21 days, soft callus 14–21 days, hard callus 21–42 days, and remodeling (up to 1 year) (Kleinman 2015; Prosser et al. 2012; Walters et al. 2014).

Other factors that affect the healing process need to be considered when dating fractures, including the severity of injury, degree of fracture displacement, degree of immobilization of the injured body part, metabolic bone diseases that influence the healing process, and repetitive trauma. Repetitive trauma to the fracture site cannot be ruled out in fractures that have not had medical care. Certain fracture sites, such as skull fractures or classic metaphyseal lesions, are difficult to date due to their

healing patterns. The follow-up skeletal survey performed approximately 2 weeks after the initial survey is quite useful as it assists in dating and in the identification of occult injury, skeletal dysplasias, and metabolic disease.

Long Bone Fractures

Fractures of the bones of the arms and legs are common childhood injuries (Rivara et al. 1986). Accidental trauma accounts for the majority of long bone fractures and abuse accounts for only a minority. The likelihood that a long bone fracture is due to abuse is greatest in infants. The type of fracture sustained depends on the mechanical forces applied to the bone during the trauma (Table 4.3).

Due to the decreased amount of mineral content in a child's bones (as compared to an adult's bones), there is greater elasticity. The child's bone will tolerate more stress before a fracture occurs (Pierce et al. 2005). Correlating the history with the fracture type is often useful in identifying cases of non-accidental injury. However, it is important to realize that accidental fractures may be unwitnessed in ambulatory children, and therefore the exact mechanism of trauma may not be recounted. Each case requires careful evaluation that includes developmental ability to determine if an injury is suspicious for abuse. For example, meta-analyses of current literature have found that femur and humerus fractures in children under 18 months are significantly more likely to be abusive than in children 12–48 months (Maguire et al. 2013). Careful evaluation is needed to uncover indicators of abuse for each case (Photos 4.3 and 4.11).

Diaphyseal Fractures

Diaphyseal fractures are injuries to the midshaft of the long bones. They are generally described by the bone injured (femur, humerus, ulna, radius, tibia, fibula), the location of the fracture within the bone (distal, proximal, midshaft), and the type of fracture as defined by radiography (transverse, spiral, torus, etc.) (Photos 4.3, 4.7, and 4.10). In young infants, a diaphyseal fracture of the femur (while often due to abuse) should raise the question of birth-related injury (both in vaginal and cesarean deliveries) (Morris et al. 2002). In birth-related fractures, metabolic bone disease with osteopenia should also be considered as a contributing cause. Toddler fractures (oblique or spiral tibial fractures) have been described and attributed to the mechanics of toddlers' balance and walking skills (John et al. 1997; Mellick et al. 1999).

It requires substantial force to break the femur (although precise forces needed have not been elucidated), and healthy, non-ambulatory infants do not take part in activities that generate the forces needed to sustain these fractures (Photo 4.3). A systematic review found a high prevalence of abuse in children who had femur fractures under 12 months of age (Wood et al. 2014b). Another study found that most

Table 4.3 Common types of diaphyseal fractures seen in childhood

Type	Characteristics	Causes
Transverse	Fracture line perpendicular to long axis of the bone Force applied to bone is perpendicular to length of the bone	Direct trauma Associated with accidental and inflicted injury
Spiral	An oblique fracture where fracture line encircles a portion of the bone	Indirect torsional forces to the bone Often associated with abusive injuries Seen with accidental injury (in ambulatory children) and child abuse (primarily in infants and young toddlers)
Oblique	Fracture line angled across long axis of the bone (from approximately 30–45 degrees)	Often the result of combination loading (torsional, tensile, and compressive) Seen in accidental and abusive injury
Toddler's fracture	A nondisplaced spiral fracture of the tibia Manifested by limp. There may be a delay in seeking medical care because the injury does not initially appear to be significant. May be occult: nondisplaced, little swelling, initial radiographs may fail to identify the fracture Diagnosed by bone scan at time of presentation or plain films repeated in approximately 2 weeks if clinical scenario indicates toddler's fracture but there is no fracture identified on initial radiographs	Common accidental injury in children between the ages of 1 and 3 Often occurs with routine play activities May result from running and slipping, jumping and falling, and even sliding with a difficult landing Uncommonly results from abuse History of trauma given may seem incomplete or insignificant
Greenstick fracture	An incomplete fracture Compressed side of bone is bowed, but not completely fractured	Occurs secondary to plasticity of a child's bone Commonly accidental and not commonly reported in the abused child
Torus (buckle) fracture	Localized buckling of the cortex of the bone Injuries located toward metaphysis of the bone Due to anatomy of the developing bone	Results from forces applied parallel to long axis of the bone
Impacted fracture	Involves entire bone	Both commonly accidental and not common in child abuse

Note: No type of diaphyseal fracture is diagnostic of abuse.

femur fractures in healthy, mobile children ages 1–5 years old were accidental due to falls (from standing or a height), stumbling, fall while running, or an object falling on the child (Capra et al. 2013). Yet another study found that transverse femur fractures are more predictive of abuse than spiral or oblique fractures in children 3 years and under (Murphy et al. 2015). These findings underlie the need for an

objective, thorough evaluation of femur fractures in infants that includes a detailed history and assessment of developmental ability. Risk factors for abuse suggested for infants include the following: non-ambulatory status, suspicious history (absent, unwitnessed, or inconsistent with the child's developmental ability or pattern of injury), and the presence of additional injuries (Wood et al. 2014a). The history is the most important factor in determining whether a femur fracture is inflicted or accidental (Capra et al. 2013).

Stair falls are often attributed as the cause of fractures. In general, serious injuries with stair falls are uncommon (Pierce et al. 2005). In a study of stair falls, spiral fractures of the femur were more commonly seen in children over 12 months, and buckle fractures were seen in the group under the age of 12 months. The likelihood of more serious injury was increased if the fall occurred with an adult. Buckle fractures of the femur appear to be associated with compressive injury occurring with the striking of the knee onto a surface (Photos 4.1 and 4.2). A torsional injury can occur with a leg being twisted under the child during a fall. Pierce found that the linear momentum associated with transverse femur fractures was almost 10 times greater than that seen with spiral or buckle fractures (Pierce et al. 2005).

Like with femur fractures, abusive humerus fractures are more often found in younger infants versus older children (Maguire et al. 2013). Overall, the majority of humeral fractures are accidental and occur in older children (Caviglia et al. 2005). Fracture patterns described include transverse or oblique occurring with force to the shoulder or outstretched arm and spiral or oblique fractures due to rotational (torsional) movement of the body onto an outstretched (weighted) arm (Photos 4.7 and 4.10). Supracondylar fractures of the humerus occur when children fall on the elbow or outstretched hand (with the elbow in full extension). Likely due to these mechanisms, distal humerus fractures are much more likely to be accidental when compared to proximal and humeral shaft fractures (Pandya et al. 2010). As seen with femur fractures, the type of fracture (transverse, spiral, etc.) does not necessarily predict whether an injury is due to abuse or accident. However, spiral and oblique fractures of the humerus are the most common fracture type from abuse (Kemp et al. 2008). As with many other abusive injuries, having greater than 1 fracture was also associated with abuse in humerus fractures (Pandya et al. 2010).

Forearm diaphyseal fractures often occur secondary to sports activities or falls (Ryznar et al. 2015). These fractures are common in the pediatric population, representing 42% of all pediatric fractures (Rodríguez-Merchán 2005). The injury often occurs with a fall onto an outstretched hand. In a retrospective study of forearm fractures in children less than 18 months, younger age (mean age 7 months) was associated with abuse versus a mean age of 12 months in those with accidental forearm fractures. Children with abusive forearm fractures were also more likely to have no explanation or a changing fracture history (Ryznar et al. 2015).

Treatment of diaphyseal fractures depends on patient age, fracture age when identified, and the type and location of the fracture. In general, diaphyseal fractures impede the normal functioning of the involved bone. Treatment requires immobilization and limitation of weight bearing for lower extremity fractures.

Metaphyseal Fractures

Metaphyseal fractures of the long bones are strongly predictive of abuse and are highly specific for inflicted injuries in children under 1 year of age (Kleinman and Marks Jr. 1998; Kleinman et al. 2011) (Photos 4.23, 4.24, and 4.25). In children over the age of 1 year, similar lesions should be viewed with caution as there are nonspecific Salter-Harris II fractures and developmental variants (Kleinman 2008). Until recently, metaphyseal fractures were thought to represent "chip fractures" of the metaphyses (Caffey 1957). Caffey (1957) postulated that these lesions were due to small avulsions of the metaphyseal cartilage and bone at the point of insertion of the periosteum. Recent findings in which histologic correlations to radiographic findings were performed document that metaphyseal fractures represent fracture through the most immature portion of the metaphysis creating a planar type injury (Kleinman et al. 1986). Depending on the radiologic projection, metaphyseal fractures may appear as linear lucencies or densities across the metaphysis, "bucket-handle" fractures, or corner fractures (Photo 4.23). All of these lesions are subtle and may be recognized on a skeletal survey or incidental radiograph.

Metaphyseal fractures are injuries generally found in infants and young toddlers. The mechanism of injury is related to either acceleration–deceleration forces associated with the abusive head trauma or torsional and tractional forces applied to the bone when an infant is twisted, jerked, or pulled by an extremity (Kleinman et al.

Photo 4.23 This 5-month-old female presented with swelling and pain with movement of her right lower leg. There was no known trauma reported other than the child caught her leg during a feeding. Multiple classic metaphyseal lesions were found including bilateral distal femurs, bilateral proximal, and distal tibias

Photo 4.24 Additional views of the 5-month-old female's left lower extremity and classic metaphyseal lesions

Photo 4.25 This demonstrates the 5-month-old female's right proximal humeral classic metaphyseal lesion. The left upper extremity has no fractures and normal metaphyses

1986) (Photos 4.4, 4.5, and 4.6). Metaphyseal fractures are often multiple and bilateral. Common sites for metaphyseal fractures include the proximal humerus, distal femur, proximal tibia, and distal tibia and fibula (Kleinman and Marks Jr. 1996a, b, c, 1998). The number of bones involved varies from case to case, and fractures isolated to one or only a few bones are not uncommon. Metaphyseal fractures do not typically result in significant soft tissue swelling or external bruising. Injuries are not usually identified clinically by either a parent or the physician during the physical examination. In addition, most of these fractures heal without specific treatment or the need for immobilization.

The differential diagnosis should include metabolic bone disease (particularly in a premature infant), a history of rickets with excessive range of motion exercise (Helfer et al. 1984; Kleinman and Marks Jr. 1998), bone dysplasias (Bronicki

et al. 2015), treatment for club foot (forced eversion and inversion) (Grayev et al. 2001), iatrogenic injury associated with neuromuscular disorders (Uddenfeldt Wort et al. 2013), birth-related injuries (both vaginal and cesarean deliveries) (O'Connell and Donoghue 2007), external cephalic version (Lysack and Soboleski 2003), and normal variants such as step-offs, beaks, and collars (Kleinman et al. 1991). In infants and toddlers with significant genu varum, classic metaphyseal-like lesions may be seen. With time these lesions do not show evidence of healing (Photos 4.19, 4.26, and 4.27).

The metaphysis is an area of rapid bone turnover due to normal growth of the infant skeleton. Because metaphyseal fractures are subtle and usually clinically silent, the skeletal survey remains the identification method of choice. A pediatrician or radiologist familiar with the skeletal manifestations of child abuse is often required to identify metaphyseal fractures. A bone scan, which identifies areas of rapid bone turnover, is not helpful in identifying metaphyseal fractures because the metaphysis is normally an area of bone growth and turnover (Drubach et al. 2010).

Metaphyseal fractures are difficult to detect or date radiographically due to an absence of periosteal elevation and hemorrhage. As a result, the fracture may not show signs of periosteal reaction, or the reaction may be only modest. Metaphyseal lesions may or may not heal with subperiosteal new bone formation. The clinician needs to differentiate this from physiologic new bone formation. However, physiologic new bone formation is largely diaphyseal in location. There may be sclerotic lines or loss of fracture line during the healing process. Another change that may

Photo 4.26 The 3-month-old infant in Photo 4.30 had multiple rib fractures in addition to her skull fractures and subdural hemorrhages. The stepfather reported squeezing her around the rib cage until she would "pass out." Healing rib fractures are seen in multiple locations including the right posterior 4th–9th, left posterior 3rd–10th, and left lateral 3rd–7th

Photo 4.27 This 3-month-old infant had crepitus on examination and posterior arc fractures seen only on the oblique view of the skeletal survey at the left 6th–8th ribs

assist in identifying a healing fracture is local extension of the physeal lucency into the metaphysis (caused by cartilaginous hypertrophy) (Kleinman 2015). Most classic metaphyseal lesions will be healed by 4 weeks (Kleinman 2008). Massive periosteal reaction usually indicates a displaced fracture or a shearing injury to the periosteum itself (Photo 4.6) (Kleinman and Marks Jr. 1998). Metaphyseal fractures also may be dated by evaluating the sharpness of the fracture margins. As the injury heals, the margin becomes more poorly defined. Unfortunately, this is a subjective measure and one that has not been studied systematically. It is thought that future studies using MRI may help to date metaphyseal injuries more precisely (Perez-Rossello et al. 2010).

Growth Arrest Lines

Growth arrest lines are radiopaque transverse lines across the metaphyses seen occasionally in abused or neglected children. They are not specific for maltreatment and may occur in children with illness, injury, starvation, or other stresses that affect growth (Zapala et al. 2016). Growth arrest lines represent periods of slowed growth and are most evident in bones that normally grow rapidly. They form because the usual orientation of the trabeculae of fast-growing bones is longitudinal (parallel to the long axis of the bone), as opposed to transverse (seen in the trabeculae of normally slow-growing bones) (Ogden 1990). During periods of slow growth, the

trabeculae become oriented transversely, causing a thicker appearance to the affected bone. When the stress is removed and the bone begins to grow at a normal rate, the normal longitudinal orientation of the bone resumes, and the thickened area appears as a discrete transverse line. Many children have evidence of multiple growth arrest lines in a single bone, representing prolonged periods of physiological stress. With time, the transverse orientation of the bone resolves, and growth arrest lines break down so that they are no longer visible. One study compared the skeletal surveys in infants at high risk of abuse versus infants at low risk of abuse and found that growth arrest lines were more commonly found in the high-risk infants (Zapala et al. 2016). However, growth arrest lines are a nonspecific finding, as they can result from many types of physiologic stressors.

Physeal and Epiphyseal Fractures

Physeal and epiphyseal fractures in young children and infants are very rare. Most of physeal and epiphyseal injuries occur in school-age children. Since they are not ossified in young children, these types of fractures can be easily missed on radiographs, including skeletal surveys. Ultrasound or MRI can be useful to confirm a suspected epiphyseal separation or injury (Supakul et al. 2015). These fractures are important to confirm when suspected, as they sometimes require surgical intervention and long-term follow-up to monitor bone growth. These fractures can result from birth trauma, abuse, or accidental trauma in children under 3 years old (Supakul et al. 2015; Tharakan et al. 2016). More research is needed on these rare fractures.

Skull Fractures

Skull Anatomy

The skull consists of cranial and facial bones. The eight intramembranous cranial bones—frontal, occipital, sphenoid, ethmoid, and left and right parietal, and temporal bones—develop directly within a membrane and not from cartilage, as with the long bones. The cranium is composed of a number of separate bones joined by strips of connective tissue called sutures. The main sutures include the sagittal, coronal, and lambdoid. Lesser known sutures include the squamosal, metopic, and mendosal. The mendosal sutures extend medially from the lambdoid sutures into the occipital bone. In the sutures are larger areas of connective tissue known as the fontanelles. In addition to the anterior, posterior, and anterolateral fontanelles, there can also be small accessory fontanelles within the sutures, especially the sagittal suture. Islands of bone (ossification) found within the posterior sagittal and lambdoid sutures, if large enough, are referred to as “wormian bones.” There is another

variant of the occipital bone referred to as the interparietal (Inca) bone at the vertex of the lambdoid sutures. The Inca bone can be bipartite divided by a superior median fissure (Quigley and Stafrace 2014).

Both accessory sutures and fissures are common in the parietal and occipital bones. These fissures can be mistaken for skull fractures (Choudhary et al. 2010; Quigley and Stafrace 2014). The occipital bone has several sutural variants including superior median, midline, and lateral occipital fissures; transverse occipital sutures; and innominate synchondrosis (Choudhary et al. 2010). The parietal bone may be partially or completely bisected by a fissure running parallel to the sagittal suture (Stokes and Cremin 1974). The presence of these fissures and sutural variants is largely the result of multiple ossification centers within the developing bones of the skull. The skull of the newborn is quite thin and does not achieve the adult "three-layer" diploe configuration for 3–4 years (Holck 2005). The parietal bone is quite thin, monolayer, and particularly susceptible to fracture. In studies of infant cadavers with falls (head-first with parieto-occipital impact) onto differing surfaces from 0.82 m, fractures occurred almost exclusively in the parietal bone (Weber 1984, 1985, 1987). The growth and repair of the skull bones are distinct from that of the long bones, making dating of skull fractures more difficult. Additionally, bone scans do not identify skull fractures with any sensitivity. Three-dimensional CT reconstruction does enable a detailed view of the skull, sutures, fissures, and fractures (Photos 4.15, 4.16, and 4.17) (Choudhary et al. 2010; Culotta et al. 2017; Parisi et al. 2015). CT of the head is also useful for differentiating between vascular channels that may be confused with fractures (George et al. 2017). With so many normal variants of the infant and young child's skull, working with a pediatric radiologist is highly recommended.

Skull Fractures and Abuse

Skull fractures are due to a direct impact of the head with a solid object. A description of the fracture includes the location identifying the skull bone involved and the type of fracture. Skull fractures related to child abuse generally refer to the cranial bones, although facial fractures occur (see Chap. 8). Table 4.4 describes common types of skull fractures.

Skull fractures are the perhaps the most common fracture in hospitalized children. However, only 17% of these were attributable to abuse in children under 12 months of age (Leventhal et al. 2008). Skull fractures are more commonly reported after accidental head injuries (Kemp et al. 2008). Simple linear parietal skull fractures are just as commonly found in accidental as in abusive head injuries (Billmire and Myers 1985; Leventhal et al. 1993; Meservy et al. 1987) (Photo 4.28). In young children, accidental linear fractures may occur from falls of less than 4 ft (such as off a bed, couch, or changing table), falls of greater distances (down stairs), or walker injuries (Coats and Margulies 2008; Duhaime et al. 1992). Likewise, linear fractures may result from abuse and are indicative of a direct impact to the

Table 4.4 Common types of skull fractures

Type	Characteristics
Basilar	Fracture of base of skull Difficult to identify radiologically CT scan is a more sensitive test than plain films Usually diagnosed by clinical criteria: CSF otorrhea, rhinorrhea, raccoon eyes (periorbital blood), or Battle's sign (ecchymoses over the mastoid area)
Comminuted	Complex fracture results in separate piece(s) of bone
Complex	Comprised of more than one line
	May be branched or stellate, or consist of more than one distinct fracture
Depressed	Occurs when bony fragment is displaced inward toward the brain Often a comminuted fracture and may be associated with neurologic deficits, usually due to underlying brain involvement
Diastatic	Fracture margins significantly separated Injuries to the sutures can result in diastasis, either in association with a fracture or as an isolated injury Diastasis of multiple sutures may occur with increased intracranial pressure or occasionally with rapid brain growth
Linear	A single, unbranched line that can be straight, curved, or angled
Ping-pong	Bone indented, but without a distinct fracture
Stellate	A type of complex fracture Fracture lines radiate from central point

Photo 4.28 A 1-month-old female with linear parietal skull fracture after a fall from parent's arms

head (Photo 4.29). Some report complex skull fractures, depressed fractures, and diastatic fractures as characteristic of inflicted injury (Hobbs 1984). Other studies report no real difference in the incidence of complex skull fractures (Leventhal et al. 1993; Meservy et al. 1987) but strong associations with multiple fractures, bilateral fractures, and fractures crossing sutures (Meservy et al. 1987) (Photos 4.15, 4.16, 4.17, 4.29, and 4.30). Bilateral skull fractures may result from crushing injuries (Hiss and Kahana 1995), but they can also occur from a single midline cranial impact (Arnholz et al. 1998). Young infants may sustain linear, depressed, and ping-pong fractures from simple falls because of the relative ease with which the

Photo 4.29 This 3-month-old female presented with poor feeding and lethargy and no history of trauma. Skeletal survey notable for bilateral skull fractures with diastasis on the left. The infant had multiple other injuries including subdural hemorrhages, bruises, and rib fractures

Photo 4.30 A 5-month-old female with multiple extremity fractures is found to have a complex, comminuted skull fracture on skeletal survey. Caregiver reported only a single fall from a bouncer chair

skull can be deformed at this young age and its thin, monolayer construction (Weber 1985). Although no fracture type is pathognomonic for abuse, abuse is suspected when no history of trauma is provided, the history is inconsistent or changes, the history is developmentally implausible, or a history of minor injury results in complex or multiple fractures.

In nonverbal children with a seemingly isolated skull fracture, it is controversial whether to complete the skeletal survey to screen for occult injuries or not. In recent studies, there is a small subset of young children who present with an apparently isolated skull fracture but are then found to have occult skeletal injuries on skeletal survey (Deye et al. 2013; Laskey et al. 2013). Laskey et al. (2013) recommend considering a skeletal survey in any child less than 2 years old who presents with a skull fracture and emphasizes the importance of a skeletal survey in infants less than 6 months old. Similarly, a multispecialty panel of experts deemed skeletal surveys "necessary" in infants 0–11 months old, with an exception for those infants 7–11 months who presented with a reported fall and a unilateral linear skull fracture (Wood et al. 2014b).

The presence or absence of cutaneous injury and/or skull fracture does not predict intracranial injury. In one study of the association between bruising and fractures, 43% of patients had bruising or subgaleal hematoma at the site of skull fracture. Of those patients with skull fractures, almost half had evidence of intracranial injury. Skull fractures were present in 75% of those with abusive head trauma (Peters et al. 2008). In Duhaime's study of head injury in young children, 37% of children with abusive head trauma had skull fractures (Duhaime et al. 1992). Much of the variability lies in study design. Controversy regarding the exact mechanism and biomechanics of abusive head trauma relates to whether impact is required to produce intracranial injury. Multiple and diastatic skull fractures, from direct impacts such as from falls from significant height or blows, do occur without life-threatening intracranial injury. Yet many children without skull fracture have intracranial injury so severe as to result in death. Infants whose injuries are credited to acceleration–deceleration injury may have a skull fracture documented by skull films. As indicated by the fracture, these children have sustained direct impact to the head in addition to acceleration–deceleration injury (see Chap. 6).

Dating Skull Fractures

Skull fractures are more difficult to date than long bone fractures, both clinically and radiographically. Soft tissue swelling may not be apparent clinically in the acute period and may become noticeable only after the associated scalp hematoma begins to degrade and liquefy. This can lead to a delay in seeking medical care by the child's caregiver as well. Soft tissue swelling in the first 24 h after a skull fracture should be evident on CT scan. Kleinman and Spevak (1992) evaluated soft tissue swelling associated with acute (less than 24 h old) accidental skull fractures in children. All fractures were associated with soft tissue swelling overlying the fracture

of at least 4 mm, as seen by CT scan (Kleinman and Spevak 1992). However, another study identified an absence of facial or scalp soft tissue swelling in 11% at the time of presentation with an acute head injury (Ibrahim et al. 2012). Skull fractures do not heal with exuberant callus formation. Recognition of older injuries rests on the subjective determination of fracture line definition and is therefore imprecise. Like those in other types of fractures, infant skull fractures heal relatively rapidly compared with older children and adults. In most cases, isolated skull fractures require no specific therapy. "Growing fracture" or "leptomeningeal cyst" is a known but rare complication of diastatic skull fractures in approximately 1–2% of children under 3 years of age. Clinical examination is recommended in 6–8 weeks after injury with consideration for follow-up radiography (Ersahin et al. 2000).

Rib Fractures

Rib fractures are unusual pediatric injuries that commonly result from major trauma (such as motor vehicle crashes [MVCs] or child abuse). An evaluation for child abuse is performed when an infant or young child presents with unexplained rib fractures. Rib fractures are the most common fracture found in association with other non-accidental injuries (Day et al. 2006; Kleinman et al. 1995; Worlock et al. 1986). Many studies have confirmed the association between child abuse and rib fractures (Darling et al. 2014; Paine et al. 2016). A large retrospective study of trauma patients with rib fractures calculated a 95% positive predictive value for non-accidental trauma in children less than 3 years of age with rib fractures (Barsness et al. 2003). A systematic review of the literature found rib fractures to have the highest probability for abuse at 0.71 (as compared to other skeletal injuries) (Kemp et al. 2008). Another more recent systematic review of the literature found that the prevalence of abuse in children under 12 months was 91% after excluding MVCs and bone pathology (Paine et al. 2016). Rib fractures from abuse are found in multiple locations including posterior (most common), posterolateral (mid-posterior), lateral, and anterior (Barsness et al. 2003; Bulloch et al. 2000; Kleinman et al. 1996) (Photos 4.23 and 4.24). Barsness et al. (2003) found a statistically significant association between the posterior location and non-accidental trauma. It should be noted that despite posterior rib fractures being highly specific for abuse, multiple posterior rib fractures have also been found in the case of high-impact blunt-force trauma of an infant in a stroller bring stuck by a car (Bixby et al. 2011). However, in this case the mechanism of injury was not in question.

Direct blows to the chest can result in rib fractures and probably represent the mechanism of injury in older children. Kleinman et al. (1992) studied postmortem changes of fractured ribs in infants who died of abuse. The location (near the costotransverse process articulation) and the healing patterns (on the ventral or internal surface of the rib) of the fractures suggested that rib fractures occur as the rib is levered over the transverse process of the adjacent vertebral body during violent manual anterior-posterior compression of the chest (Kleinman et al. 1992). CT was utilized by Kleinman and Schlesinger (1997) to assess physical factors associated

with manual compression and rib fractures in rabbits. With digital chest compression on a firm surface simulating cardiopulmonary resuscitation, no rib fractures occurred. With manual compression with hands around the chest (until palpable/audible popping heard), levering of the ribs was seen as the vertebral body migrated dorsally. A total of 13 fractures occurred in 3 rabbits (Kleinman and Schlesinger 1997). Rib fractures in non-accidental trauma usually involve multiple ribs (Barsness et al. 2003) and are often bilateral. Children with accidental rib fractures from trauma often have blunt impact and/or thoracic compression. These children are struck or run over by motor vehicles or become unrestrained projectiles striking firm surfaces with anterior-posterior compression of the chest (Bulloch et al. 2000; Kleinman and Schlesinger 1997).

Cardiopulmonary Resuscitation and Rib Fractures

In adults, rib fractures frequently occur in association with cardiopulmonary resuscitation (CPR) (Krischer et al. 1987). Prior to 2005, when the recommended method of infant CPR was "one-handed CPR" (two fingers pressing on the sternum), rib fractures did not appear to be a clinically significant complication of CPR in infants and young children as the thorax is less rigid and has more elasticity. In a systematic review of the literature on the relationship between one-handed CPR and rib fractures, a total of three children had rib fractures as a consequence of CPR out of a documented 923 cases. Two children were less than 6 months of age and one child was 5 years of age. All rib fractures were multiple and anterior. Two of the cases had mid-clavicular fractures, and one case had bilateral fractures at the sterno-chondral junction. No cases were identified with posterior rib fractures. Five of the six studies meeting inclusion criteria were postmortem (Maguire et al. 2006).

In 2005, the American Heart Association changed their infant CPR recommendations to a "two-handed" method (both hands encircling the chest of an infant with thumbs compressing over the sternum). Since then, a case series of five infants found that this two-handed CPR may be associated with more rib fractures than the prior one-handed method; however, posterior rib fractures were not demonstrated (Matshes and Lew 2010).

Radiographic Findings of Rib Fractures

Rib fractures due to abuse are almost always occult and not recognized either by an unsuspecting caregiver or during routine physical examination. Occasionally, healing fractures with exuberant callus can be palpated, but this usually occurs only after the fractures have been diagnosed radiographically. Acute (new) rib fractures are difficult to identify by plain radiograph. Posterior rib fractures have little displacement or angulation or disruption of the periosteum (Kleinman et al. 1988). Fractures are generally recognized only after callus formation and

Photo 4.31 A 5-week-old infant with multiple skull fractures and cutaneous trauma. Initial chest radiograph appeared reassuring

periosteal reaction are evident. The addition of oblique views to the skeletal survey has been helpful in identifying fractures (Hansen et al. 2008; Marine et al. 2014) (Photos 4.31 and 4.32).

Bone scan is more sensitive for the identification of acute rib fractures (less than 7–10 days old) than plain films (Bainbridge et al. 2015; Drubach et al. 2010). Likewise, a study comparing CT with chest radiograph found CT more sensitive in identifying rib fractures at all locations except lateral (Photos 4.13, 4.14, and 4.18). However, the study did not utilize oblique views of the chest, and CT requires higher doses of radiation (Wootton-Gorges et al. 2008). Chest CT does have the additional benefit in children with multisystem trauma in identifying additional injuries including hemothorax and pulmonary contusion.

In suspected abuse with an initial negative skeletal survey, a bone scan may identify acute fractures, including those of the ribs. An infant who presents without a history of trauma but with intracranial injury should have a skeletal survey with oblique views of the chest performed as part of the initial evaluation. Repeat skeletal survey in 2 weeks, as outlined in the imaging section, is crucial in the identification of occult rib fractures (Photos 4.31 and 4.32).

In the majority of cases, rib fractures are not associated with clinical pulmonary or liver injuries and do not interfere with normal respiration. These fractures typically heal rapidly and without specific therapy. In studies of children with thoracic trauma, the likelihood of intrathoracic injury and multisystem trauma increased in children with multiple rib fractures or posterior rib fractures (Garcia et al. 1990). However, a recent retrospective study noted that although abuse cases were found to

Photo 4.32 The infant had a repeat skeletal survey now demonstrating healed left posterior rib fractures of ribs 7 and 8

have more rib fractures than the accidental cases, abuse cases were less likely to have intrathoracic injury. This is thought to be from the slower loading forces in child abuse versus the high-energy blunt force impacts in the accidental cases, which included MVCs and motor-pedestrian collisions (Darling et al. 2014).

Other Fractures Associated with Child Abuse

Child abuse can result in injury to virtually any bone in the body, although the most common injuries are fractures of the extremities, ribs, and skull. Many fractures are clinically unrecognized, which emphasizes the need for careful radiologic assessment of all bones. The following sections review injuries occasionally seen in the abused child, although none is pathognomonic for maltreatment.

Vertebral Fractures

Spinal fractures in infants and toddlers are relatively rare injuries from child abuse but probably occur more frequently than they are recognized (Kleinman 2015). The injury to the vertebral bodies and spinous processes are subtle and require lateral

views of the spine. Most vertebral injuries are occult, although a few children present with spinal cord compression. Lateral views of the spine may reveal vertebral body compression fractures or anterior vertebral end-plate injury. MRI may be used to further assess significant vertebral and spinal cord injuries. These abusive compression vertebral fractures often result from severe hyperflexion of the torso and axial spinal loading (Kleinman and Marks 1992; Tran et al. 2007). Vertebral compression fractures in isolation do require further evaluation for osteogenesis imperfecta (Renaud et al. 2013). Vertebral injuries, if stable, do not require specific therapy. Children with cord compression, however, require surgical intervention and often have permanent neurologic disability.

Even rarer than compression vertebral fractures are distraction fractures of the vertebral column. These can be associated with vascular and spinal injury, and the mechanism of this type of injury is a high force applied over a fulcrum that causes rapid hyperextension (Brink et al. 2017).

A couple of studies have shown that perhaps spinal fractures are not as rare as previously thought. One study showed a spinal fracture prevalence of 1.9% in children 0–4 years old (Barber et al. 2013). The other study showed a prevalence of 2.7% in the skeletal surveys on children under 2 years (Kleinman et al. 2013).

Pelvic Fractures

Fractures of the pelvic bones are uncommon injuries in abused children (Bixby et al. 2014; Lindberg et al. 2013). Injuries to the pelvis that occur in infants and young children are often unrecognized prior to radiologic discovery. Most of the reported injuries are unilateral and occur in conjunction with other skeletal trauma. The ischiopubic ramus is most commonly fractured. Although the precise mechanism of inflicted pelvic trauma is not described in the literature, accidental pelvic injuries in children are due to direct trauma in association with falls, motor vehicle crashes, and crush injury (Quinby 1966). Although accidental pelvic injuries may be life threatening, inflicted pelvic fractures are generally stable injuries that do not require surgical intervention.

There are anatomic variants associated with the ossification centers in the superior pubic ramus. The ossification centers can be single or multiple, unilateral or bilateral, and can have associated sclerosis of the margins. Fractures are more likely to be oriented obliquely to the axis of the pubic ramus with displacement of fragments and callus formation. A vertical radiolucency with smooth margins, in the absence of other pelvic or skeletal trauma, should be considered an anatomic variant (Perez-Rossello et al. 2008).

Clavicle Fractures

Clavicle fractures are common accidental pediatric injuries and are occasionally associated with abuse (Ogden 1990). This fracture is the most common birth-related fracture and is often associated with infants who are large for gestational age. The fracture may go unnoticed, while the infant is in the newborn nursery. If the question is raised on birth-related versus post-hospital care, attempts to age the healing fracture should be used. If callus is not present by the time the child is 10–14 days of age, it is unlikely to be birth-related (Walters et al. 2014). Accidental injury, accounting for 75–80% of all clavicle fractures, generally occurs in the midshaft of the bone due to the thinness of the bone at this site as well as the lack of muscular and ligamentous supports (Pecci and Kreher 2008). Accidental fractures of the clavicle are associated with birth trauma, direct injury, or falling on an outstretched arm. Midshaft fractures are common with both accidental as well as inflicted injury. Clavicular fractures involving the acromioclavicular joint are associated with violent traction of the arms (Kogutt et al. 1974). Inflicted clavicular fractures are typically associated with other skeletal injuries and are an uncommon isolated finding (Merten et al. 1983). In teens where ossification of the growing centers is not complete, growth plate injury must be considered (Pecci and Kreher 2008). Clavicle fractures in older children are usually treated with a clavicle strap or figure-8 sling, primarily to ease discomfort. These injuries in young children and infants often heal well without immobilization.

Fractures of the Hands and Feet

Fractures of the hands and feet, while common in older children, are suspicious injuries in infants and young toddlers. These fractures are rare but may be the only indication of inflicted injury (Lindberg et al. 2013). Close attention should be paid to images of the hands and feet in the skeletal survey, ensuring that the fingers are not curled or obscured by intravenous equipment. Specific treatment depends on the extent and location of the fracture.

Foot fractures may occur from forces acting on the foot such as objects dropped onto the foot, falling from height, lawn mower injuries, or from using the foot to stop motion (biking, sledding, etc.). Likewise, indirect force (adduction, eversion, and inversion) may result in fractures. Due to the many small bones, growth centers, cartilaginous bones, and lack of displacement of fracture fragments, it may be difficult to identify a fracture in the foot. Radiographs, if inconclusive, may be repeated in 2–3 weeks (in the otherwise stable patient). Use of bone scans or MRI studies can be used in more concerning evaluations such as concern over talus fractures and the potential risk of avascular necrosis. Some conditions may be confused with foot fractures, including osteochondroses, tumors, inflammatory conditions, and infections.

Hand fractures are relatively common in children. Two peak ages have been identified with the first occurring at age 1–2 years (distal phalangeal fractures) and next at age 12 years (with proximal phalangeal and metacarpal) (Valencia et al. 2005). Sports injuries are more common in older pediatric patients (teenagers). Fractures of the fingers may present with swelling, whereas fractures to the metatarsals, metacarpals, and phalanges are frequently asymptomatic and only incidentally discovered by skeletal survey (Kleinman 1990). The fractures can be caused by direct impact, torsion, and twisting. Buckle fractures of the proximal phalanx may be the result of forced hyperextension of the fingers (Nimkin et al. 1997). Oblique views may be useful in the evaluation of buckle fractures (Nimkin et al. 1997). With Salter type I injuries, the initial radiographs may appear normal. Scaphoid fractures are unique since they may be difficult to identify acutely without the use of MRI or scaphoid views. If not identified and treated early, these fractures can result in avascular necrosis.

The Differential Diagnosis of Inflicted Fractures

Metabolic and physiological processes may lead to pathological fractures, or they may simulate fractures. Although some of these conditions are readily apparent and easily diagnosed, others can be confused with and misdiagnosed as abuse. The presence of a metabolic bone disease does not preclude abuse. The following sections describe some of the more common conditions included in the differential diagnosis of inflicted fractures.

Birth Trauma

Difficult or emergency deliveries, large infants, or breech presentations may cause diaphyseal or epiphyseal fractures of the clavicle, humerus, or femur. Multiple fractures in the newborn suggest an underlying neuromuscular or metabolic bone disease (Ogden 1990).

Clavicle fractures are most common and may not be recognized in the days after delivery. They are often asymptomatic and may be detected initially by a parent who palpates the callus when the infant is a few weeks old.

Diaphyseal femur and humerus fractures may be noted at the time of delivery. These injuries typically cause a pseudoparalysis (the infant does not move the extremity in order to avoid pain and discomfort; to the observer, it appears “paralyzed”) or asymmetry in the use of the extremities. Treatment generally requires splinting of the involved extremity for a few weeks during rapid healing.

Epiphyseal fractures most commonly involve the proximal humerus and are associated with difficult deliveries. The diagnosis may be made clinically and may

be difficult to detect radiographically. A distal humerus epiphysis can also be from birth injury (Supakul et al. 2015).

Fractures of the distal extremities or ribs are extremely rare in association with birth trauma. A case series identified 13 cases of definitive birth-related posterior rib fractures (van Rijn et al. 2009). The majority of infants had large birth weights and difficult deliveries, over 50% with shoulder dystocia. In infants with an associated clavicular fracture, the rib fractures were ipsilateral. Van Rijn et al. (2009) reported in detail three definitive and one possible case of birth-related posterior rib fractures. In all four cases, the rib fractures were mid-posterior. The authors postulate that leverage over the pubic symphysis in the macrosomic infants applies forces similar to those seen with bimanual compression, without anterior displacement of the vertebrae (van Rijn et al. 2009). Fractures due to the birth process heal rapidly. By 2 weeks of age, they should all show radiographic signs of healing (Fadell et al. 2017; Walters et al. 2014). In most cases, birth trauma is easily distinguished from abuse, although the possibility that an injury was the result of birth trauma occasionally arises. Fractures that do not show the callus by 2 weeks of age are not consistent with birth trauma, and the injuries should be accounted for by another mechanism.

Caffey disease (infantile cortical hyperostosis) is a rare, benign condition that presents with a classic triad of fever, soft-tissue swelling, and irritability. The radiographic appearance is striking and notable for thickening or bony expansion, especially affecting the flat bones such as the mandible, clavicle, rib, scapula, skull, and ilium (Davis 2010). The underlying cause of Caffey disease remains unclear. It has characteristics of an inflammatory process that may be inherited, immunologic, or infectious in nature. It typically presents in early infancy, is self-limited, but it may have a protracted course over months. Owing to its dramatic presentation, it may be confused with child maltreatment (Davis 2010) (Photos 4.33 and 4.34).

Photo 4.33 A 1-week-old male with bony angulations noted at birth. Multiple lesions noted in the mandible, clavicles, humeri, and ribs. The child has Caffey disease or infantile cortical hyperostosis

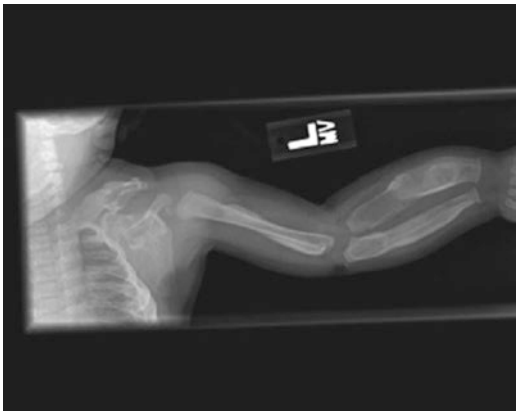

Photo 4.34 The left upper extremity of the 1-week-old with Caffey disease demonstrates the periostitis and subsequent lamellar bone formation

Normal Variations Mistaken for Abuse

A number of normal variants of the developing skeleton may be mistaken for fractures and may sometimes suggest abuse. The most common of these variations is the subperiosteal new bone formation of the long bones seen commonly in young infants between 1 and 4 months of age (Kwon et al. 2002). The subperiosteal new bone formation is a normal physiologic pattern of rapid bone growth in infants who still undergo intramembranous ossification. The new bone formation is smooth, involves multiple bones, and is generally symmetric (although it can be unilateral). The infant is asymptomatic, in contrast to infants with congenital syphilis or other disorders. If the new bone formation occurs in older infants or appears thick, irregular, or extends to the end of the metaphysis, other etiologies, including trauma, should be explored (Glaser 1949; Kwon et al. 2002; Shopfner 1966).

Variations can also be seen in the newborn and infant skull in size, shape, and ossification. Suture variants and fissures can be mistaken for fractures. Common mimickers of trauma include the median occipital fissure, intraparietal (accessory) sutures, the interparietal bone, and accessory fontanelles in the sagittal suture (called the third fontanelle) (Quigley and Stafrace 2014). Wormian bones in the skull, which can be associated with osteogenesis imperfecta, are also present in children without any bone disease. One study of 605 CT scans of the brain found that 53% of children under 3 years of age had wormian bones and 10% had four or more wormian bones (Marti et al. 2013).

Congenital Syphilis

The osteochondritis, epiphysitis, and periostitis (inflammation of the periosteum) of congenital syphilis may mimic the metaphyseal fractures and periosteal new bone formation associated with child abuse (Fiser et al. 1972). Sixty to hundred percent

of pregnant women with primary or secondary syphilis will transmit the infection to the fetus, and the risk of transmission slowly lessens in the latent stages of mother's infection (Kimberlin et al. 2018). Bone involvement (most often involving the humerus or femur but may affect any bone of the skeletal system) is the most common sign of syphilis. The early findings in congenital syphilis are varied and unpredictable. There are limited studies available to follow the long-term effects. The presentation may be early (birth to 3 months) or late. Treatment with antibiotics for the mother (during the pregnancy) does not assure that infection will not occur in the fetus. Negative testing early in pregnancy does not rule out congenital syphilis in the infant.

Radiographic changes are often diagnostic and usually involve multiple symmetric bones. The lower extremities are involved more often than the upper extremities. Metaphyseal destruction and periosteal new bone formation are characteristic of the skeletal changes associated with syphilis. Epiphyseal changes are evident radiographically approximately 5 weeks after infection, whereas periosteal changes are first seen after 4–5 months of infection. Therefore, the radiographic manifestations of syphilis vary depending on the trimester in which the fetus was infected. Radiologic findings also include (1) Wegner's sign (serrated appearance of epiphyseal margin), (2) a zone of rarefaction at the metaphysis, (3) a moth-eaten appearance, (4) irregular periosteal thickening, (5) Wimberger's sign (demineralization and boney destruction in the upper medial tibial metaphysis), (6) saber shin (anterior bowing of tibia), (7) Higoumenakis' sign (periosteal reaction to the sternoclavicular portion of the clavicle), and (8) saddle nose deformity. Perforation of the hard palate has been suggested to be pathognomonic for congenital syphilis.

Clinical signs of skeletal involvement include pseudoparalysis of affected limbs (due to pain) and swelling and tenderness of the ends of involved bones. Affected infants may have other clinical manifestations of congenital syphilis, including hepatomegaly, splenomegaly, anemia, jaundice, rash, sniffles, and adenopathy. Often the first symptom is rhinitis. The rash is desquamative, diffuse, and maculopapular and is found on the palms, soles, mouth, and anus.

Diagnosis is based on serologic testing, which should be obtained in all high-risk infants.

Copper Deficiency and Scurvy

Copper deficiency is a rare cause of metabolic bone disease and pathologic fractures. Causes include both nutritional deficiencies in premature infants as well as diseases associated with intestinal copper transport. Radiologic features include severe osteopenia, symmetric cupping of the metaphyses, metaphyseal spurs, and subperiosteal new bone formation (Flaherty et al. 2014). The osteopenia develops after the fetal copper stores are utilized, which would be after 6 months in a term infant but sooner in a premature infant. Predisposing risk factors include prematurity, deficient nutrition, malnutrition, and malabsorption. Children with copper

deficiency will have associated laboratory changes including sideroblastic anemia resistant to iron, neutropenia, and low levels of copper and ceruloplasmin. Menke's syndrome (kinky hair syndrome) is notable for psychomotor retardation, hypotonia, seizures, failure to thrive, and hypopigmentation, with hair that is kinky, coarse, and lacking in pigment.

Scurvy, a deficiency of vitamin C (ascorbic acid) and ascorbic acid oxidase (copper dependent enzyme), has similar clinical and radiologic features to copper deficiency. It is also the consequence of malnutrition (not often seen before 6 months of age). Although this is a rare disease, it can be seen in infants and children with extremely restricted diets that are void of vitamin C, iron overload from multiple transfusions for sickle cell anemia or thalassemia, neurologic disorders, or chemotherapy from bone marrow transplants (Flaherty et al. 2014; Golriz et al. 2017). The "scurvy line" is a lucent band under the zone of provisional calcification (not usually present in copper deficiency). Features include pathologic fractures occurring through the metaphyses as well as subperiosteal and soft tissue hemorrhages. Diaphyseal fractures are not common (Kleinman 2015).

Both copper deficiency and scurvy have severe osteopenia, which can aid in the differentiation between these deficiencies and child abuse. Other clinical, laboratory, and radiologic features should be present if the copper deficiency is severe enough to cause fractures. Metabolic bone disease, such as copper deficiency, should affect the entire skeleton symmetrically.

Disuse Osteopenia

Any condition that severely impairs normal motor function to the point of inability to bear weight can cause a disuse osteopenia. One study that evaluated the bone mineral density in the femoral neck of children with spina bifida showed that wheelchair-bound children have lower bone mineral density compared to ambulatory children (Apkon et al. 2009). When disuse osteopenia is severe enough, it is possible that the bones may become fractured in the course of daily care. If the bones are affected to the degree that fracture risk increases, the bones should be clearly osteopenic on radiographs (Photo 4.35). Another study, which evaluated fractures in children with cerebral palsy, found that the risk of fracture increased only in the children with the least gross motor function, which was defined as children mostly or completely confined to a wheelchair or bed (Uddenfeldt Wort et al. 2013). The fracture risk was increased even more if the child did not use a standing device or if their growth was significantly stunted. The authors also noted multiple contributing factors in addition to disuse osteopenia including the following: use of antiepileptic drugs that negatively affect bone mineral density, potential malnutrition due to feeding difficulties, or frequent hospitalizations that result in even more immobilization than their usual daily routine (Uddenfeldt Wort et al. 2013).

Photo 4.35 This 2-year-old male presented with leg swelling and fussiness. He had a history of spastic quadriplegia after being struck by a car. His radiographs demonstrate disuse osteopenia with thin cortices. He has a distal transverse femur fracture with swelling noted after physical therapy

Osteopenia of Prematurity

It is estimated that 50% of infants less than 1000 g will develop osteopenia of prematurity (Moyer-Mileur et al. 1995) with fracture rates ranging from as low as 1.2% (Amir et al. 1988) to 27% (Dabezies and Warren 1997). There is tremendous variability between studies depending on the gestational age of the infant, weight, and other risk factors. In addition, many of the studies with the highest rates of fracture were performed in the 1980s to early 1990s. There is now significant improvement in nutritional management, immobilization, and ventilator times (Rauch and Schoenau 2002).

Decreased bone mineralization can occur as the result of insufficient matrix being deposited or as the result of insufficient mineral being incorporated into the matrix. Osteomalacia results from an accumulation of unmineralized bone matrix and can be seen clinically as "rickets." Osteopenia (scarcity of bone) is the result of decreased amounts of matrix or bone tissue whether through insufficient deposition or increased resorption. During the last trimester, 80% of calcium and phosphorous deposition occurs in fetal bone as well as two-thirds of the fetal weight gain. The full-term infant will develop "physiological osteoporosis of infancy" in the first few months of life as the marrow cavity size in the long bone increases faster than the cross-sectional area of the bone cortex. There is no bone fragility associated with "physiological osteoporosis of infancy" in the full-term infant. This also occurs in the premature infant albeit earlier than the term infant (Rauch and Schoenau 2002).

The preterm infant (<32 weeks gestation) has a bone mineral content (BMC) that is 40–50% less than the full-term infant at 40 weeks gestation (Congdon et al. 1990; Horsman et al. 1989a). In multiple prospective studies of premature infant bone accretion, there is rapid mineral deposition occurring between 40 and 60 weeks postconception (Congdon et al. 1990; Horsman et al. 1989b; McDevitt et al. 2007). Mineral accretion rates are often 5–10 times higher in preterm infants (Congdon et al. 1990) than in full-term infants, suggesting the presence of a "biostat" (McDevitt et al. 2007). The deficit noted at birth between preterm and full-term infants is largely resolved by 50 weeks postconception in preterm infants (Horsman et al. 1989c). Preterm infants increase their BMC by 30–60% of the mean value seen in full-term infants whereas full-term infants increase their BMC by only 11–45% (Horsman et al. 1989c).

Risk factors for mineralization issues in premature infants include prematurity <28 weeks gestational age, cholestatic jaundice, total parenteral nutrition (TPN) for greater than 3 weeks, bronchopulmonary dysplasia with prolonged use of steroids, and prolonged diuretic therapy (greater than 2 weeks) (Amir et al. 1988; Carroll et al. 2007). Premature infants who are ELBW (<1000 g) appear to be at greatest risk for osteopenia of prematurity at 6–12 weeks of age. Osteopenia of prematurity should be suspected when there is elevation in alkaline phosphatase and low phosphorous levels (Rauch and Schoenau 2002). Close attention to calcium and phosphorous content in TPN, as well as the use of supplemented breast milk and premature formulas, has decreased the incidence of bone disorders in premature infants. In a large study of fractures in 973 premature infants, only 1.2% of infants surviving more than 6 months had fractures (Amir et al. 1988).

Rickets

The radiographic appearance of rickets is identical regardless of its etiology and reflects the undermineralization of growing bones. There are multiple causes of rickets, including vitamin D deficiency, renal and hepatic disease, medications (antacids, anticonvulsants, furosemide), and other rare diseases. Children at risk for rickets include small, ill, premature infants (related to nutritional compromise, high growth rates, medication use); breastfed infants who do not receive vitamin D supplementation and have limited UV-B light exposure; children using sunscreen or in the practice of covering most of the skin with clothing; children and adolescents with restrictive diets or poor nutritional habits; and children with kidney or liver disease (Wharton and Bishop 2003).

Radiographic findings include fraying of the costochondral junctions and metaphyses, widening of the distance from the epiphysis to the mineralized portion of the metaphysis, flaring of the metaphyses, and cortical thinning (Photo 4.36). The changes that occur in the metaphyses and ribs are not usually confused with abuse (Perez-Rossello et al. 2015). These changes can develop rapidly, in contrast to

Photo 4.36 A 3.5-year-old female with renal rickets. Note the bowing of the long bones as well as the flaring and ragged metaphyses

osteomalacia. During healing, bony changes may mimic abuse because dense mineralization occurs adjacent to radiolucent bone, which may resemble metaphyseal fractures. Periosteal new bone formation may mimic trauma. The most common long bone sites are the proximal tibia and fibula and the distal end of the radius and ulna. Changes in the phalanges include subperiosteal erosions. In a retrospective study evaluating fractures in infants and toddlers with rickets, the vast majority of fractures were in mobile children with overt radiologic rickets (Chapman et al. 2010). The fractures that were found were from load-bearing failure, not easily mistaken for abuse (Chapman et al. 2010). Classic metaphyseal fractures and posterior-medial rib fractures were not found (Chapman et al. 2010).

The diagnosis of rickets is dependent on clinical suspicion, radiographic findings, and laboratory screening for rickets (Servaes et al. 2016). Clinically, affected children may appear apathetic and irritable and prefer to sit rather than stand and walk. The epiphyseal ends of long bones may be tender and swollen (big wrists). Other clinical findings include delayed eruption of teeth, enamel hypoplasia, rachitic rosary, frontal bossing, craniotabes, and genu varum (bowed legs) (Wharton and Bishop 2003). Laboratory findings in rickets include hypophosphatemia, elevated alkaline phosphatase, and elevated parathyroid hormone (PTH). Calcium levels are often variable (normal to low). The diagnosis of rickets requires a detailed evaluation of clinical, laboratory, and radiologic findings (Misra et al. 2008). Low levels of 25-hydroxy vitamin D can confirm the diagnosis, but are not diagnostic in isolation (Perez-Rossello et al. 2012; Schilling et al. 2011; Servaes et al. 2016).

There is a lack of agreement in the literature surrounding the definition of normal levels for 25-hydroxy vitamin D. Most experts agree that levels of 25-hydroxy vitamin D less than 20 ng/ml are deficient, with less than 8 ng/ml indicative of severe deficiency. Levels between 21 and 30 ng/ml are considered insufficient (Gordon et al. 2008; Holick 2009). A prospective study found that in children less than 2 years old vitamin D insufficiency (20–30 ng/ml) was not associated with the diagnosis of child abuse, multiple fractures, rib fractures, or classic metaphyseal lesions (Schilling et al. 2011). Vitamin D insufficiency was not more common in those with unexplained vs accidental fractures (Schilling et al. 2011). A vitamin D level in the insufficient range does not have a clinical correlation with bone health (Servaes et al. 2016).

There is increasing evidence that vitamin D deficiency is common among infants and toddlers (Holick 2007). In a prospective study of children ages 8–24 months, 40% had insufficient levels of vitamin D with 12% deficient (<20 ng/ml) and approximately 2% severely deficient (<8 ng/ml). Of those children found deficient in vitamin D, one-third appeared demineralized on plain radiograph and a few children (3 of 40) demonstrated rachitic changes (Gordon et al. 2008). In another prospective study, demineralization and rachitic changes were also found to be rare in 40 children 8–24 months with vitamin D deficiency (<20 ng/ml) who were otherwise healthy. Within this group, no fractures were discovered (Perez-Rossello et al. 2012). Vitamin D deficiency has certainly been associated with breastfeeding without vitamin supplementation and with inadequate milk consumption.

There are other metabolic causes of osteopenia, osteomalacia, and rickets. Metabolic bone disease should affect the entire skeleton symmetrically. Low levels of 25-hydroxy vitamin D are not diagnostic of metabolic bone disease in isolation and are a common finding in the population. A detailed evaluation including careful history taking, physical examination, and laboratory and radiologic testing should exclude these conditions. Treatment of rickets is guided by the primary cause.

Osteogenesis Imperfecta

Osteogenesis imperfecta (OI), also referred to as brittle bone disease, is a rare (6–7/100,000) (Van Dijk et al. 2013), inherited disorder of connective tissue that results from an abnormal quantity or quality of type I collagen. The clinical result is osteoporosis with increased bone fragility and decreased bone density. There are different variable expressions of the disease. Currently there are 13 types of OI. Types I–V are based on clinical phenotype and radiologic features, and type VI–XIII are phenotypically like type II, III, or IV but with different genetic mutations (Van Dijk et al. 2013). Over half the OI cases are types I and IV (Van Dijk et al. 2013). OI type V is very rare with only 47 cases reported to date (Forin 2010).

Most forms of this disease are easily distinguished from child abuse, but only the rare case may pose difficulties. In infants with OI, one study found that rib fractures and multiple fractures were not found in the time between the neonatal period and

becoming an active toddler (Greeley et al. 2013). They did note that rib fractures were found to result from both the birth process and being an active, mobile child (Greeley et al. 2013).

The following sections describe the major features of each type of OI. Table 4.5 shows common characteristics of the five main OI phenotypes. An important piece of the diagnosis of OI is the emphasis on connective tissue defects including the dental, skin, bone, and sclera. Due to the range of severity expressed, patients may not always fall clearly into one category (Glorieux 2008).

Type I

The most common (and mildest form) of OI is type I, which accounts for 80% of all cases and has autosomal dominant inheritance. No recessive cases have been reported of the OI type I phenotype (Van Dijk et al. 2013). Although type I is a

Table 4.5 Common characteristics of osteogenesis imperfecta phenotypes

Phenotype	Major characteristics	Comments	Confused with abuse	Genetic defect
Type I	80% of all cases Bone fragility mild to moderately severe Fractures occasionally at birth Fractures common during preschool years Radiographic osteopenia Blue sclera Hearing impairment or family history of hearing impairment Wormian bones Easy bruising Normal stature Dentinogenesis imperfecta	Most common form No known recessive inheritance	Sometimes	*COL1A1*
Type II	Death by 1 month of age Severe skeletal deformities Blue sclerae Intrauterine growth retardation Multiple fractures at birth	Perinatal lethal form	Never	*COL1A1* *COL1A2*
Type III	Severe bone fragility Severe osteopenia Fractures at birth (2/3 cases) Extremely short stature Skeletal deformities Sclerae: normal but may be mild blue at birth Triangular facies (85% cases) Dentinogenesis imperfecta (50%) Ligamentous laxity (50%) Easy bruising (25%) Occasional hearing impairment	Most severe nonlethal form	Unlikely	*COL1A1* *COL1A2*

(continued)

Table 4.5 (continued)

Phenotype	Major characteristics	Comments	Confused with abuse	Genetic defect
Type IV	Bone fragility mild to moderate Birth fractures (>1/3 cases) Radiographic osteopenia Wormian bones Triangular facies may be present Short stature may be present Normal sclerae Dentinogenesis imperfecta may be present Hearing impairment uncommon Easy bruising uncommon	Rare	Sometimes	*COL1A1* *COL1A2*
Type V	Bone fragility moderate to severe May have fractures at birth Hyperplastic callus formation Calcification of interosseous membrane in forearm Normal sclerae No dentinogenesis imperfecta May have short stature May have scoliosis May have wormian bones	Rare	Unlikely	*IFITM5*

relatively mild form of OI, the bone fragility varies from mild to moderately severe. Fractures are occasionally present at birth but characteristically begin during preschool years (Sillence 1988). Children often have blue sclerae. Common findings include hearing impairment or a family history of hearing loss and easy bruising due to abnormal collagen in blood vessels. Associated findings such as joint hypermobility and dentinogenesis imperfecta may occur. Stature is usually not significantly impacted (Ablin et al. 1990; Kleinman 2015). Dentinogenesis imperfecta and eventual bowing of long bones are generally not helpful in distinguishing OI type I from abuse, as infants would not yet have these findings (Kleinman 2015).

Type II

Type II is the perinatal lethal form of the disease and is not confused with child abuse. Affected neonates all have severe skeletal deformities, blue sclerae, intrauterine growth retardation, short bowed legs and arms, and multiple fractures at birth. Affected children generally die in early infancy, although there are reports of infants surviving to 1 year of life.

Type III

Type III is the most severe form surviving beyond infancy and is also called "progressive deforming type." Mode of inheritance is usually autosomal dominant, by spontaneous mutation, or rarely autosomal recessive (Ablin et al. 1990). Bone fragility and osteopenia are more severe than in types I and IV, and fractures at birth are present in two-thirds of affected patients (Sillence et al. 1986). Growth deficiency (height achieved is that of a prepubertal child) and skeletal deformities such as scoliosis and bowed limbs are common, often resulting in patients requiring wheelchair use. Sclerae are typically normal but may be mildly blue or gray at birth. Eighty-five percent of patients eventually manifest triangular facies because of soft craniofacial bones and temporal bossing (Sillence 1988). This is usually not apparent in early childhood. Dentinogenesis imperfecta and ligamentous laxity occur in about half of the patients and easy bruising in 25%. Hearing impairment is found only occasionally (Photo 4.37).

Type IV

Type IV is a rare form of OI with autosomal dominant inheritance. This is the most variable form of OI from moderately severe to a mild form of OI (with the first clinical signs occurring at birth or later in school years). Type IV may be the most difficult to distinguish from abuse (Ablin et al. 1990). Bone fragility varies from mild to moderate, and fractures at birth are present in less than one-third of patients. The bones may be normal in radiologic appearance at the time of the first fracture. The

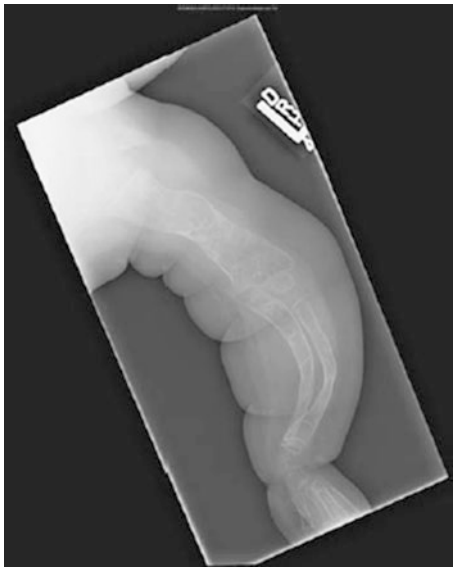

Photo 4.37 Left upper extremity of an infant with osteogenesis imperfecta type III

sclerae are typically normal. Hearing impairment and easy bruising are uncommon. Dentinogenesis imperfecta may be present.

Type V

Type V is similar to type IV due to its variable severity in bone fragility. In fact, type V was originally classified as type IV with negative *COL1* testing until 2000, when it was reclassified as a distinct type of OI (Marini and Blissett 2013). Features unique to type V are hyperplastic callus formation (beginning in later infancy), calcification of the interosseous membrane in the forearm (also beginning in later infancy), and unique histology. Dentinogenesis imperfecta and blue sclerae are not usually present. Type V is very rare.

Distinguishing Osteogenesis Imperfecta from Child Abuse

A number of clinical findings help identify children with OI. Blue sclerae, hearing impairment, dental abnormalities, hypermobility of joints, easy bruising, short stature, wormian skull bones, osteopenia, bowing tendency, angulation of healed fractures, and progressive scoliosis all suggest OI.

The fractures seen in OI are generally diaphyseal, although metaphyseal fractures resembling those seen in abuse are described (Astley 1979). Radiographic changes of generalized osteopenia, bowing, and remodeling deformities can be seen. Vertebral compression fractures may also be identified.

A few children with type IV OI have a normal physical examination, no obvious radiographic evidence of OI, and a negative family history. These children are at risk for an incorrect diagnosis of abuse. Children with OI usually have a history of minor trauma that accounts for the location but not the severity of the injury. Recurrent fractures often occur in different environments, helping to distinguish OI from abuse (Gahagan and Rimsza 1991).

Laboratory testing for bone studies are generally normal, except following a fracture when the alkaline phosphatase may be elevated. Teeth may look normal on gross examination but may show defects on radiograph (Glorieux 2008).

Most cases of OI can be diagnosed clinically; however, genetic testing is useful for prognostic value and for knowledge regarding risk of transmission to potential children (Van Dijk et al. 2013). Ninety percent of OI cases are caused by a mutation in *COL1A1* or *COL1A2* (Van Dijk et al. 2013). For those more recently discovered recessive forms of OI (types VI–XIII), genetic mutations are not found in *COL1* but in genes that produce proteins that act upon type I collagen (Marini and Blissett 2013). Many of these mutations are transmitted in an autosomal dominant pattern; however, many of the more recently discovered genetic mutations that can cause OI are autosomal recessive (Marini and Blissett 2013; Van Dijk et al. 2013). Many cases result from spontaneous mutation, so a negative family history of OI does not

rule out an autosomal dominant form of OI. Various genetic testing panels are available; however, it is reasonable to start by testing *COL1A1* and *COL1A2*.

Culture of skin fibroblasts from a skin biopsy used to be the mainstay of laboratory diagnosis of OI, prior to the widespread availability of genetic testing. However, this modality will also not catch every case of OI. Furthermore, when it does confirm the diagnosis of OI, it does not determine the genetic mutation, lacking prognostic information. If there is any question about the correct diagnosis, the child should be placed in a protective environment while awaiting test results. Finally, it is important to note that osteogenesis imperfecta and child abuse can coexist.

It is also important to note that outside of OI, there are other genetic conditions that can cause bone fragility. These disorders can be classified by the following features: decreased bone density, increased bone density, and slender bones (Bronicki et al. 2015). As these categories imply, there are clinical features that would point to an underlying disorder in these cases, as well as radiographic findings. The vast majority of these conditions cause distinctive craniofacial features that lead to clinical suspicion of the underlying disorder (Bronicki et al. 2015).

In Brief

- Fractures are a common manifestation of abuse, particularly in infants and young children.
- Diaphyseal fractures are the most common type of fracture associated with abuse, but are not specific for inflicted injury.
- The history of injury, development abilities of the child, morphologic type of fracture, and biomechanics are considered in determining the likelihood of abuse in children with diaphyseal fractures.
- Rib fractures and metaphyseal fractures are highly specific for child abuse.
- A skeletal survey should be done in all children less than 2 years of age who have injuries suspicious for abuse.
- The yield from the skeletal survey decreases with increasing age of the child and is not a useful test in children older than 5 years.
- Standards for performing skeletal surveys exist and should be followed (ACR Appropriateness Criteria: Suspected Physical Abuse-Child 2017).
- Radionuclide bone scan may identify infants and young children with subtle injuries that are not detected by skeletal survey.
- Bone scans are excellent in detecting rib injury, but are not useful in identifying skull fractures and do not consistently identify metaphyseal fractures.
- Skeletal surveys should be repeated in 2 weeks in all children under 2 years old undergoing workup for suspected physical abuse.
- A number of disease states predispose to fractures. Careful evaluation usually distinguishes children with pathologic fractures from those who are abused.
- Trauma is the leading cause of bony injury to otherwise healthy bones.
- A medical disease and child abuse can coexist and are not mutually exclusive.

Additional Recommended Reading

ACR appropriateness criteria: Suspected physical abuse-child. (2017). *Journal of the American College of Radiology, 14*(5S), S338–S349. doi:https://doi.org/10.1016/j.jacr.2017.01.036.

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Chapter 5
Abdominal and Thoracic Trauma

Rohit Shenoi

Abdominal and thoracic injuries are some of the most dangerous types of injuries resulting from child abuse. Abusive abdominal trauma ranks as the second most lethal type of inflicted injuries in children after head injuries. Victims of child abuse with significant abdominal and thoracic injuries often succumb to their injuries before diagnosis and treatment. They are young and defenseless and unable to brace themselves against the violent forces that cause these types of injuries. Blunt force caused by kicking or punching is a common mechanism. Several factors such as inaccurate and incomplete history offered by the accompanying adult, the lack of external markers, and the lack of immediately evident specific signs and symptoms often lead to a delayed presentation and diagnosis. Victims presenting late with cardiovascular instability may be assumed to have a medical cause and receive standard cardiopulmonary resuscitation instead of management based on trauma protocols. This explains the high fatality rates associated with these injuries.

This chapter describes the prevalence, nature, and extent of inflicted abdominal and thoracic injuries in children. It will guide the reader in making an early diagnosis by maintaining a high index of suspicion, in the appropriate use of diagnostic tests, and in conducting a comprehensive evaluation of injuries in childhood victims of inflicted visceral trauma.

Epidemiology

Blunt abdominal injuries are uncommon in childhood victims of trauma, accounting for 1.7–7.2% of all types of trauma in children (DiScala et al. 2000; Tracy et al. 1993; Yamamoto et al. 1991). However, among those identified as having

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abdominal trauma, the frequency of inflicted trauma varies from 4% to 19%. In a study of British children, Barnes et al. (2005) described the incidence of abdominal injury due to abuse as 0.9 cases per million children per year for children up to 14 years of age and 2.33 cases per million children per year in those younger than 5 years. Trokel et al. (2006) studied all cases of blunt abdominal trauma, excluding those caused by motor vehicle crashes, in patients aged 0–4 years from the National Pediatric Trauma Registry (NPTR) phases 2 and 3 (October 1995–April 2001). Child abuse was the most common mechanism of injury (40.5%) among the 664 cases that were analyzed. The contribution of race in visceral injuries is complex. It is possible that different races and ethnic groups abuse their children in different ways and may lead to different patterns of injury, but data are not available to prove this. Child abuse may be overdiagnosed in injured minority children or underdiagnosed in White non-Hispanic patients. However, Trokel et al. (2006) suggest that the same risk factors are associated with a medical diagnosis of suspected child abuse in both minority and White children. Trauma to the internal thoracic structures is less common than abdominal injuries. The rate of hospitalizations for abusive abdominal trauma in children 0–9 years was 5.3 per million and for infants was 17.7 per million (Lane et al. 2012). In 2006, abuse contributed to 6% of the approximately 3500 hospitalizations for pediatric abdominal trauma in US children 9 years old and younger. Infants accounted for 25% of those hospitalization (Lane et al. 2012). Also, the incidence of abusive abdominal trauma hospitalizations is up to 10 times higher among those receiving Medicaid compared to those covered by private insurance (Lane et al. 2012). Finally, among children ages 0–18 years who presented to 20 US pediatric emergency departments with torso trauma, inflicted causes contributed to 6% of those visits (Shenoi et al. 2017).

Abdominal Injuries: General Principles

Blunt trauma accounts for the majority of injuries to the abdomen in victims of abuse. Although penetrating injuries do occur (such as stabs or gunshot wounds), they are relatively infrequent when compared to blunt trauma (Canty et al. 1999). Three basic mechanisms of blunt trauma account for the abdominal injuries commonly found in abused children:

1. *Crushing* of solid organs (liver, spleen, and pancreas) of the upper abdomen against the vertebral bodies or bony thorax as a result of a blow to the upper abdomen. Hepatic or splenic injuries may be mild, with small amounts of blood loss, or may result in severe hemorrhage and death. The patient's presentation generally reflects the degree of blood loss, ranging from asymptomatic injuries to hemorrhagic shock or cardiac arrest. Children with pancreatic injury may present with symptoms of pancreatitis.

2. *Sudden compression* of hollow abdominal viscera (intestines, stomach, colon, bladder) against the vertebral column as a result of a blow to the abdomen. Most patients with hollow visceral injuries present for medical care with signs of peritonitis or sepsis, often because of a delay in seeking treatment. Vomiting and abdominal pain also may result from hematoma formation.
3. *Shearing* of the posterior attachments or vascular supply of the abdominal viscera (mesenteric tears, disruption of small intestines at sites of ligament support) occurs as a result of rapid acceleration or deceleration, such as when a child is thrown against a wall. Shearing forces may also result in intestinal perforations (Kleinman 1987). Children generally present with hypotension, shock, or cardiac arrest, reflecting severe blood loss. Patients with intestinal perforations from shearing forces generally present with symptoms related to peritonitis or sepsis.

The spectrum of abdominal injuries includes rupture or hematoma to hollow organs (stomach, small intestine, including duodenum and rectum), pancreatic injury and unexplained pancreatitis, solid organ lacerations or contusions (liver, spleen, or kidney), and injury to major blood vessels (mesenteric vessels are especially susceptible).

Although major abdominal trauma occurs infrequently, it is the second leading cause of death due to physical abuse. The relatively high mortality rate due to abdominal and thoracic injuries is likely due to a number of factors, including:

(a) Young age of the victims with a poorly developed musculature and relatively small anteroposterior abdominal diameter placing intra-abdominal organs at increased risk.
(b) Failure to brace and protect themselves from trauma due to poor coordination.
(c) Delay in seeking appropriate medical care.
(d) Delay in correct diagnosis that occurs when misleading or incomplete histories are provided by the caretaker.
(e) Lack of external signs of trauma.
(f) Severity of injuries sustained to vital organs.
(g) Brisk hemorrhage associated with certain injuries.
(h) Coexisting head injuries.

Studies have found higher mortality rates with abusive abdominal trauma than with accidental injury (Ledbetter et al. 1988; Roaten et al. 2006). Mortality rates in abusive abdominal trauma are highest when there is associated traumatic brain injury (Trokel et al. 2004). Abused victims with fractures may fare better than children without fractures because they may be brought to medical attention earlier and receive definitive management sooner. Mortality rates due to visceral injuries may have decreased in recent years due to the increased awareness of visceral injuries caused by abuse and improved treatment. Among children aged 1–9 years, those with abusive abdominal trauma had higher mortality (9.2%) versus 2.7% of children with noninflicted abdominal trauma. However, among the two groups, there was no significant difference in mortality for children younger than 1 year (Lane et al. 2011).

Peritonitis and sepsis account for most other deaths. Many children with inflicted abdominal injury do not manifest symptoms immediately, and the severity of the injuries may not be readily apparent. Caregivers may incorrectly assume that their actions did not result in severe injuries and may not bring the child for medical care. The severity of the peritonitis and the rapidity with which signs and symptoms develop depend on the location and severity of the initial injury, nature of bacterial contamination of the peritoneal cavity, and the child's preexisting health. In general, signs of peritonitis develop within hours of the injury, although death may be delayed by a few days in untreated cases.

The symptoms and presentation of the child generally reflect the type and severity of the injuries sustained, the time elapsed prior to seeking medical care, and the rate of bleeding. Patients often present with nonspecific abdominal complaints and without a history of trauma. Common, nonspecific presenting symptoms of children with inflicted abdominal trauma include vomiting, which may be bilious (if an obstruction exists), fever, and abdominal pain. Physical examination may reveal fever, abdominal tenderness, abdominal distention, diminished bowel sounds, and other signs indicative of obstruction or peritonitis. Classic peritoneal signs are not always present in infants and young children. In one series, absent bowel sounds and nonlocalized tenderness were the only consistent physical findings in children with intestinal perforations (Cobb et al. 1986).

Affected children are best managed by personnel trained in the management of pediatric trauma. The medical prognosis for children who sustain abusive visceral injury improves if the child survives acutely and is managed aggressively.

Evaluation of Inflicted Abdominal Trauma

The approach to the evaluation is dependent on the severity of injuries. Children with severe injuries presenting in shock or cardiac arrest require full resuscitation and management based on trauma protocols. The stabilization should include a trauma response team and pediatrics specialists in emergency medicine, surgery, and critical care. For children presenting in community hospitals, early transfer to tertiary care centers by transport teams trained in the management of pediatric emergencies and trauma is necessary. Once the child is stabilized, a careful and well-documented history is the most important part of the medical evaluation. This should be followed by a thorough physical examination with meticulous documentation, indicated laboratory studies, and psychosocial assessment. Children with less severe injuries are evaluated according to their symptoms and examination findings.

History

Historical clues to child abuse are the same for abdominal trauma as with other forms of physical abuse (see Chap. 2). The history provided by the caregiver of the child may be incomplete and misleading and may not include a history of trauma. The history may be even more obscure if the child is brought by a nonoffending caregiver who has not witnessed the injury. If the history provided by the perpetrator includes trauma, the trauma is often reportedly trivial. Common chief complaints may be falls down the stairs, off the bed, or off the couch. It is important to remember that stairway falls in children rarely result in a life-threatening injury or significant abdominal trauma (Joffe and Ludwig 1988; Huntimer et al. 2000). If the child is critically ill and has a reported minor trauma, attention may be focused incorrectly solely on central nervous system injury. Coexisting head trauma can obfuscate a clinical examination of the abdomen and further delay the detection of visceral injuries.

With inflicted abdominal injuries, the history focuses on the following:

1. Details of any injury history given
2. Details of when the child was last well and when the child became symptomatic
3. Details of who was with the child at the time of injury or when symptoms initially began

Physical Examination

The initial evaluation of a patient with suspected child abuse should follow trauma assessment protocols. After ensuring that the patient is hemodynamically stable, the examiner completes a full physical examination to identify all injuries. There may be coexisting extraabdominal injuries such as head injuries. A careful head-to-toe examination, concentrating on the skull, extremities, genitalia, and skin, is required. Of note, many children with serious abdominal trauma have no soft tissue injury to the abdomen (Cooper et al. 1988). The internal organs, rather than the skin, absorb the force of the impact (see Fig. 5.1). Lack of abdominal bruising never eliminates intra-abdominal trauma from diagnostic consideration in an abused or otherwise injured child. Abdominal bruising may be absent in up to 80% of victims with abdominal injuries (Maguire et al. 2013). However, abdominal bruising and distension is significantly associated with abdominal injury (Hilmes et al. 2011). During the initial evaluation and later management, attention is paid to assessment of vital signs and mental status, observation, auscultation, and palpation of the child's abdomen. Vital signs include body temperature, heart rate, respiratory rate, and blood

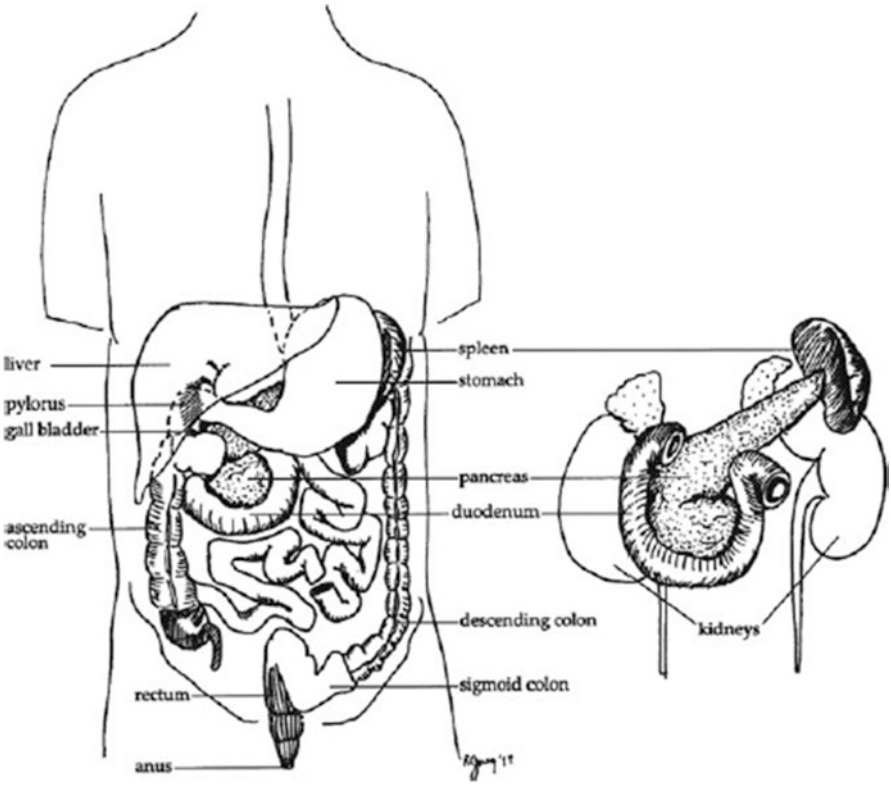

Fig. 5.1 On left, schematic of the abdominal anatomy showing the location of the vital organs with transverse colon not drawn. On right, relative organ position with the stomach and intestines not drawn

pressure. These are important measures of hemodynamic stability and are serially monitored in all patients with suspected abdominal trauma. Serial measurements of the vital signs and hematocrit, especially in response to fluid resuscitation, may help to predict the type and severity of the injury (Cooper et al. 1988). The following are important clinical situations:

- Children with intestinal or pancreatic hematomas have mild blood loss into a confined space and present with mild anemia and stable vital signs.
- Children with intestinal perforations generally are not acutely anemic but may have tachycardia and fever as the result of peritonitis.
- Children with minor solid organ injuries tend to present with low hematocrit, tachycardia, and hypotension, which generally respond clinically to volume resuscitation.
- Children with major solid organ injury or vascular trauma typically present with low hematocrit and profound shock and may not respond clinically to fluid resuscitation.

- Children may maintain relatively normal blood pressure despite significant blood loss until late in the clinical course, at which time the child's condition can deteriorate rapidly.

Findings of the abdominal examination may suggest the etiology of the injury. In the comatose patient, the clinical examination of the abdomen is more limited and interpretation more difficult. The following suggests a systematic approach to the assessment:

1. *Observation of the abdomen*. Look for signs of distention. Abdominal distention may be due to gastric air. Distention that persists after the placement of a nasogastric tube may indicate solid visceral injury or peritonitis.
2. *Auscultation (precedes palpation)*. Note bowel sounds. Absent bowel sounds may indicate perforation and peritonitis. Peritonitis may be accompanied by fever, absent bowel sounds, bloody or bilious nasogastric aspirate, and marked abdominal tenderness with guarding.
3. *Palpation*. Carefully palpate for liver and spleen size and for masses. Note any voluntary or involuntary guarding or rebound tenderness.

Indicated Laboratory/Diagnostic Evaluation Laboratory

The laboratory evaluation is an important part of the workup of abdominal trauma and may prove helpful in evaluating children with possible inflicted abdominal trauma (see Table 5.1).

Table 5.1 At a glance: laboratory tests

Laboratory study	Indications	Notes
CBC with differential, platelet count	Screen for anemia due to blood loss, nutritional deficiency	May need serial samples
	Screen for infection	
	Check platelet count	
Prothrombin time (PT), partial thromboplastin time (PTT) Chemistry panel (electrolytes, BUN, creatinine, glucose, etc.)	Screen for coagulopathies and DIC Screen for metabolic abnormalities Helps assess ongoing fluid management	
Serum aspartate aminotransferase (AST, SGOT) and alanine aminotransferase (ALT, SGPT)	Screen for liver injury	Not specific for trauma
Urinalysis (U/A)	Screen for renal, bladder, genital injury, myoglobinuria or hemoglobinuria, UTI	
Serum amylase and lipase	Screen for pancreatic injury	Not specific for trauma

1. *Complete blood count (CBC with differential)*. The CBC identifies anemia (suggests blood loss in a clinical setting of trauma) and infection (elevation of the white blood cell [WBC] count). Thrombocytopenia may indicate disseminated intravascular coagulopathy (DIC) or an underlying bleeding disorder.
2. *Prothrombin time (PT) and partial thromboplastin time (PTT)*. Screen for coagulopathies or suspected DIC.
3. *Fluid and electrolyte assessment (chemistry panel)*. Children with signs of intra-abdominal pathology frequently require fluid resuscitation and ongoing intravenous fluid management. A chemistry panel is often sent to the laboratory to assist in an ongoing fluid management.
4. *Liver function tests (LFTs) (hepatic transaminases).* Elevations of the serum aspartate aminotransferase (AST) and the serum alanine aminotransferase (ALT) are sensitive predictors of liver injury associated with blunt abdominal trauma. Lindberg et al. (2013) demonstrated that children evaluated for physical abuse with transaminase levels >80 IU/L should undergo definitive testing for abdominal injury (sensitivity of 83.8%, specificity of 83.1%, area under the receiver operating characteristic curve [AUC] of 0.87). Besides traumatic injuries, liver enzyme elevation may occur after a period of ischemia. This is a more diffuse injury that will not be visualized on radiographic studies (Garland et al. 1988).

   It is important to measure hepatic transaminases in all children with suspected abdominal trauma and in young victims of physical abuse as a screen for occult hepatic injury. Serial measurements may be used to support the dating of an injury because enzyme levels return to normal rapidly after blunt trauma. Hepatic transaminases rise rapidly after uncomplicated blunt liver injury and then fall predictably. Persistently stable or increasing concentrations may indicate complications. ALT > AST indicates subacute injury (Baxter et al. 2008). Elevations of hepatic transaminases are not specific for trauma and, depending on the clinical situation, may necessitate evaluation for other etiologies, including hepatitis.
5. *Amylase/lipase*. Elevations of the serum amylase and lipase are markers of pancreatic injury and are measured in all children with suspected abdominal trauma. However, the level of the enzyme increase does not appear to correlate with the extent of injury. By using a threshold of 100 U/L, serum lipase had a sensitivity of 61.5% and a specificity of 79.2%. The AUC for serum lipase to identify an intra-abdominal injury was 0.71 (Lindberg et al. 2013). The AUC for amylase to identify an intra-abdominal injury was 0.67. By using a threshold of 50 U/L, serum amylase had a sensitivity of 62.5% and a specificity of 77.9%.
6. *Urinalysis (U/A)*. Renal injury is usually indicated by the presence of gross blood in the urine, a positive urine dipstick for blood, or a microscopic urinalysis with greater than 20 red blood cells (RBCs) per high-power field. Occasionally, the urine is positive for blood by dipstick, but microscopy reveals no RBCs. Myoglobinuria, or occasionally hemoglobinuria, may be the cause. In the acute situation, elevation of the serum creatine phosphokinase (CPK) supports the diagnosis of myoglobinuria. Elevated CPK in this setting indicates deep contusions and muscle injury.

Radiologic Evaluation

Children with abdominal injuries who are hemodynamically stable are approached differently from those with life-threatening injuries. The following are commonly used methods for imaging the abdomen in children (see Table 5.2).

1. *Plain abdominal radiographs*. Plain films are used for initial evaluation in all stable children with suspected intra-abdominal injury. Films are taken with the patient in the frontal view with the patient supine and erect. A cross-table lateral or left lateral decubitus film is used instead of an erect film for infants or children who cannot assume an erect posture. Hollow visceral perforations are sometimes, but not always, associated with pneumoperitoneum (free air in the abdominal cavity). Perforations of the stomach are most commonly associated with free peritoneal air. If a significant amount of free intraperitoneal air is present, it may be visible on supine views as it outlines the falciform ligament of the liver or if the serosal aspect of the gut opposes it (Kleinman 1998). Free intraperitoneal fluid appears as diffusely increased density or a central location of the bowel on

Table 5.2 At a glance: radiologic evaluation

Study	Detects	Limitations
Plain abdominal radiographs	Intestinal obstruction, ascites, intra-abdominal foreign bodies, free air in abdomen, bone injuries surrounding abdomen	Difficult to detect solid organ injuries
Upper gastrointestinal (UGI) series, barium enema (BE)	Injuries to esophagus, stomach, duodenum, intestines, and colon	Requires contrast Patient must be stable
Ultrasonography (US)	Pancreatic, renal, liver, spleen, and pelvic injuries, free fluid within the abdominal cavity, intestinal hematomas, retroperitoneal injuries	Requires direct contact with abdominal wall
Abdominal CT scan	Solid organ injuries	Requires contrast
	May detect hollow visceral injury, occasionally detects rib fractures	Patient needs to be hemodynamically stable
Radionuclide scans	Anatomy and function of specific organs Bone scintigraphy is an adjunctive examination for detecting bone injuries. It may aid by detecting bony injury that is occult, equivocal, or subtle on plain radiographs	Length of time
Intravenous pyelography (IVP)	Abnormalities of urinary system	Requires contrast
	Used as adjunct to other tests described	
Skeletal survey	New and healing fractures Other abnormalities of skeleton	Difficult to detect solid organ injuries

supine abdominal views. Retroperitoneal perforations (such as to the duodenum) are very difficult to detect on plain radiograph. Plain films can be used to detect intestinal obstruction, ascites, intra-abdominal foreign bodies, and occasional injuries to the bony structures surrounding the abdomen.

2. *Upper gastrointestinal (UGI) series.* UGI studies have limited use in the acute setting but may be used adjunctively in the context of bowel trauma, and in particular to evaluate and follow up duodenal hematomas (Di Pietro et al. 2009), the use of contrast is debatable. Oral contrast in the stomach or small intestine can better delineate the lesser sac of the peritoneum, pancreas, duodenum, or jejunum. However, oral contrast may place a patient at greater risk of aspiration especially if the patient is obtunded, sedated, or immobilized (Sane et al. 2000). Contrast examinations of the gastrointestinal tract define the location and extent of intestinal tract injuries. UGI is frequently used to evaluate esophageal, gastric, duodenal, and jejunal injuries, especially a duodenal hematoma. Small bowel follow-through is used in conjunction with the UGI series to evaluate the small intestine. Contrast enemas visualize colonic abnormalities. Contrast examinations can localize the site of intestinal perforation and can be used for evaluating ulcers and hematomas. Water-soluble contrast media are recommended for patients with possible intestinal perforation.
3. *Ultrasonography (US).* Ultrasound of the abdomen is useful as a screening examination of the abdomen. US identifies free fluid within the abdominal cavity, assesses pancreatic injuries (rupture, pancreatitis, pseudocyst), and evaluates renal anatomy. It can identify solid organ and intestinal hematomas and evaluate the retroperitoneum and pelvis. Focused abdominal sonography (FAST) can rapidly diagnose intra-abdominal injury, especially in patients who are hemodynamically unstable. However, the bony thorax and the presence of air can limit the usefulness of this test. Therefore, US has a complementary role of improving the selection of patients for further imaging without compromising diagnostic accuracy. Computed tomography (CT) is still the preferred imaging modality for seriously injured children and for victims of child abuse since it is more sensitive than US in the detection of hemoperitoneum and solid organ injuries. Abdominal US with or without serial measurements of liver enzymes in place of CT is not recommended.
4. *Contract-enhanced CT of the abdomen and pelvis*. This is the radiographic method of choice for evaluating abdominal trauma. CT of the chest with IV contrast along with CT of the abdomen/pelvis with IV contrast should be considered if intrathoracic vascular injury is suspected (Expert panel on pediatric imaging, 2017). Helical or dynamic axial scanning techniques with proper timing of intravenous contrast bolus are important for accurate diagnosis. The following are conditions and situations where abdominal CT scan is recommended:

    1. Solid organ injuries (if hemodynamically stable)
    2. Intra-abdominal bleeding (if hemodynamically stable)
    3. Physical examination findings uninterpretable because of obtundation
    4. Child undergoing a head CT scan because of neurologic signs of trauma

CT of the abdomen/pelvis with contrast is the method of choice for detecting injuries to solid viscera such as the liver, spleen, or kidney and may detect hollow visceral injury. The CT scan is not sensitive in detecting intestinal injury, such as perforation, intramural hematomas, and mesenteric injury. Portal venous phase imaging is most helpful for detecting solid organ injury. Delayed excretory-phase imaging may be useful in a few selected cases when imaging findings suggest disruption of the genitourinary tract. Noncontrast abdominal CT is not recommended. The need for oral contrast is at the discretion of the radiologist, and its use may be considered when there is concern for duodenal hematoma. CT scan is contraindicated in children who have a history of anaphylaxis to contrast agents, severe shock, and renal failure (Sane et al. 2000). It is not recommended for patients who are hemodynamically unstable despite resuscitative efforts; these patients require emergency laparotomy in the operating room.

5. *Radionuclide scans (liver-spleen scan, radionuclide renal scan)*. Radionuclide scans are inadequate for evaluating suspected visceral injury from child abuse. They have been used to evaluate specific organs for both anatomy and function. Bone scintigraphy is an adjunctive examination for detecting bone injuries. It may aid by detecting the bony injury that is occult, equivocal, or subtle on plain radiographs.
6. *Skeletal survey*. Approximately two-thirds of children with inflicted abdominal injuries have other manifestations of abuse by physical examination or skeletal survey (Ledbetter et al. 1988). Therefore, it is extremely important to obtain a skeletal survey in children with inflicted abdominal trauma. Most victims of abusive abdominal injury are young, and approximately one-third of patients with inflicted abdominal trauma will specifically have skeletal injuries (Cooper et al. 1988; Ledbetter et al. 1988). The skeletal survey is best performed when the patient is stable, but it should be done prior to discharge from the hospital (see Chaps. 2 and 4).

Specific Organ Injuries

Liver

The relative size and location of the liver predispose it to injury from blunt trauma. Liver injuries, such as lacerations and subcapsular hematomas, are among the most common abdominal injuries due to abuse. They are most often due to blows to the upper abdomen, although penetrating injuries can result in liver laceration. The severity of liver injuries varies from asymptomatic to life threatening. (See Table 5.3 for an overview of organ injuries.) Clinical manifestations and management depend on the size of the laceration and its location.

Table 5.3 At a glance: organ injuries

Solid organ injuries		
Liver	Commonly injured in abuse-related abdominal trauma	Lacerations Subcapsular hematomas
Spleen	Infrequently reported as abuse-related	
	Protection from underlying ribs	
Pancreas Renal system	Commonly injured in abuse-related trauma Infrequently reported as abuse-related	Crush injury Pancreatitis
	Protection from surrounding tissues	
Hollow visceral injuries		
Oropharynx/ esophagus		Aspiration, traumatic perforations, burns resulting from caustic ingestion
Stomach	Infrequently reported as abuse-related	
Duodenum	Commonly injured in abuse-related abdominal trauma Vulnerable because of fixed position near the vertebral column	Hematomas Perforations
Jejunum/ileum	Infrequently reported as abuse-related	
Colon	Infrequently reported as abuse-related	Penetrating rectal trauma is of special concern, i.e., rule out sexual abuse

Elevations of hepatic enzymes (ALT, AST) have a reported sensitivity of 100% and a specificity of 92% for predicting hepatic injury in children (Hennes et al. 1990; Karaduman et al. 2003) and contribute significantly to the identification of children with intra-abdominal injuries after blunt trauma (Holmes et al. 2002). The high rate of occult liver injuries in children with suspected physical abuse has led to the recommendation for broader screening of these children for abdominal injury (Jenny 2006). It is measured in all patients with suspected abdominal trauma and in infants and young children with other signs of physical abuse. Lindberg et al. (2013) demonstrated that children evaluated for physical abuse with transaminase levels >80 IU/L should undergo definitive testing for abdominal injury. CT of the abdomen/pelvis with contrast is the method of choice for imaging the liver in cases of abdominal trauma and is done unless the child requires immediate surgical intervention. Small lacerations and many subcapsular hematomas are treated nonoperatively, although more extensive injuries require surgical repair.

Liver laceration is a reported complication of CPR in adults, usually in association with rib fractures. Liver lacerations also have been reported in association with CPR in young children (Krischer et al. 1987). The first reports date back to the early 1960s prior to widespread acknowledgment of physical abuse. Abuse may not have

been recognized in these early case reports. Although children who died with liver lacerations were not identified as abused, the cause of death remained undetermined. In one case, the child had previously suffered "traumatic brain injury" (Thaler and Krause 1962). Liver lacerations resulting from CPR are extremely rare in children and should not be assumed to be the result of CPR, especially if the child dies and the cause of death is undetermined.

Spleen

Splenic injury is often caused by accidental trauma but is infrequently reported as the result of abuse (Caniano et al. 1986; Ledbetter et al. 1988). This may relate to its position underlying the ribs (Cooper 1992). Splenic injury should be suspected in any child with left-sided chest wall pain. Contusions of the spleen and subcapsular hematomas are more common than splenic lacerations in nonaccidental trauma. A splenic rupture in a preambulatory child is strongly suggestive of abuse. Like liver injuries, the severity of splenic injuries ranges from minor to life threatening. Evaluation for splenic injuries is done by CT abdomen/pelvis with contrast. Management is dependent on the extent of the injury, and surgical repair may be required. Attempts at salvaging the spleen are a mainstay in the therapeutic approach to this form of injury.

Pancreas

Pancreatic injury resulting from blunt trauma to the upper abdomen occurs with some frequency. The body of the pancreas overlies the spine and can be crushed with significant blows to the epigastrium. Injury to the pancreas typically results in pancreatitis because of the release and activation of pancreatic enzymes. Causes of pancreatitis in childhood include biliary tract disease, congenital anomalies, cystic fibrosis, infection, and medications (Ziegler et al. 1988). Trauma is a leading cause of pancreatitis in children (Cooney and Grosfeld 1975). Abuse is a leading cause of traumatic pancreatitis in children younger than 4 years of age and is often associated with other manifestations of abuse (Ziegler et al. 1988). Other trauma-related causes include those caused by bicycle handlebars, motor vehicle crashes, and falls. Pancreatic pseudocysts, which may develop after abuse (Pena and Medovy 1973), form as resultant fluid collections and become confined, beginning within a few days of the injury.

The development of pancreatitis after trauma may be insidious so that not all children present with it in the acute period. Most children with pancreatitis eventually develop abdominal pain, vomiting, fever, abdominal distention, or other nonspecific symptoms. Elevation of the serum amylase and/or lipase level in children

with abdominal symptoms indicates pancreatic involvement. CT scan and US are most useful in identifying pancreatic injuries.

The management of pancreatitis is usually conservative and consists of bowel and bed rest, nasogastric decompression, and pain and nutritional therapy. Surgery is reserved for children with severe pancreatic injury and those who require drainage of pseudocysts.

Kidney, Bladder, and Urinary Tract

Abuse may result in injuries to the kidneys, ureters, and bladder. Severe blows to the flank most commonly cause renal contusions or lacerations. Because the kidneys are well protected by their location and surrounding anatomy, trauma severe enough to cause renal injury is often associated with injuries to other abdominal organs. Although children may present with flank pain and tenderness, these symptoms are not universally present. Hematuria (gross hematuria or greater than 20 RBCs per high-power field) generally indicates renal involvement in children with abdominal trauma. The severity of the renal injury is not reflected by the degree of hematuria, so all children with hematuria require renal imaging by CT scan or other methods. Both myoglobinuria (secondary to rhabdomyolysis and muscle injury) and hemoglobinuria may result from abuse and can be mistaken for hematuria (Mukerji and Siegel 1987; Rimer and Roy 1977). Unlike hematuria, neither will show microscopic evidence of urinary RBCs. Myoglobinuria and hemoglobinuria may result in renal failure. Most renal injuries are managed conservatively and do not require surgery. Myoglobinuria and hemoglobinuria require aggressive medical treatment and careful hydration.

Bladder injuries from abuse are unusual but have been reported (Halsted and Shapiro 1979). Traumatic rupture of superior surface of the bladder can occur as a consequence of inflicted blows to the abdomen and present with pseudorenal failure (Yang et al. 2002). With rupture of the bladder, urine and blood extravasate into the peritoneal cavity. Peritoneal resorption of urine produces electrolyte imbalance, acidosis, and uremia. Victims who present early do not have significantly increased BUN or creatinine concentrations. However, a delay in presentation and diagnosis of bladder rupture results in significant resorption of urea and creatinine through peritoneal dialysis. The recognition of a possible relationship between an elevated BUN and intraperitoneal rupture of the bladder may be the only indication of this diagnosis in clinically unsuspected cases. The diagnostic test of choice is a retrograde cystogram radiograph. The outcome of surgical treatment of traumatic bladder rupture is generally good, but delayed diagnosis may lead to abscess and urinary fistula formation.

Stomach and Bowel Perforation Injuries

Injuries to the hollow viscera of the abdominal cavity, especially in children younger than 4 years of age, should be an important red flag for child maltreatment. Hollow viscera are more commonly injured in abused children as compared to children who sustain accidental abdominal trauma (Ledbetter et al. 1988; Trokel et al. 2006). Injuries are generally due to either direct blows to the abdomen or shearing forces associated with rapid deceleration. Bowel perforations may occur anywhere along the course of the intestine, but most tend to be located in the duodenum (Tracy et al. 1993; Nijs et al. 1997) because of its fixed position in the retroperitoneum and at the duodenojejunal junction. Children (particularly infants and toddlers) with perforations or hematomas to the intestinal tract, without a history of significant accidental trauma, require a full evaluation for child abuse. Findings on CT suggestive of small bowel or mesenteric injury include free intraperitoneal fluid, thickened bowel wall, and extraluminal air (Frick et al. 1999).

Oropharynx/Esophagus

Injuries to the pharynx and esophagus due to child abuse are reported occasionally. Reported injuries include foreign body aspirations (Nolte 1993), traumatic perforations, and burns resulting from caustic ingestion (Friedman 1987; McDowell and Fielding 1984). Children with esophageal foreign bodies typically present with respiratory symptoms either from direct compression of the membranous tracheal wall by the object or infection that develops in surrounding tissues. Patients with significant injury to the posterior oropharynx, hypopharynx, esophagus, or trachea often present with fever, subcutaneous emphysema, erythematous swelling of the neck, hemoptysis, hematemesis, or pneumomediastinum. Caustic ingestions manifest by drooling, respiratory distress, oral burns, and/or stridor.

Stomach

Gastric perforation is reported in the child abuse literature, although it is not a frequent injury (McCort and Vaudagna 1964; Schechner and Ehrlich 1974). Gastric perforation is more common if the child has a full stomach at the time of the trauma. Children with gastric perforation have rapid manifestations of the injury because of pain associated with gastric spasms and the noxious effects of gastric acid in the peritoneum. Gastric perforation is usually indicated by a distended, tense abdomen,

and pneumoperitoneum on plain radiograph. Gastric perforations require timely operative repair. Gastric perforation is reported as a complication of CPR, albeit rare (Krischer et al. 1987). Gastric distention can accompany duodenal hematomas secondary to the obstructive effect of the hematoma.

Duodenum

Duodenal hematomas and perforations are among the more frequent abdominal injuries that result from abuse (Ledbetter et al. 1988; McCort and Vaudagna 1964; Woolley et al. 1978; Gaines et al. 2004). Duodenal injuries commonly involve the third or fourth part of this structure (Maguire et al. 2013). The duodenum is at risk for injury due to its relatively fixed position in the upper mid-abdomen, its proximity to the vertebral column, and its rich blood supply from the pancreaticoduodenal arteries. A crushing injury that forces the duodenum against the vertebral column typically results in rupture of the duodenal blood vessels. This results in a hematoma that develops between the mucosa and serosa. As the hematoma expands, the duodenal lumen narrows, leading to partial (or occasionally complete) obstruction. Duodenal hematoma can result from both accidental and inflicted trauma. Children with duodenal hematoma often have some delay in presentation because the signs of obstruction develop with time. Children typically present with vomiting and abdominal pain and have abdominal tenderness on examination. Associated injuries to the pancreas may be found.

Plain films may be normal but may show gastric dilatation and decreased bowel gas. The diagnosis of a duodenal hematoma can be made by UGI series, CT, and US. Affected children may have significant anemia (Woolley et al. 1978). Children who present with unexplained duodenal hematoma should be screened for coagulopathies, and young victims should have a skeletal survey.

Injuries to the duodenum result in prolonged hospitalization. Treatment of duodenal hematoma is conservative, with bowel rest and nasogastric suctioning. Surgery to evacuate the hematoma is occasionally required. Transections, avulsions, and lacerations of the duodenum may also result from abuse (Tracy et al. 1993; Woolley et al. 1978). Children with perforations of the duodenum present with vomiting, abdominal pain, and signs of sepsis. Classic signs of peritonitis may be absent because of the duodenum's location in the retroperitoneum. Plain films are often normal if the perforation is in the retroperitoneum. Radiographic diagnosis is best made by UGI with water-soluble contrast media. Treatment requires surgical repair.

Jejunum/Ileum

Perforations and hematomas of the small intestine may occur in abused children with abdominal trauma. They are infrequent in accidentally injured children (Ledbetter et al. 1988). A majority of intestinal perforations are located in the jejunum, near the ligament of Treitz, and are the result of either direct compression associated with blows to the abdomen or shearing forces. A delay in presentation is common. Peritoneal signs typically develop within 6–12 h after perforation, but children are sometimes brought for medical treatment only after days have passed. Children may present with signs of peritonitis and sepsis, although classic peritoneal findings may not be present (Cobb et al. 1986). Plain radiographs may reveal free air. UGI may locate the perforation, although in many patients the need for laparotomy precludes the usefulness of extensive radiographic evaluation. Surgical resection or repair constitutes definitive treatment.

Colon

Abused children sustain injuries to the colon infrequently. There are occasional reports of colonic injury from blunt abdominal trauma (Caniano et al. 1986). Injuries to the colon are also associated with penetrating rectal trauma that may be the result of physical or sexual abuse (Press et al. 1991). Signs related to peritonitis are often present. Rectal blood is usually present in children who present with injuries to the colon and/or rectum. Colonic perforations require surgical repair.

Retroperitoneal Vascular Injuries

Severe deceleration injuries that result in shearing of the mesentery and retroperitoneal vascular supply to the abdomen are occasionally encountered (Cooper et al. 1988; Dworkind et al. 1990). Shearing injuries result in retroperitoneal hemorrhage, which can be life threatening. Injuries to larger retroperitoneal vessels may result in hemorrhagic shock; emergency laparotomy is required to save the child's life. CT scan sometimes identifies smaller retroperitoneal hematomas. Children with less severe injuries may be managed conservatively, without operative repair.

Differential Diagnosis

In additional to common conditions such as infective gastrointestinal and respiratory conditions, the following conditions are important to consider in the differential diagnosis of inflicted visceral trauma:

1. Seat belt syndrome. Child passengers between 4 and 8 years of age may be inappropriately restrained in lap belts, alone or in combination with shoulder restraints, instead of belt-positioning booster seats. In these children there is a tendency for the lap belt to ride over the abdomen rather than over the hips. The sudden deceleration forces generated in automobile crashes can cause significant blunt force injuries to the abdomen and spine. The findings in the seat belt syndrome include abdominal wall ecchymosis, small bowel injury, and lumbar spine injury or Chance fractures.
2. Bicycle handle bar injuries. A child who is accidently struck in the abdomen by a bicycle handle bar can present with injuries to the bowel, pancreas, or liver.
3. Falls. Though falls can result in intra-abdominal injuries, it is important to obtain a history of blunt or penetrating force trauma in a child who presents with injuries sustained after a fall. Stairway falls in children rarely result in life-threatening injury or significant abdominal trauma (Joffe and Ludwig 1988; Huntimer et al. 2000).

   Most children who sustain significant inflicted abdominal trauma are young, generally between 6 months and 3 years of age (Cobb et al. 1986; Cooper et al. 1988), and tend to be younger than those with accidental abdominal trauma (Ledbetter et al. 1988). When compared to children who die of inflicted head trauma, those with fatal abdominal injuries tend to be slightly older (Cooper et al. 1988). Ledbetter et al. (1988) compared accidental and abusive injuries in 156 cases of abdominal trauma. Eleven percent were due to abuse. The abused group tended to be younger (mean age, 2½ years), have a history inconsistent with their physical findings, and have a higher incidence of hollow viscus injuries. Wood et al. (2005) found that young abused children were more likely to have hollow viscus injuries alone or in combination with solid organ injuries and a delay in seeking care than young children with accidental abdominal trauma. However, the delay in seeking care was not specific for inflicted injury and occurred in some children with low-velocity accidental abdominal trauma. Trokel et al. (2006) evaluated the associations between patient and injury characteristics and the medical diagnosis of suspected child abuse. They concluded that young children with severe pancreatic or hollow viscus injuries or severe abdominal injuries in the context of either brain injury or undernourishment should be evaluated for the possibility that these injuries resulted from abuse. Small bowel injuries due to abuse are 2.3 times more likely than those due to motor vehicle crashes and 5.7 times more likely than those due to falls. Therefore, injuries to the small bowel in young children need special consideration, particularly if a minor fall is the explanation (Barnes et al. 2005).

4. Other conditions. Acute appendicitis with bowel perforation and hematuria in patients with glomerulonephritis or resulting from minor trauma in patients with hydronephrosis and Wilms tumor can also mimic child abuse.

Thoracic Injuries

While not as common as inflicted head injuries, thoracic injuries are an important source of morbidity and mortality in children. They are an independent predictor of mortality in pediatric trauma patients (Peclet et al. 1990). Roaten et al. (2006) reported that thoracic injuries including pulmonary contusions, rib fractures, and clavicle fractures were three times more common in child abuse victims (17%) than in those with accidental trauma (6%) in a regional pediatric trauma center. Using data from the National Pediatric Trauma Registry between 1988 and 1997, DiScala et al. (2000) compared hospitalized children under age 5 years who were victims of child abuse with victims of unintentional injuries. Thoracic injuries were more common following child abuse (12.5%) than after accidental trauma (4.5%).

Children have important anatomic and physiologic differences when compared to adults. Unlike adults, children undergo constant growth and change. The greater flexibility of the thoracic cage in young children permits the anterior ribs to be compressed to meet the posterior ribs. As a result, pulmonary contusions are more common, whereas rib fractures occur less frequently in children than adults (Nakayama et al. 1989). As the bony rib cage ossifies, fractures and flail segments begin to occur. Similarly, bony thoracic spine injuries are uncommon in infancy through preadolescence. Because the bones are incompletely ossified, the ligamentous attachments are more flexible, and the supportive musculature is not fully developed, younger patients are more likely to experience injuries without plain film abnormalities.

The internal thoracic organs in children are not only smaller than in adults but exhibit different physiologic characteristics. Early in life, the trachea is narrow, short, more compressible, and narrowest at the level of the cricoid cartilage. Therefore, small changes in airway diameter or seemingly inconsequential wounds in the thoracic cage may lead to rapid respiratory embarrassment. In addition, children have a diminished functional residual capacity coupled with higher oxygen consumption per unit body mass and are therefore more prone to the rapid evolution of hypoxemia.

Direct lung injury usually manifests as nonanatomic areas of consolidation often in the absence of rib fractures, chest wall bruising, or other external anatomic correlates of lung trauma. At a parenchymal level, findings include alveolar hemorrhage, consolidation, and edema. The physiologic consequences include ventilation/perfusion mismatch, decreased compliance, hypoxemia, and hypoventilation.

Cardiac function in children is able to compensate for a remarkable degree of hypovolemia. Cardiac output is largely determined by heart rate and preload, whereas contractility is largely fixed. Whereas adults may manifest hypotension after a 15–20% blood volume loss, children may remain compensated with up to a

40% blood loss. Myocardial dysfunction, although rare, may follow cardiac contusion. In this setting, posttraumatic dysrhythmias may also precipitate rapid physiologic deterioration. Furthermore, the less prominent fixation of the mediastinum in children allows for more visceral shift, compromise of preload and profound hypotension (Bliss and Silen 2002).

Pulmonary Injuries

These injuries include pulmonary contusions, hemothorax, pneumomediastinum, and pneumothorax. Contusions and lacerations of the lower lungs are occasionally identified by abdominal CT (Sivit et al. 1989). Although rib fractures in abused infants are common (see Chap. 4), symptomatic pulmonary injury is unusual. In isolation, rib fractures are a rare source of morbidity or mortality but indicate significant energy transfer. In the age group 0–3 years, child abuse is a paramount concern after ruling out conditions of bony fragility such as osteogenesis imperfecta and rickets. As with significant abdominal trauma, external signs of trauma such as bruising over the chest wall may be absent despite serious intrathoracic injury. Chest radiographs followed by CT scan of the chest with intravenous contrast are performed if the patient is stable and internal chest injury is suspected.

Pulmonary contusions are among the most common thoracic injuries in traumatized children. Patients with significant pulmonary contusions present with tachypnea and hypoxia. The initial chest radiograph can detect pulmonary contusions in most patients. They resemble infiltrates on radiographs shortly after injury. However, radiographic findings in pulmonary contusions are observed much earlier than those caused by aspiration which is typically delayed. Management of most pulmonary injuries is supportive, and operative repair is not usually required for blunt force injuries. Pneumothoraces can be present in older children with rib fractures, but infants may present with them without rib fractures due to a compliant chest wall. Prompt drainage of intrathoracic collections of air or fluid that may limit pulmonary expansion facilitates a rapid return to normal physiology.

Noncardiogenic pulmonary edema can occur after intentional suffocation or inflicted head injury. This usually has a rapid onset. At presentation, these children have diffuse inspiratory rales; pink, frothy pulmonary secretions; and chest radiographs with infiltrates. The appearance of these secretions, coupled with the rapid clinical and radiographic improvement in the course of illness, helps exclude the diagnosis of infiltrates because of aspiration, infection, or ingestion of toxic drugs or chemicals. Victims of intentional suffocation have characteristic family and medical histories that should alert the physician to consider the diagnosis during evaluation of unexplained acute life-threatening events in infants, especially those with a recent history of wellness (Rubin et al. 2001).

Occasionally, chylothorax from injury to the thoracic duct may be attributed to child abuse (Anderst 2007; Guleserian et al. 1996; Geismar et al. 1997). The anatomy of the thoracic duct predisposes it to traumatic rupture with compressive and/

or acceleration–deceleration forces. It enters the posterior mediastinum from the abdominal cavity by passing through the aortic hiatus of the diaphragm on the anterior surface of the vertebral column. Continuing extrapleurally in the posterior mediastinum up the right side of the vertebrae, the duct then crosses to the left side of the vertebral column, typically between the fourth and sixth vertebrae, before traveling cephalad and exiting the thoracic inlet. Disruption of the duct in the thorax leads to an accumulation of extrapleural chyle, which may eventually rupture the mediastinal pleura and form a chylothorax. Abusive chylothorax occurs when the thoracic duct is subjected to shearing forces against compressed ribs and/or vertebrae in association with spinal hyperextension during shaking.

Though blunt trauma to the chest is more common, penetrating injuries to the chest occasionally occur from child abuse. These injuries are best managed by pediatric surgeons trained in trauma.

Cardiac Injuries

Direct cardiac injuries are rarely seen following child abuse. Cardiac injuries as the result of abuse have been reported (Cumberland et al. 1991; Marino and Langston 1982; Rees et al. 1975). Rees et al. (1975) reported a traumatic ventriculoseptal defect (VSD) that resulted from a kick to the chest of a 5-year-old girl, and Karpas et al. (2002) reported a 5-month-old infant who sustained a traumatic VSD and left ventricular aneurysm after inflicted blunt trauma to the chest. She presented in cardiac failure and was treated medically with eventual surgical repair. This injury was felt to have occurred from the heart being distorted and crushed against the vertebrae. Cumberland et al. (1991) report intimal tears of the right atrium found at autopsy of six children, three of whom were teenagers who died in motor vehicle accidents (MVAs) and three of whom were young victims of abuse. All six children had associated liver lacerations and other signs of abdominal trauma. The authors postulate that the cardiac injuries were the result of transmitted hydrostatic forces from the abdomen, through the inferior vena cava, and to the fixed right atrium.

Commotio cordis is a condition where a disorganized cardiac rhythm and collapse rapidly ensue following blunt trauma to the chest. Denton and Kalelkar (2000) described two children aged 14 months and 3 years who collapsed immediately after being struck on the chest by a closed fist and died. No external chest trauma was visible in one child. Commotio cordis was also reported by Boglioli et al. (1998) in a 28-month-old boy and by Baker et al. (2003) in a 7-week-old infant due to child abuse.

Blunt cardiac injuries can result in electrical conduction abnormalities. Children with suspected cardiac injuries require continuous electrocardiogram (ECG) monitoring, chest radiography, echocardiography, and serial cardiac enzymes. Elevated cardiac enzymes (troponin I and CPK MB fractions) are helpful in diagnosing cardiac muscle damage. Close monitoring and serial physical examinations are essential to identify the development of life-threatening complications of blunt cardiac inju-

ries which include dysrhythmias, traumatic VSD, and ventricular wall aneurysms (Karpas et al. 2002). In general, significant myocardial contusion can be ruled out when 12-lead ECG and echocardiography findings are normal (Wesson 1998).

In Brief

- Visceral injuries are rare in children, but when they occur, they are more likely to be nonaccidental in etiology.
- Most victims of serious inflicted visceral injury are infants and toddlers.
- The vast majority of injuries are due to blunt trauma, not penetrating injury.
- Nonaccidental trauma should be suspected in children with visceral injuries, with an unclear history, or accompanying head trauma or malnourishment.
- The mechanism of injury is related to *crushing* of solid organs, *compression* of hollow viscera against the vertebrae or bony thorax, or *shearing* forces that result from sudden deceleration.
- Morbidity and mortality associated with abusive abdominal injury are related to delays in diagnosis and treatment, which stem from delayed presentation of the victim.
- Rib fractures commonly result from inflicted thoracic trauma. Inflicted cardiac and pulmonary injuries are less common.
- Infant and child victims of physical abuse should be screened for abdominal injuries by history, physical examination, and appropriate screening tests, including AST, ALT, and amylase. Solid organ injuries are the most common visceral injuries resulting from abuse but are also seen with accidental trauma. Hollow visceral injury is more common with inflicted trauma than with accidental injury.
- Vital signs, serial hematocrit, and the response to fluids generally indicate the severity and probable type of abdominal injury present.
- Contrast-enhanced CT of the abdomen/pelvis is the imaging modality of choice to detect visceral injury, although plain abdominal radiography, US, gastrointestinal contrast studies, and radionuclide studies all contribute to the noninvasive evaluation of visceral trauma.
- Most solid organ injuries are treated conservatively without the need for surgery. Laparotomy is required for repair of intestinal perforation and of significant mesenteric and vascular injuries.
- Children who survive the acute assault generally have a good medical outcome.

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Chapter 6
Abusive Head Trauma

Donna Mendez and Erin E. Endom

Introduction

Abusive head trauma (AHT) is the most common cause of death in abused children, especially those under 2 years of age (Nuño et al. 2015; Niederkrotenthaler et al. 2013; Yu et al. 2018). The incidence of AHT in the first 2 years of life has been shown to be 16–33% per 100,000 infants per year; this is felt to be an underestimate (Keenan and Runyan 2003; Palusci and Covington 2014; Narang and Clarke 2014). A recent retrospective analysis of hospitalizations for AHT revealed national rates of 39.8/100,000 children under 1 year and 6.8/100,000 children 1–2 years old (Niederkrotenthaler et al. 2013).

A review of the 2005–2009 data from the United States National Child Death Review Case Reporting System found that 30% of deaths due to child maltreatment resulted from AHT (Palusci and Covington 2014). Children with AHT have been found to have a fivefold higher mortality rate compared to nonabusive head trauma (nAHT) (Niederkrotenthaler et al. 2013). A recent Texas-based study found an 11% mortality rate in children under 5 years of age with AHT (Yu et al. 2018). A similar mortality rate of 10.8% was found in a review of children under the age of 2 years (Nuño et al. 2015). While the majority of AHT occurs in infants under 1 year, recent studies have shown a significantly higher mortality rate in children older than 1 year (Nuño et al. 2015; Yu et al. 2018).

Known risk factors for AHT include male gender, age under 1 year, male caregiver (father, stepfather, or male partner of mother), nonparental caregiver, young or

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unmarried mother, prenatal care initiated after the first trimester, parents with low socioeconomic status, parent in the military, presence of extended family in the home, and infant crying (Keenan et al. 2003; Niederkrotenthaler et al. 2013; Scribano et al. 2013; Palusci and Covington 2014; Nuño et al. 2015).

The estimated annual cost of US hospital visits for the initial evaluation and management of AHT is $69.6 million/year (Peterson et al. 2015). Medical costs may continue for years following diagnosis and include inpatient, outpatient, and medication costs (Peterson et al. 2014).

Definition

AHT is any injury to the skull or intracranial contents of an infant or child younger than 5 years caused by inflicted blunt impact, violent shaking, or both (Parks et al. 2012). The American Academy of Pediatrics (AAP) has recommended that the term *shaken baby syndrome* be replaced in medical records with the broader term *abusive head trauma*, which allows for consideration of multiple mechanisms of injury in any child (Christian and Block 2009).

Anatomy and General Principles

Children are more vulnerable than adults to intracranial injury because of their anatomy. The child's anatomy differs from the adult's in that the child's neck muscles are weaker, the head is large in proportion to the body, the skull is thinner, the base of skull is relatively flat, and the brain is softer.

The skull and subarachnoid space of the infant are different from that of an adult. The base of the infant skull is relatively flat, permitting the brain to move more readily in response to acceleration-deceleration forces. As the child matures, the brain moves less due to the development of prominent bony ridges and concavities of the basilar skull. The infant skull is thinner and more pliable, and because of this, forces are transferred more effectively across the shallow subarachnoid space to the brain. The subarachnoid space is larger and shallower than that in adults, contributing to this increased transfer of forces (Gean 1994; Pounder 1997; Kriel et al. 1988).

The head of an infant is relatively large, heavy, and unstable. The rapid growth of the brain and skull accounts for the large and heavy head. The brain of an average 2-year-old child is approximately 75% the weight of an average adult brain. The large head and weak neck musculature permit greater movement when the head is undergoing acceleration-deceleration forces. In addition, the weak cervical muscles cannot adequately stop the head's motion once acceleration starts (Gean 1994; Wilkins and Rengachary 1985).

Infants and young children have relatively soft, jellylike brains with high water content. Other reasons why the young child's brain is softer than an adult's are the following: the central nervous system is not completely myelinated; the axons are

smaller than that of adults; and the brain is primarily composed of neurons without dendritic connection (Gean 1994; Wilkins and Rengachary 1985).

Because of the unique characteristics of the developing skull and brain, children younger than 5 years are particularly vulnerable to shearing brain injury. Shearing is the stretching and tearing of the tiny nerve cells that comprise the brain. Impact to the immature brain is more likely to produce shearing injury rather than the typical brain contusions that might occur in older children and adults (Gean 1994).

Signs and Symptoms

The signs and symptoms of AHT are those seen in nAHT, such as vomiting (Hobbs et al. 2005; Starling et al. 2004; Vinchon et al. 2005), altered status (Hobbs et al. 2005; Starling et al. 2004; Vinchon et al. 2010; Bechtel et al. 2004), seizures (Hobbs et al. 2005; Starling et al. 2004; Vinchon et al. 2005, 2010; Bechtel et al. 2004; Hettler and Greenes 2003), and apnea (Hobbs et al. 2005; Starling et al. 2004; Hettler and Greenes 2003). One may misdiagnose mild AHT due to nonspecific symptoms such as vomiting or fussiness. In one study, 31% of children diagnosed with AHT had been evaluated previously by a physician for symptoms compatible with brain injury yet diagnosed with such illnesses as gastroenteritis or colic (Jenny et al. 1999). Because of the potential missed diagnoses of AHT, studies have tried to better identify mild AHT.

Several researchers have developed and studied standardized methods for detecting injuries that may have been abusive (Berger and Pearce 2002; McKinney et al. 2004; Sidebotham et al. 2007). Typically these methods have been developed for use in the emergency department. It has been shown that these tools can increase the rate at which child abuse is considered and detected (Rangel et al. 2009; Louwers et al. 2011; Smeekens et al. 2011; Sittig et al. 2014). An example is an observational study of a universal child abuse screening tool in multiple emergency departments that saw over 104,000 children. There was a significant increase in the rate of detection of child abuse among screened children when compared to children who were not screened (0.5% versus 0.1%, respectively) (Louwers et al. 2012). However, the low accuracy and difficulty in obtaining consistent use of these instruments in routine practice raised concerns regarding their utility. For example, in a multicenter prospective observational study of a validated child abuse screening tool during more than 38,000 child emergency department visits, fewer than half of the patients had the instrument completed, and only 420 were positive (Smeekens et al. 2011). Sensitivity and specificity of the tool were 80% and 98%, respectively. Negative predictive value for the screening tool was 99%, and positive predictive value was 10%. A total of 89 patients were referred for a child abuse evaluation, and 55 were judged to have been abused (prevalence 0.1%). In a systematic review of the diagnostic accuracy of screening tools designed to detect child abuse, sensitivity ranged from 26% to 97% and specificity from about 50% to 100% (Bailhache et al. 2013).

In a more recent study by Berger et al. (2016), 5 predictor variables for AHT were identified: age >3 months, head circumference percentile >90%, serum hemoglobin <11.2 g/dL, abnormality on neurologic or dermatologic examination, and a previous ED visit for a high-risk symptom. A clinical decision rule was derived to identify children at low risk for AHT. The 5-point model included abnormality on dermatologic examination (2 points), age >3.0 months (1 point), head circumference > 85th percentile (1 point), and serum hemoglobin <11.2 g/dL (1 point). At a score of 2, the sensitivity and specificity for abnormal neuroimaging was 93. This is a promising study, but overall more research is needed before a universal screening tool can be accepted. Use of the current guidelines such as those of the National Institute for Health and Care Excellence (NICE) and the AAP is recommended. According to the NICE guidelines, one should suspect child maltreatment if a child has an intracranial injury in the absence of major confirmed accidental trauma or known medical cause, in one or more of the following circumstances:

1. The explanation for the injury is absent or implausible.
2. The child is under 3 years old.
3. The injury is accompanied by retinal hemorrhages, rib or long-bone fractures, or other associated inflicted injuries.
4. There are multiple subdural hemorrhages, with or without subarachnoid hemorrhage and with or without hypoxic ischemic damage to the brain.

According to the AAP, histories that are suspicious for abuse include:

1. There is either no explanation or a vague explanation given for a significant injury.
2. There is an explicit denial of trauma in a child with obvious injury.
3. An important detail of the explanation changes in a substantive way.
4. An explanation is provided that is inconsistent with the pattern, age, or severity of the injury or injuries.
5. An explanation is provided that is inconsistent with the child's physical and/or developmental capabilities.
6. There is an unexplained or unexpected notable delay in seeking medical care.
7. Different witnesses provide markedly different explanations for the injury or injuries (Christian 2015).

Forces

AHT may be caused by blunt force, shaking, or a combination of forces (Table 6.1). Rotational (angular) forces are prominent in AHT. Biochemical forces generated during AHT and nAHT are different. Most nAHT is due to contact forces and translational forces. Contact forces, which occur when the head is struck or strikes an object, produce focal injuries to the scalp, skull, and brain. These can be seen as

Table 6.1 Injury types produced by abusive (AHT) and nonabusive (nAHT) head trauma

Type of traumatic brain injury	Type of force	Type of injury seen	Morbidity/mortality
Inflicted	Contact Rotational	Diffuse axonal injury Subdural hemorrhage	Poor
Noninflicted	Contact Translational	Epidural hemorrhage Subdural hemorrhage Contusion Laceration	Fair

skull fractures, intracranial cerebral lacerations, contusions, and epidural or subdural hemorrhages (Duhaime et al. 1987; Duhaime and Raghupathi 1999; Gennarelli 1993; Bandak 1995; McIntosh et al. 1996; Ommaya 1995; Hanigan et al. 1987; Marguilies and Thibault 1998). Translational forces produce linear movement of the brain. This type of movement is quite benign, such as that caused by short falls (Ommaya et al. 1968; Gennarelli et al. 1982). Although such falls may occasionally result in skull fractures, these incidents are generally benign and do not result in loss of consciousness, neurologic deficit, or death (Duhaime et al. 1987; Wilkins and Rengachary 1985; Ommaya and Gennarelli 1974; Stahlthammer 1986).

In AHT, inertial forces, which typically involve acceleration-deceleration forces, result in movement of the brain and yield more diffuse injuries such as subdural hematomas and diffuse axonal injury (DAI) (Kriel et al. 1998). Rotational forces are generated by either impact or nonimpact inertial mechanisms, such as whiplash shaking, which produce sudden acceleration or deceleration of the head. Rotational forces applied to the head cause the brain to turn abruptly on its central axis or its attachment at the brainstem cerebral junction. Evidence from biomechanical models is controversial since no realistic model is available. Extensive clinical and experimental data have suggested that such rotational movement of the brain results in two types of injury, DAI and subdural hematomas (Wilkins and Rengachary 1985; Ommaya and Gennarelli 1974; Stahlthammer 1986). Biomechanical forces have been shown to be greater with shaking and impact than with shaking alone (Duhaime et al. 1987; Hymel et al. 1998; Alexander et al. 1990; Gilliland and Folberg 1996; Gennarelli and Meaney 1996), but confessions, eyewitness accounts, and the absence of contusions confirm that shaking alone can cause fatal cerebrocranial trauma secondary to subdural hemorrhage and DAI (Duhaime et al. 1987).

Extracranial

Almost half of the children with AHT present without evidence of external trauma, such as bruising to the head or face (Alexander et al. 1990; Morris et al. 2000; Haviland and Russell 1997). In one retrospective series describing children with AHT, 54% had no bruising noted at initial presentation (King et al. 2003). Even those without scalp swelling may have evidence on autopsy of intracranial or

subgaleal hematoma. When it does occur, bruising of the head and neck as well as bruising in nonmobile infants is concerning for AHT (Maguire et al. 2005, 2009; Pierce et al. 2010). Hymel et al. (2014) identified four variables strongly associated with AHT: bruising of the torso, ears, or neck; acute respiratory compromise before hospital admission; bilateral or interhemispheric SDH; and any skull fractures other than an isolated, unilateral, nondiastatic, linear parietal fracture.

Scalp

Children with AHT may have scalp swelling, as reported in studies by Starling et al. (2004), Duhaime et al. (1987), and Jenny et al. (1999). In another study, abused children 2 years and younger admitted to a hospital were studied to find the prevalence of occult head injury with a normal neurologic examination. Occult head injuries included scalp injuries, skull fractures, and intracranial injury not noted on physical exam but seen on computed tomography (CT) or magnetic resonance imaging (MRI). Occult head injuries included scalp injury (74%), skull fracture (74%), and intracranial injury (53%) noted by CT or MRI but not physical exam (Rubin et al. 2003).

Subgaleal Hematoma

Subgaleal hematoma is bleeding into the potential space between the fibrous layers of the scalp and the skull. Subgaleal hematomas are associated with blunt injury to the head in AHT but have also been reported from hair pulling during an abusive event. Forceful hair pulling results in the scalp being lifted off the calvarium (Hamlin 1968; Seifert and Puschel 2006). Children without scalp swelling may have evidence of subgaleal hematoma on autopsy. A subgaleal hematoma may be associated with an underlying skull fracture.

Skull Fractures

While skull fractures are frequently seen in children with AHT, they are also common in those with unintentional head injury. For example, in an observational study of 218 children with traumatic brain injury (TBI) (54 with AHT), skull fractures were reported in 57% and 30% of children with unintentional head injury and AHT, respectively (Adamo et al. 2009). In a systematic review of 7 studies that reported skull fractures in 520 children (predominantly infants and toddlers), the probability of abuse in children with a skull fracture was 30% (95% CI 19–46%) (Kemp et al. 2008). Skull fractures are caused by direct force to the head.

The specificity of certain types of skull fractures as an indicator of AHT is not entirely clear. Complicated fractures (e.g., multiple, bilateral, diastatic, or depressed) have historically been associated with AHT (Ewing-Cobbs et al. 1998; Brown and Minns 1993; Hobbs 1984). Other literature has shown this not to be true, with complicated fractures occurring also in those with nAHT (Leventhal et al. 1993; Arnholz et al. 1998). The specificity of complicated skull fractures as an indicator of child abuse varies as illustrated by the following studies:

- In one observational study of skull fractures in 89 children younger than 2 years (29 with AHT), fractures that crossed suture lines or were multiple, diastatic, growing, depressed, complex (e.g., stellate, branching), or bilateral were much more common among children who were abused than those who had unintentional injuries (83% versus 22%). The majority of children with nAHT had single linear fractures (78%) (Hobbs 1984).
- Another observational study of 134 young children (39 with AHT), who in general had injuries of minor severity, found no significant difference between abusive and unintentional trauma in the incidence of complex, diastatic, or depressed fractures (39% versus 42%); however, fractures that were multiple, bilateral, or crossed suture lines were significantly more common in abused children (52% versus 22%) (Meservy et al. 1987).
- In another study, linear fractures were found in a majority (54%) of the abuse cases. Complicated fractures (e.g., multiple, bilateral, diastatic, or depressed) were more common in the abused than the accidental group (46% versus 26%) (Leventhal et al. 1993).

Linear, parietal skull fractures are the most common type of skull injury following both unintentional and inflicted trauma (Meservy et al. 1987; Leventhal et al. 1993; Harwood-Nash et al. 1971). Given the similar clinical features of unintentional and abusive skull fractures, these injuries should be evaluated in the context of the history that is provided by the child's caregiver(s) (Wood et al. 2009). Abusive injury should be suspected if the history is inconsistent with the physical examination findings. If the mechanism of injury is a fall, it is important to determine the height of the fall and the type of surface of impact (e.g., concrete, wood, carpet). In general, falls from 2 feet or less are unlikely to produce head injuries more serious than linear skull fractures (Albert and Drvaric 1993).

Accidental falls at home are rarely associated with significant injury, such as a skull fracture. Short falls can cause a skull fracture but are rare (Duhaime and Raghupathi 1999; Williams 1991; Helfer et al. 1977; Johnson et al. 2005; Lyons and Oates 1993; Nimityongskul and Anderson 1987; Rieber 2000; Chadwick et al. 1991). Similar findings are reported in a study by Roshkow et al. (1990). Duhaime et al. (1991) reviewed 100 consecutively admitted head-injured patients, 24 months old and younger, and analyzed mechanisms of injury, injury type, and associated injuries. Based on their analysis of patients with accidental injuries, they found that a fall of less than 4 feet (such as from a crib) could produce soft tissue injuries, linear skull fractures, or epidural hemorrhage but was rare. Williams (1991) reported 106 patients younger than 3 years old with a history of a free fall witnessed by two

Photo 6.1 Skull fracture. Displaced fracture within the fronto-occipital bone. There is also diastasis of all visible sutures

or more people or by a noncaretaker. Of the 106 patients, 77 sustained only mild bruises, abrasions, or simple skull fractures. Of these 77 patients, 43 had fallen more than 10 feet. Intracranial injury, depressed skull fractures, or compound fractures occurred in 14 patients who fell from 5 to 40 feet. However, in the three patients who fell less than 10 feet, no life-threatening injury occurred. An interesting aspect of this study was that in 53 patients with unwitnessed falls (or falls witnessed by only one caretaker), there were 18 severe injuries, including intracranial injuries, in patients who fell less than 5 feet. This finding suggests that these patients were, in fact, victims of AHT. A similar phenomenon has been noted in other studies (Rieber 2000; Chadwick et al. 1991). In children with a clear history of trauma, no extracranial injuries, and no social concerns, most skull fractures are unintentional (Harwood-Nash et al. 1971) (Photo 6.1).

Neck

Because the child's neck muscles are weaker and the head is large in proportion to the body, infants can sustain a whiplash-type injury. Specific spinal injuries, including extra-axial hemorrhage, ligamentous injury, trauma to the paraspinal soft tissues, vertebral body subluxations or fractures, and/or spinal cord injury, are reported in approximately 50–80% of such patients who undergo spinal MRI

(Meservy et al. 1987; Kemp et al. 2010; Barber et al. 2013; Choudhary et al. 2012; Narang and Clarke 2014). Many injuries occur in the cervical region, but thoracic and lumbar injuries are also found. Hadley et al. (1989) found that five of six infants' autopsies showed a cervicomedullary junction injury. Other studies have shown axonal damage in the cervical spines of some children who sustained AHT (Shannon et al. 1998; Brennan et al. 2009; Kadom et al. 2014). Brennan et al. (2009) found that 71% of infants with AHT had cervical cord injury. MRI studies have shown cervical spinal injury which included the cord or ligaments. The findings are not usually accompanied by clinical signs or symptoms (or they are masked by altered mental status). As an example, in one study of infants with AHT and spinal neuroimaging, 44% were found to have subdural hemorrhages (SDHs) in the spine; all of these were clinically occult (Koumellis et al. 2009).

Cervical spinal injury can result in hypoventilation or apnea, worsening neurologic outcome (Kadom et al. 2014). Local traumatic damage to the corticospinal tracts of the lower pons, medulla, and cervical spine may be responsible for the apnea, respiratory distress, and resultant hypoxia so often encountered in children with AHT (Giddes et al. 2001; Sinal and Ball 1987; Choudhary et al. 2014). Thus, severe AHT may cause primary damage to the brainstem, including the respiratory centers, which initiates widespread secondary hypoxia, leading to global hypoxic/anoxic changes and brain swelling (Sinal and Ball 1987; Choudhary et al. 2014). In one study of infants with AHT and accidental head injury, cervical ligamentous injury was positively associated with hypoxic-ischemic brain injury. The ligamentous injuries were predominantly posteriorly located, suggesting that severe neck flexion may be an important mechanism of injury (Meservy et al. 1987).

Intracranial

Intracranial bleeding is a nonspecific term to describe bleeding inside the skull.

Subdural Hemorrhage

SDH is the most common type of intracranial bleeding seen in AHT, with a reported incidence of 82–92%, and is much less common in nAHT (Duhaime and Raghupathi 1999; Leventhal et al. 1993; Zimmerman et al. 1979; Dashti et al. 1999; Reece and Sege 2000; Tzioumi and Oates 1999; Hosokote et al. 2002; Kemp et al. 2011). Jayawant et al. (1998) found a much higher incidence in their study of SDH in AHT, probably due to the younger age of the children studied. They found the incidence of SDH in AHT to be 27 of 33 (82%) in children less than 2 years of age, in whom it is known that there is a high risk of AHT.

An SDH occurs in the space between the dura and the arachnoid membranes, usually as a result of tearing of the bridging veins that join the surface of the brain

to the dura. SDHs seen in nAHT are caused typically by severe force, often after a motor vehicle collision, ejection from a motor vehicle, or a fall from a significant height. SDHs caused by nonabusive mechanisms are usually unilateral, single, and limited to the cerebral convexities and can cause a mass effect. The presence of bridging vein rupture on MRI (tubular-shaped clots at the vertex) or on postmortem examination definitively identifies a significant degree of mechanical trauma as the cause of the hemorrhage (Adamsbaum et al. 2014; Rambaud 2015).

SDH following a severe accidental trauma can be hard to differentiate from inflicted SDH. SDH related to accidental trauma usually occurs at a single site, often at the site of impact and often associated with an overlying fracture (Ewing-Cobbs et al. 2000). Hymel et al. (1998) reported SDHs in 16/39 (41%) of an AHT group compared with 4/39 (10%) of a non-AHT group. As in nAHT, the commonest site for SDH in AHT is over the cerebral convexities. Subdural blood can be seen following an impact injury from any cause, but it is usually at the site of the impact and is often associated with a fracture. Subdural blood seen remote from the point of impact is unusual in accidental trauma, unless severe. SDHs typically associated with AHT are those in more than one location, bilateral, mixed density, chronic, and interhemispheric or in the posterior fossa (Jayawant et al. 1998; Duhaime et al. 1996; Dias et al. 1998; Hymel et al. 1997). The interhemispheric SDHs in AHT are usually posterior (Ewing-Cobbs et al. 1998). Duhaime et al. (1996) pointed out that SDHs in nAHT may be extensive, but they are shallow and most do not cause significant mass effect. Scans of infants and children who have sustained head injuries following accidental head trauma may show the same pattern of SDHs at different sites (as in AHT) but usually only where the accidents involved severe forces such as after road traffic accidents or major falls. Most domestic accidents do not involve this degree of force (Warrington and Wright 2001). SDHs following accidental trauma are relatively uncommon. SDHs usually reabsorb in days to weeks (Starling et al. 2004; Hobbs 1984; Meservy et al. 1987; Leventhal et al. 1993).

Intracranial injury associated with nAHT is rare even in those with fatal TBI. The incidence of isolated subdural/subarachnoid hemorrhage as the only gross finding in fatal accidental head injuries in young children is less than 2%, compared with the 90–98% incidence of these hemorrhages associated with AHT (Case 2008a). The trivial home accidents that children so frequently sustain are primarily associated with translational forces and not with the rotational forces necessary to develop tearing of bridging veins, which would produce SDH or other shearing injuries (Duhaime and Raghupathi 1999; Haviland and Russell 1997; Williams 1991; Helfer et al. 1977; Chadwick et al. 1991; Tzioumi and Oates 1999; Nimityongskul and Anderson 1987; Kravitz et al. 1969; Lyons and Oates 1993). Even in falls down stairs, the incidence of intracranial injury is rare. Joffe and Ludwig (1988) found no evidence of intracranial hemorrhage in 363 patients, 1 month to 18 years old, with a history of having fallen down stairs. Chadwick et al. (1991) describe the injuries of children who fell less than 1.2 meters, none of which were fatal.

SDHs in those with AHT are different from those with nAHT (Table 6.2). Mixed density SDHs were significantly more common in inflicted (67%) than noninflicted

Table 6.2 Types, locations, and severity of subdural hemorrhages (SDH)

Type of SDH	Focality	Location	Consistency	Patient's condition	Depth in brain	Can lead to mass effect
Inflicted	Multifocal	Cerebral convexities, interhemispheric fissure and posterior fossa	Heterogeneous	Seriously ill	Shallow	No
Non inflicted	Unifocal	Cerebral convexities	Homogeneous	Not seriously ill	Not shallow	Yes

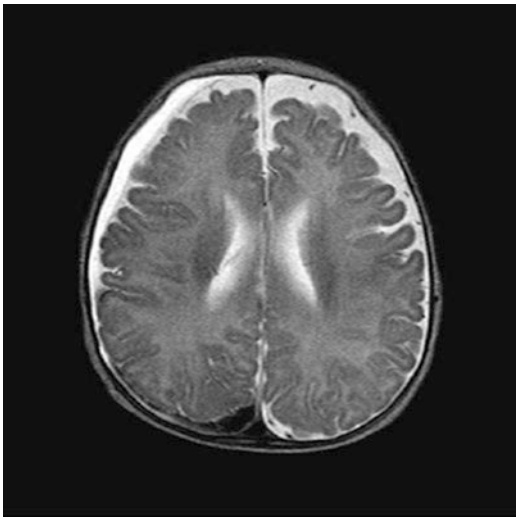

Photo 6.2 MRI with new and old SDH. View of the new subdurals on the right cerebral convexities and the old subdurals on the left cerebral convexities

TBI (18%). Homogenous hyperdense SDHs were more common in nAHT. MRI is also useful in the differentiation between cerebrospinal fluid (CSF) in the subarachnoid space and chronic SDHs in cases where the CT scan shows low attenuation extra-axial fluid (Sato et al. 1989; Barlow et al. 1999; Chabrol et al. 1999). In the absence of any documented trauma, the possibility of AHT needs to be seriously considered in any child with SDH, particularly in the presence of other unexplained injuries (Photo 6.2).

Birth-related SDH occurs in approximately one-fourth of vaginally delivered births within the first few days of life (Zahkary et al. 2009). These are small and asymptomatic and usually resolve by 4–6 weeks of age (Rooks et al. 2008). Any SDH that occurs after 6 weeks without evidence of trauma should alert one to consider AHT.

Chronic Subdural Hematomas

In most cases of inflicted subdural hematomas, the hematoma is eventually reabsorbed in days to weeks, but in some cases it evolves into a chronic subdural hematoma (Starling et al. 2004; Hobbs 1984; Meservy et al. 1987; Leventhal et al. 1993). There is an association of chronic subdural collections and AHT, with chronic subdural collections suggesting prior episodes of abuse (Ewing-Cobbs et al. 1998; Wells et al. 2002; Dias et al. 1998). The development of the classic multilayered chronic subdural hematoma results from venous bleeding under low pressure and requires the potential for the subdural space to enlarge without a significant increase in pressure. The factors that promote such a development within a low-pressure intracranial space exist only in specific categories of people, such as those with brain atrophy, those with hydrocephalus who have been treated by placement of a ventricular shunt, or those with traumatic encephalomalacia (Lee et al. 1996). A chronic subdural hematoma rarely follows severe head injury in a previously normal person, and instead, the blood of the acute subdural hemorrhage in these head injuries is readily resolved or rapidly organized (Lee et al. 1998; Sargent et al. 1996; Parent 1992). MRI can differentiate between acute and chronic subdural collections and is essential for a second investigation. It is best performed 5–10 days after the insult, when it can reliably differentiate between acute and chronic subdural collections. The time required for an acute SDH to evolve into a chronic SDH varies from days to weeks (Dias et al. 1998). It is not possible to presume that chronic subdurals are caused by AHT in the absence of other supporting evidence such as unexplained fractures.

An SDH can organize into a neomembrane composed of large vascular channels at risk for rebleeding. Neomembranes form from the dural border cells that are able to proliferate in any pathologic process involving cleavage of the dural border zone tissues (Case 2008b). Neomembrane development is accompanied by neovascularization. Spontaneous microhemorrhages from these fragile new vessels may then occur and lead to a mixture of CSF and blood. Rebleeds are believed to occur in resolving subdural hematomas, but the amount of bleeding around the existing hematoma is seldom large or life-threatening (Chadwick et al. 1991). Rebleeding after trivial injury or spontaneous rebleeding from a preexisting chronic subdural hematoma should not be offered as an explanation for the presence of acute subdural blood if the old subdural membrane is not demonstrated on autopsy (Showers 1998).When rebleeds occur, the appearance on radiographs as “acute on chronic SDH” raises concern for AHT, since this is seen as previous trauma with acute trauma. These neomembranes are only visible by the naked eye but not by CT or MRI so this can pose a difficult situation (Photo 6.3).

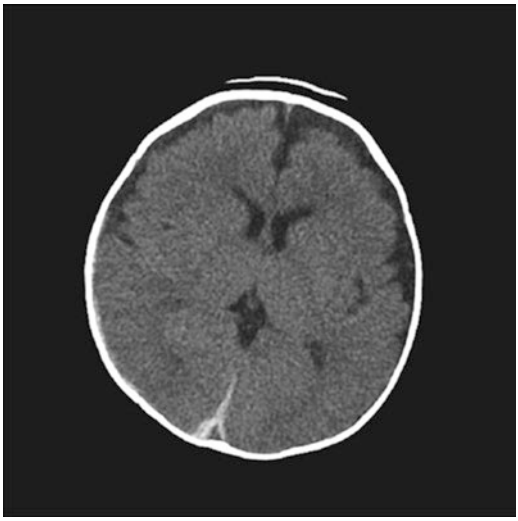

Photo 6.3 CT with new and old SDH. This is a 3-month-old who was diagnosed with AHT at our institution

Epidural Hematoma

An epidural hematoma (EDH) is due to bleeding into the space between the inner skull surface and the dura. While EDHs have been described in abused children, they are not typically associated with AHT (Duhaime and Raghupathi 1999; Dashti et al. 1999; Kemp et al. 2011; Piteau et al. 2012). An arterial epidural hematoma is caused by a tear of the middle meningeal artery or one of its major branches. EDHs may be caused by venous bleeding as well.

Subarachnoid Hemorrhage

A subarachnoid hemorrhage (SAH) is bleeding into the area between the arachnoid membrane and the pia mater surrounding the brain. This may occur spontaneously, as a result of arteriovenous malformations, cerebral aneurysms, coagulopathies, infection, and accidental trauma (Broderick et al. 1993). SAHs are associated with significant trauma. They usually occur at the site of a focal impact and in association with depressed skull fractures or cortical contusions. SAHs are also frequently seen in association with SDHs as bridging veins rupture and bleed into both spaces. Abusive SAH may be present in association with either shaking only or shaking with impact (Hardman and Manoukian 2002). It may be difficult to differentiate SAH from SDH or the normal falx in the posterior interhemispheric fissure (Hardman and Manoukian 2002). The presence of SAH has not been significantly associated with either AHT or nAHT (Kemp et al. 2011; Piteau et al. 2012).

Intraventricular Hemorrhage

Intraventricular hemorrhage (IVH) is bleeding into the brain's ventricular system. The most common etiology is the rupture of subependymal veins, usually due to rotational forces. Injury to the corpus callosum commonly occurs. IVH is usually caused by extension of an intraparenchymal bleed if the corpus callosum is not injured. The blood is most commonly in the lateral ventricles (Stooley 2005). IVH in the infant who is not a newborn is usually from vascular malformation, coagulopathy, or trauma or as a complication of surgery. IVH has been described in abused children (Kleinman 1987) but is rare.

Contusion

A cerebral contusion is a bruise of the brain tissue (Hardman and Manoukian 2002). Contusions are often indicative of direct impact. In abuse, contusions are often seen in association with other cerebral injuries such as DAI and SAH (Hardman and Manoukian 2002). Like bruises in other tissues, cerebral contusions can be associated with multiple microhemorrhages, where small blood vessels leak into brain tissue. MRI and CT are equally sensitive in detecting hemorrhagic contusions. Contusions are likely to heal on their own without medical intervention (Sanders and McKenna 2001). Numerous small contusions from broken capillaries that occur in gray matter under the cortex are called multiple petechial hemorrhages or multifocal hemorrhagic contusions and are caused by shearing injuries at the time of impact. These hemorrhages, a type of diffuse brain injury, are not always visible on CT (Downie 2001). MRI can more readily reveal contusions and other parenchymal damage (Zimmerman et al. 1979).

Diffuse Axonal Injury

Diffuse axonal injury (DAI) is diffuse microscopic tearing of axons in the white matter of the brain. DAI caused by movement of the brain within the skull requires extreme forces of angular deceleration and is responsible for prolonged coma in many patients after severe head injury (Berger and Pearce 2002). It may occur along with subdural hematoma. DAI is detected with MRI or upon autopsy but not with CT (Zimmerman et al. 1979; Leventhal et al. 1993; Meservy et al. 1987; Harwood-Nash et al. 1971). Such injuries are especially common in the subcortical white matter, corpus callosum, periventricular regions, and dorsolateral aspect of the rostral brainstem (Case et al. 2001; Ommaya and Gennarelli 1974; Gennarelli et al. 1982).

Hypoxic-Ischemic Injury

Hypoxic-ischemic injury (HII) is another important consequence of AHT. Injuries may be multifocal and widespread and do not necessarily respect vascular territories. Cerebral edema may accompany cerebral hypoxic ischemia (Meservy et al. 1987). Using techniques which are even more sensitive for the detection of brain hypoxic-ischemic change, such as MRI and particularly diffusion-weighted imaging, hypoxic-ischemic change in cases of AHT is seen earlier and in a higher proportion than when using CT alone (Meservy et al. 1987; David 1999). A recent review has shown both HII and cerebral edema to be significantly associated with AHT (Kemp et al. 2011); a second study confirmed the association of HII but not that of cerebral edema (Piteau et al. 2012).

Hygromas

Hygromas are enlarged subdural or subarachnoid spaces filled with CSF. Children with AHT are more likely to show hygromas than those with nAHT. Subarachnoid hygromas can represent either brain atrophy or communicating hydrocephalus, reflecting previous head injuries (Ewing-Cobbs et al. 1998; Case 2008b). This has also thought to be the cause of acute subdural hemorrhage progressing to chronic subdural hematomas. Subdural hygromas are believed to be mainly derived from chronic subdural hematomas. After trauma, subdural fluid collections (hygromas) can develop from a tear in the arachnoid and subsequent accumulation of CSF. It is not uncommon on head CT reports for chronic SDHs to be misinterpreted as subdural hygromas and vice versa. MRI should be done to differentiate a chronic SDH from a subdural hygroma and brain atrophy, when clinically warranted (Choudhary et al. 2014). Acute hygromas are a relatively common posttraumatic lesion but can also develop following neurosurgical procedures (David 1999).

Intracerebral Hemorrhage

Intracerebral hemorrhage (ICH) results from rupture of an intracerebral blood vessel, causing bleeding into the brain parenchyma or ventricles. Any type of rapid jerking motion of the neck seems to be intuitively important given the number of reported cases after such events. Vertebrobasilar dissections have been known to occur at fixation points, i.e., the point where the vertebral artery enters the dura. It seems the tethering of the arteries increases the shearing forces at these locations during trauma. These types of arterial injuries are commonly suspected following trauma involving adults but are less commonly considered in children. Although children seem to have risk factors that increase the rate of arterial injury during

trauma, it is unclear why ICH is not frequently reported in the pediatric population. Two reports of three cases of abuse-related aneurysms were found (Lam et al. 1996; Agner and Weig 2005). Traumatic arterial dissection was postulated as the cause of the vessel injury, with the narrowing and infarction as the late manifestations. Hypothetically, the shearing forces caused small tears of the intima leading to thrombus formation, vascular occlusion, and stroke (Agner and Weig 2005). In all three of these reported cases, stroke followed the arterial injury. In a fourth case, a traumatic intracranial vertebral arterial dissection associated with SAH was not followed by a stroke (Nguyen et al. 2007).

Imaging

The imaging modalities used most often for the evaluation of AHT are CT (with or without contrast) and MRI. Of these, CT without contrast is generally considered the first-line modality of choice, as it reliably identifies skull fractures, acute bleeding, and cerebral edema, all conditions potentially requiring immediate medical intervention; it is readily available at most hospitals; and it can be performed quickly, without the need for anesthesia or sedation in most cases. Disadvantages of CT include radiation exposure and limited ability to detect shear injuries, ischemia, bridging vein ruptures, and ligamentous injuries of the craniocervical junction. MRI is superior in the detection of these injuries, as well as (to a limited extent) the ages and timing of injuries (Vázquez et al. 2014). MRI is less sensitive than CT at detection of acute bleeding and is technically more difficult to perform due to its sensitivity to patient motion, often requiring sedation or anesthesia. It is usually used as an adjunct to CT, performed days after the acute injury to delineate injuries in fine detail.

Ultrafast MRI without sedation has been used with increasing frequency to replace CT in the evaluation of conditions such as hydrocephalus. Trials comparing ultrafast MRI to CT in the initial evaluation of AHT have revealed low MRI sensitivity to acute hemorrhage as with standard MRI and confirm the superiority of CT in initial AHT evaluation (Ryan et al. 2016; Kralik et al. 2017).

It has been recommended that all children undergoing brain MRI for moderate or severe AHT should have at least cervical, and potentially complete, spinal MRI imaging as well (Vázquez et al. 2014; Narang and Clarke 2014).

Outcome

Mortality

Mortality rates range from 13% to 38% (Ludwig and Warman 1984; Keenan et al. 2003) in AHT. A five- to sixfold increase in mortality rate (13% vs 2%) has been seen in children with TBI with AHT versus nAHT (Bonnier et al. 1995; Niederkrotenthaler et al. 2013). Outcomes for children with inflicted AHT are poor.

Morbidity

Among survivors, the rate of persisting disability is higher in those with AHT versus nAHT. Thirty percent to fifty percent of survivors suffer cognitive or other neurologic deficits, and 30% have a chance for full recovery (Case et al. 2001).

Injury-Related Factors

Injury-related factors indicating worse morbidity and mortality are age at injury, severity of injury, type and extent of primary and secondary brain injuries, and nature and severity of associated extracranial injuries (Michaud et al. 1992).

Age

The effect of age at time of TBI on neurologic and functional outcome is complex, with the results among studies being inconsistent (Berger et al. 1985). Most studies show worse outcomes for children injured at younger ages (Ewing-Cobbs et al. 1995; Lazar and Menaldino 1995; Mahoney et al. 1983; Raimondi and Hirschauer 1984). It was once believed that the plasticity of the infant brain would allow very young children to compensate for their TBI, but the opposite is now thought to be true.

Severity of Injury

Severity of injury has been associated with outcome in children with AHT, with the more severe the injury, the worse the outcome. Severity of injury, as measured by lower Glasgow Coma Scale (GCS) scores and longer periods of unconsciousness, has been associated with worse cognitive, motor, and behavioral outcomes (Ewing-Cobbs and Fletcher 1987). Even in children with comparable GCS scores, AHT has been shown to result in larger cognitive deficits and less favorable Glasgow Outcome Scale (GOS) scores at short-term (average 1.3 months) follow-up, in comparison with children with nAHT.

Goldstein et al. (1993) found more severe injury, as indicated by the admission GCS score, in the 14 of 40 children whose brain injuries were inflicted. Outcomes in that study, as indicated by GOS scores at hospital discharge, were worse in the group with inflicted injuries. Those children with inflicted injuries in that study were also significantly younger (mean age 1.6 years) than those with unintentional injuries (mean 7.3 years).

Type of TBI

SDH and DAI, which are among the characteristic lesions of AHT in young children, are associated with worse outcomes than other types of intracranial injury (Michaud et al. 1992; Berger et al. 1985; Goldstein et al. 1993).

Secondary brain injury is also associated with worse outcome. Secondary brain injury may occur from hypoxia, hypotension, edema, infarction, delayed hemorrhage, or pressure necrosis from displacement and herniation of the brain. Children with widespread infarction and atrophy have worse physical and cognitive deficits. In a study by Gilles and Nelson (1998), poorer outcome was seen in those with AHT and signs of ischemia who eventually developed cerebral infarction.

Long-Term Neurocognitive Functioning

Long-term neurocognitive functioning in young children with AHT is poorer compared to those with nAHT. This may be related to the fact that children who survive AHT tend to be younger than those accidentally injured. They have not attained neurocognitive skills prior to the injury. Skills that are in a rapid stage of development might be more vulnerable to disruption by trauma than skills that have already been acquired (Gilles and Nelson 1998). In a study by Bonnier et al. (1995) among 13 patients with AHT, 6 children initially appeared to have full recovery. By the end of the study, 11 of 12 survivors had been diagnosed with abnormalities including psychomotor delay, mental retardation, learning disabilities, blindness, seizures,

tetraplegia, and hemiparesis. In another study, 25 children with AHT were followed for a mean of 59 months, and 68% had abnormalities at follow-up. Identified abnormalities included motor (60%), visual (48%), speech and language impairment (64%), and epilepsy (20%). Behavioral disturbances were noted in 52% of children. The behavioral abnormalities included self-injurious and self-stimulatory behaviors, hyperactivity, impulsivity, temper tantrums, and rage reactions. Many of the behavioral problems developed in the second and third year of life. Ewing-Cobbs and Fletcher (1987) reported outcomes of 40 children with TBI (20 with AHT and 20 with nAHT); 20% of the AHT children were doing well neurocognitively versus 55% of children with nAHT. In a study by Keenan et al. (2006), children with AHT had worse cognitive and behavioral outcomes than those with nAHT 1 year after severe TBI.

Shaken Baby Syndrome

As mentioned at the beginning of this chapter, the term *shaken baby syndrome* (SBS) is no longer recommended, but it will be discussed because many practitioners are familiar with the term. SBS, a form of AHT, is a serious brain injury caused by forcefully and violently shaking a baby. Shaken impact syndrome involves shaking plus direct impact to the head (from striking the wall, floor, bed, etc.). Clinical features of SBS include subdural/subarachnoid hemorrhage, occult fractures, and retinal hemorrhages. Only one third of patients exhibit all three clinical features.

Mechanism

The term SBS has been used to refer to injuries resulting from both shaking alone and shaking with head impact. Most cases of SBS occur in the first year of life (Duhaime et al. 1987; King et al. 2003; Keenan et al. 2006). Another mechanism of injury that has been suggested is damage to the lower brainstem and upper cervical spine. "Whiplash-shake syndrome" is significant cervical spine injury (contusions of the spinal cord at the cervicomedullary junction) associated with subdural and/or epidural hematomas (Hadley et al. 1989).

Shearing forces on the bridging veins and retina are thought to be the cause of subdural and retinal hemorrhages in SBS (Bandak 1995; Gennarelli and Meaney 1996; Michaud et al. 1992; Hymel et al. 2007). It is not known, however, how long and how often a child must be shaken to cause serious injury and why retinal hemorrhages almost invariably result from shaking but rarely from falls (Billmire and Myers 1985). Others have reported that a child with a body mass of 3.8–4.5 kg must be shaken 40 to 50 times for 20 seconds to suffer serious brain injury (Levitt et al. 1994).

Retinal Hemorrhages

Retinal hemorrhages (RHs) are frequently noted in children with AHT (60–85% in retrospective series) (King et al. 2003; Bechtel et al. 2004; Keenan et al. 2003; Vinchon et al. 2005). In comparison, they occur rarely among those with accidental head injury (Goldstein et al. 1993; Christian et al. 1999; Lazoritz et al. 1997; Maguire et al. 2013). RHs associated with AHT are characteristically numerous and bilateral, involve multiple layers of the retina, and extend beyond the posterior pole to the peripheral retina. These findings are in contrast to RHs resulting from accidental injury, which are predominantly unilateral, few in number, localized around the posterior pole, and involve only a single layer of the retina (Maguire et al. 2013) (Photo 6.4).

Intracranial Hemorrhage

Intracranial hemorrhage (ICH) is one of the characteristic features of inflicted head injury and may include SAH, SDH, EDH, intraparenchymal or intraventricular bleeding, or a combination of these. Concomitant skull fractures may or may not be present. SDH is the most common form of ICH seen in the setting of SBS.

Skeletal Fractures

Approximately 20–50% of victims of AHT have extracranial skeletal fractures (Alexander et al. 1990; Haviland and Russell 1997; Vinchon et al. 2005). In one retrospective study of 71 children younger than 3 years of age with SDH caused by

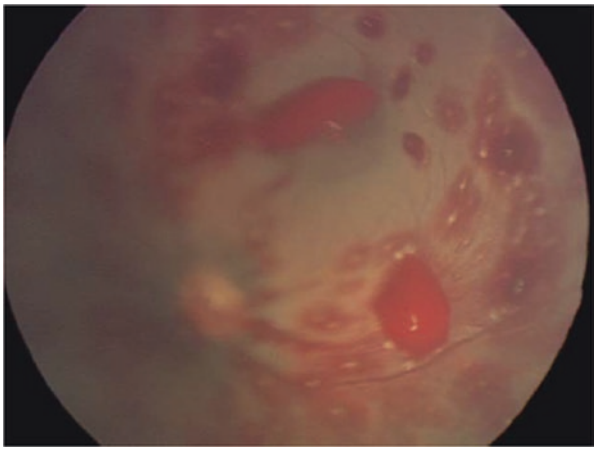

Photo 6.4 Retinal hemorrhage. (Courtesy of Paul G. Steinkuller, MD, Baylor College of Medicine and Texas Children's Hospital)

inflicted injury, 32% of victims had extracranial fractures, and 87% of these had multiple bony injuries (Caffey 1974). In a prospective study comparing young children with serious inflicted head injury versus nAHT, the abused patients were more likely to have rib, long-bone, and metaphyseal fractures than those who had sustained accidental trauma (Keenan et al. 2003). Classic metaphyseal avulsion lesions of the long bones were one of the early injuries described in SBS. They are thought to be the result of either torsion or traction when an extremity is twisted or pulled or from shearing forces applied across the metaphysis when a child is shaken and the limbs begin to flail (Bulloch et al. 2000).

Rib fractures in infants with normal bones are highly specific for child abuse, especially posterior rib fractures. In one retrospective review of infants with rib fractures, 82% were attributed to child abuse. The remaining cases were associated with accidental trauma involving major forces (8%), bone fragility (8%), or birth trauma (2%) (Bulloch et al. 2000). Another review of rib fractures in young children found a 95% positive predictive value for this bony injury as an indicator of abuse (Barsness et al. 2003).

Studies of the radiologic and histopathologic characteristics of rib fractures and perpetrator admission as to how they shook an infant have revealed how posterior and anterior rib fractures are caused by the perpetrator's hands wrapping around the child's thorax, with the vertebrae acting as a fulcrum.

Summary

1. Head trauma is the leading cause of morbidity and mortality related to child physical abuse.
2. Acute subdural hemorrhage in an infant or toddler should raise the suspicion of AHT unless a clear history explaining the severity of the injury is given by the child's caregivers.
3. Infants and toddlers with AHT may present with nonspecific symptoms such as irritability, lethargy, vomiting, apnea, and seizures. The possibility of trauma should be considered.
4. CT is the preferred imaging modality for primary evaluation of acute AHT. MRI is more sensitive at identifying and clarifying evolving injuries.
5. Skeletal survey and ophthalmologic examination are mandatory for the evaluation of the abused infant or toddler with potential AHT.

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Chapter 7
Neglect and Failure to Thrive

Lauren R. Burge, Penelope T. Louis, and Angelo P. Giardino

Nearly 700,000 children are abused or neglected in the USA annually. Neglect is the most common form of child maltreatment, representing approximately 75% of the children who experienced maltreatment in 2015, the most recent year for which there is national data (U.S Administration for Children and Families, Child Maltreatment 2015). Neglect represents a situation in which there is a risk of harm to a child because the child's basic physical, supervisional, medical, emotional, and/or educational needs are not being met (DePanfilis 2006) (see Table 7.1 for categorization of different forms of neglect). State laws define child neglect in various ways, but conceptually, the definition of neglect may present a challenge. There are many proposed definitions of neglect, all contributing greatly to our understanding of this complex phenomenon; however, the definition from Straus and Kantor (2005) serves to highlight the importance of considering cultural norms as well as avoiding assigning intent when considering a definition of neglect.

Neglectful behavior is behavior by a caregiver that constitutes a failure to act in ways that are presumed by the culture or a society to be necessary to meet the developmental needs of a child and which are the responsibility of a caregiver to provide.

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Table 7.1 Types of neglect

Physical neglect	
Neglect of basic physical needs	Failure to provide clothing, food, shelter, and hygiene
Medical neglect	Failure to provide or a delay in providing needed care by a professional for a physical injury, illness, medical condition, or impairment
Supervisional neglect	
Abandonment/ expulsion	Desertion of a child without arranging for reasonable care and supervision, including cases where (a) children are not claimed within 2 days, (b) children are left with no or false information given regarding caregiver's whereabouts, and (c) indefinite refusal of custody without adequate arrangement for care of child by others
Custody inattention	Apparent unwillingness to maintain custody by (a) repeated shuttling of child from household to household or (b) repeatedly leaving a child with others for days or weeks at a time
Safety	Inattention to the hazards in the child's physical environment and developmental capacity that place him or her at risk for injury
Emotional neglect	
Inattention to basic emotional needs/ nurturance/ affection	Inattention to the child's needs for affection, emotional support, attention, and competence, including (a) markedly overprotective restrictions that foster immaturity or emotional overdependence; (b) chronically applying expectations clearly inappropriate in relation to the child's age or level of development; (c) domestic violence in the child's presence; (d) encouragement of or permitting drug or alcohol use by the child; (e) encouragement of or permitting other maladaptive behavior (e.g., severe assaultiveness, chronic delinquency)
Mental health-care neglect	Failure to provide, or a delay in providing, needed care for a child's emotional or behavioral impairment or problem in accord with competent professional recommendation
Educational neglect	
Truancy	Permitted school absences averaging at least 5 days per month
Failure to enroll	Failure to enroll a school-age child, causing the child to miss at least 1 month of school, or a pattern of keeping a school-age child home for nonlegitimate reasons (e.g., to work, to care for siblings, etc.) an average of at least 3 days a month
Inattention to special education needs	Inattention to recommended remedial education services for child's diagnosed learning disorder or other special education need

Sources: Adapted from NIS-2 (National Center on Child Abuse and Neglect 1988)

Despite its high incidence, neglect at times has received less professional attention than physical or sexual abuse, prompting Wolock and Horowitz (1984) to decry the "neglect of neglect." The most commonly cited reason for lack of attention to this significant problem is ambivalence and discomfort among health-care professionals in passing judgment on parental choices regarding child-rearing style (Dubowitz et al. 1993; Ludwig 1992). Of note, neglect is also the most fatal form of child maltreatment. Of the 1327 deaths known to have occurred in 2015 from child maltreatment, almost 73% suffered some form of neglect (U.S. Administration for Children and Families 2015).

This chapter presents an overview of neglect with a focus on failure to thrive (FTT) which depending on circumstances may be associated with neglect (Block et al. 2005).

Conceptual Approaches

Health-care providers have long been aware that caregiving which fails to meet a child's basic needs is likely to be deleterious to the child's growth, development, and well-being (Chapin 1908; Fontana and Besharov 1979; Kempe et al. 1962; Spitz 1945, 1949). Dubowitz et al. (1993) have called for a perspective of shared responsibility in describing neglect. Rather than focusing on a specific caregiver's failure, they focus their attention instead on the child's unmet needs, looking at the shared failures of the caregivers, family, community, and society to meet the child's basic needs. This human ecological approach encourages health-care providers to pay more attention to the strengths and weaknesses of the child's caregiving environment (Dubowitz et al. 2000). This perspective also enables health-care providers to formulate comprehensive treatment plans that are likely to incorporate all the resources available in the child's environment. An example is a child who fails to grow because of a lack of infant formula. An approach that does not solely blame the child's parents but which instead identifies the parents' lack of resources as part of the problem may be more beneficial to the child and caregiver. The problem can be solved, for example, by helping the child's mother apply for the Supplemental Food Program for Women, Infants, and Children (WIC) benefits and assisting her in obtaining necessary resources to provide for her child.

A distinction can be made between neglect and deprivational abuse. "Neglect is the failure to supply the needs of the child, including emotional needs. It does not include the deliberate and malicious withholding of needs, which is a form of abuse. Neglect has its roots in ignorance of a child's needs and competing priorities; it is passive and usually sustained. The carer is without motive and unaware of the damage being caused…The stigma associated with the term abuse should never be applied to the poor struggling or uneducated mother whose child, that she loves dearly, becomes malnourished. Education of the mother and society and relief from the vicissitudes of poverty are required to alleviate most neglect of the world's children" (Golden et al. 2003).

It is also necessary to identify and measure neglect apart from harm done to the child. For example, a mother who fails to keep her child from running into the street for a brief moment, resulting in major injuries, is just as culpable as a father who leaves his young children unsupervised for hours every day at home. The unsupervised children left at home may suffer no tangible harm; however, both are examples of supervisory neglect.

There is debate as to what constitutes good parenting and what represents neglectful caregiving. Most professionals would be expected to reach similar conclusions when caregiver behaviors and choices fall far from expected norms. For

example, starving a child represents a failure to meet basic food needs, and not changing a diaper for 24 h represents failure to meet a child's basic hygienic needs. However, does leaving a child home alone at age 11 constitute neglect of the child's need for supervision? The answer to this question may entail a complicated response, in part depending on broad considerations, such as (a) the child's maturity, (b) the proximity and availability of a responsible adult, and (c) the duration of the caregiver's absence. In such "gray" cases, the health-care provider is forced to rely on subjective, personal judgments.

It is crucial that the health-care provider not impose his or her personal child-rearing style and beliefs on other families. For example, in Laotian, Cambodian, and many other societies, leaving an infant in the care of a 7-year-old sibling should be expected rather than be considered neglect (Korbin and Spilsbury 1999, quoted in Straus). Instead, the approach is to focus on the specific circumstances in a given case and evaluate the child's unmet needs and ensure that the child's growth and developmental well-being are not being imperiled.

Effects of Neglect

A range of physical, emotional, and cognitive effects on the developing child occur when basic needs are unmet. Each child's response to neglect is different and depends in part on the type of neglect (i.e., which basic needs have not been met adequately), the developmental stage at which the neglect occurs, the severity of the unmet need, how long the need was unmet, and the effectiveness of the intervention by caring adults to halt the neglect (DePanfilis 2006). The child's response to neglect depends on a complex interaction of risk to which the child is exposed and the protective factors present inherently in the child and operating within the child's environment. Some children appear to be resilient in that; despite being neglected, they appear to be able to overcome this adversity and mature and develop beyond what might be expected (DePanfilis 2006). It may be possible to promote resilience in neglected children by supporting and building upon the child's and family's strengths, especially around ordinary human adaptation processes such as motivation for change, family rituals and traditions, and basic parenting skills. When medical needs are not met, direct effects on the child's physical health and well-being may be observed. Typically reported effects of neglect on children are (a) withdrawn affect; (b) decreased social interactions; (c) disorganized, aggressive interactions with peers; and (d) fewer positive play behaviors such as offering, sharing, accepting, and following (Peterson and Urquiza 1993). Behavioral effects can be conceptualized as occurring along a continuum ranging from internalizing to externalizing behaviors (DePanfilis 2006; Pears et al. 2008). Table 7.2 lists the commonly seen behaviors along this internalizing/externalizing continuum.

Table 7.2 Continuum of internalized and externalized behavioral problems

Internalized	Externalized
Agitation	Difficulty in paying attention
Nightmares	Not listening when spoken to
Avoidance of certain activities or people	Difficulty in organizing tasks and activities
Difficulty in falling asleep or staying asleep	Being easily distracted
Sleeping too much	Being forgetful
Difficulty in concentrating	Bedwetting
Hypervigilance	Excessive talking
Irritability	Difficulty in awaiting their turn
Becoming easily fatigued	Bullying or threatening others
Poor appetite or overeating	Being physically cruel to people or animals
Low self-esteem	Playing with or starting fires
Feelings of hopelessness	Stealing
	Destroying property

DePanfilis (2006). http://www.childwelfare.gov/pubs/usermanuals/neglect/neglect.pdf

In addition, children who have experienced impaired or delayed growth on the basis of neglect may experience delayed language development and social, maturational, and behavioral difficulties. In a systematic review of the emotional, behavioral, and cognitive features exhibited by school-aged children experiencing neglect or emotional abuse, positive associations were found between neglect and externalizing/internalizing behaviors, ADHD phenotype, an inability to regulate emotions, and diminished IQ, literacy, numeracy, and language skills. Manifestations included low self-esteem, depression, difficulty initiating or maintaining friendships, and low school attainment (Maguire et al. 2015).

Health-Care Evaluation

The general approach to the health-care evaluation of neglect mirrors the evaluation suggested for other forms of maltreatment. It is ideally based on a multidisciplinary approach that includes (a) a comprehensive medical history; (b) a thorough physical examination; (c) specific, directed laboratory and diagnostic testing; (d) a formal psychosocial assessment of the family, including observation of the child–caregiver interactions; and (e) meticulous documentation of the evaluation's findings. For over three decades, clinicians have recognized that laboratory tests should only be obtained in the health-care evaluation for suspected neglect when their need is suggested by the child's history or a finding uncovered on physical examination (Sills 1978).

Neglect and Growth: Failure to Thrive

FTT is a common pediatric diagnosis with no well-defined description. No single definition of FTT has been agreed upon, which can make the diagnosis challenging and subject to change from provider to provider. FTT is a physical sign that a child is not receiving adequate nutrition for appropriate growth and development. In the past, FTT was often divided into "organic" or "nonorganic" etiologies; however, this previous standard does not sufficiently describe the multifactorial nature of FTT and may inhibit the most thorough workup and therapeutic solutions to such a complex problem (Jaffe 2011). There is not a single etiology that accounts for all cases of FTT, and some suggest replacing FTT with other terms thought to be more accurate, such as growth failure, growth retardation, and growth deficiency (Goldbloom 1987; Kempe and Goldbloom 1987). Although these arguments have merit, FTT is a term firmly rooted in clinical practice and remains the working diagnosis for children not growing as expected (Ludwig 1992) (See Photo 7.1).

There is not a consensus for the definition of FTT. Some frequently quoted growth-chart-based definitions include a child whose weight is below the third or fifth percentile for age on more than one occasion, a child whose weight drops down two major percentile lines, a child whose weight is less than 80% of the ideal weight for age, and a child who is below the third or fifth percentile on the weight-for-length curve (Jaffe 2011). As Jaffe points out, there are many problems with the chart-based definitions of FTT. What about the child who is clearly malnourished but lacks more than one point on his/her growth curve? What about the child who is chronically ill or has a neuromotor deficit who will undoubtedly have an abnormal growth curve? What about the healthy, normally developing child who does not follow one growth curve in infancy, but rather crosses multiple curves during a normal growth trajectory? Mei et al. (2004) demonstrated that between birth and 6 months

Photo 7.1 The back of an infant with FTT who has visible ribs secondary to paucity of subcutaneous fat

of age, 39% of healthy children crossed two major percentile lines on the weight-for-age curve, as did 6–15% of children between 6 and 24 months of age. FTT is not used to describe children who are growing with a normal velocity or interval growth rate, yet remain below the second percentile, nor is it used to describe children with genetic short stature, constitutional growth delay, or prematurity who have appropriate weight-for-length and normal growth velocity (Bithoney et al. 1992; Zenel 1997). "The pediatrician must still use clinical judgement and not be overly reliant on arbitrary mathematical definitions of FTT" (Jaffe 2011).

FTT usually presents in infancy and early childhood when there are rapid periods of growth. With malnutrition, weight is the first growth parameter affected, followed by height and then head circumference (Barbero and Shaheen 1967). In evaluating a child with FTT as the working diagnosis, the clinician carefully considers the age of presentation, the presence or absence of risk factors for growth failure (such as underlying medical condition), and psychosocial factors that might affect feeding and growth. The diagnosis is made when the evaluation is completed and information from each component of the evaluation is carefully considered. Once a definite etiology for the problem is uncovered, the term FTT may be linked with the appropriate diagnosis.

For many years, FTT was thought to be either organic (physically based) or nonorganic (socially based). Health-care professionals thought that the growth retardation seen in children labeled as FTT originated either from a medical condition or illness or from a psychosocial aberration in the child's caregiving environment. This dichotomous view has since been modified as clinicians realized that a third category, "mixed" FTT, accounts for a large number of cases in which a combination of both organic and psychosocial factors contributes to growth failure (Homer and Ludwig 1981). (See Table 7.3 for questions asked in the evaluation of FTT.)

Consequently, the differential diagnosis of FTT includes a wide range of possible etiologies for growth failure that may be as broad as the index of a pediatric textbook (Tunnessen and Roberts 1999; Zenel 1997). Table 7.4 contains a differential diagnosis for FTT. Psychosocial FTT is used when the growth failure is primarily attributed to characteristics in the child's caregiving environment, namely, social, environmental, psychological, or behavioral factors that affect the amount of nutrition that the child functionally receives. (See Table 7.5 for an overview of the evaluation of FTT.)

Stephens et al. (2008) summarize the basic nutritional issues that underlie the growth problems seen in all types of FTT: (a) not enough calories going into the child, (b) too many calories excreted by the child, or (c) too many calories expended internally. Organic causes may be seen in children with gastrointestinal anatomic abnormalities such as short gut, malabsorption, or a hypermetabolic state related to chronic inflammation. However, these organic conditions may coexist with social, environmental, psychological, and/or behavioral issues that contribute to or exacerbate the nutritional problem, thus giving rise to "mixed" FTT. For example, feeding a child with a cleft lip and palate may so challenge the caregivers that efforts to feed the child become dysfunctional and ineffective. Thus, an initial organic problem may become mixed over time as the psychosocial component becomes established (See Photos 7.2 and 7.3).

Table 7.3 Guide to the observation of caregiver–child interactions

I.	General
	A. Caregiver
	Is there caregiver–child physical contact? What kind?
	Is there cuddling?
	Does caregiver smile at child? Do they look at each other?
	Does caregiver appear aware of child? Child's needs? Child's comfort?
	Is there playful behavior? Does caregiver engage the child with toys?
	Is there verbal communication? Pleasant? Angry? Commanding?
	B. Child
	Is the baby/child verbal? Speech delayed?
	Is the child alert? Withdrawn? Apathetic? Sad? Apprehensive?
	Are there unusual body postures? Tone floppy? Rigid?
	Does child respond to separation from caregiver?
II.	Feeding observation (Chatoor and Egan 1983).
	Observations of feeding occur in a comfortable place that is quiet and relatively free from distractions and interruptions
	A. Homeostasis/attachment.
	Does the caregiver
	Begin the feeding touching the nipple to the infant's cheek?
	Stimulate the infant's lips and allow the child to open his or her mouth prior to introducing the nipple into his or her mouth?
	Seem aware of the amount flowing in the nipple?
	Hold the bottle at a comfortable angle for the infant and avoid jostling the child or bottle?
	Notice when the infant is hungry and initiate feed promptly?
	Avoid excessive burping and wiping?
	Permit the infant to set the pace of the feed?
	Allow the child to rest, interact, and return to the feed?
	Balance the infant's need for attention with the need to avoid overstimulation that could be distracting?
	Notice when the infant appears satisfied and halt the feed when the infant displays behaviors indicating satiety, such as turning away and closing his or her mouth?
	B. Separation and individuation.
	Does the caregiver
	Comfortably position the child for feeding/eating?
	Position him- or herself in an easily seen location and place the eating utensils in the child's view? Talk in a soothing, reassuring manner that does not overstimulate and distract the child? Demonstrate patience and permit time for the child to acclimate to meal time?
	Allow the child to handle the food and, when ready, permit self-feeding?
	Demonstrate patience for the child's pace?
	Respect the child's likes and dislikes?

Sources: Adapted from Kempe and Goldbloom (1987), Ludwig (1992), and Satler (1990)

Table 7.4 Summary of organic causes of failure to thrive

Prenatal causes	Prematurity with complications Maternal malnutrition Toxic exposure in utero Alcohol, smoking, medications, infections IUGR Chromosomal abnormalities
Postnatal causes	Inadequate intake Lack of appetite (chronic illness) Inability to suck or swallow Vomiting Therapy used to treat primary illness (e.g., chemotherapy) Developmental delay GI pain or dysmotility Poor absorption and/or use of nutrients Malabsorption Anatomical GI problems Pancreatic and cholestatic conditions Inborn errors of metabolism Chronic GI infections Increased metabolic demand HIV infection Malignancy Cardiopulmonary diseases and inflammatory conditions Renal failure Hyperthyroidism

Rabinowitz (2016. Used with permission)

Black et al. (2006) outline the difference between FTT and neglect. Health-care providers may conclude that a family of a child with FTT, without an identified organic cause, may be considered abusive or neglectful, therefore promoting a punitive rather than a therapeutic approach to families. FTT in combination with neglect is a relatively rare occurrence, and evidence supports the benefits of treating most children with FTT through sustained participation in multidisciplinary outpatient clinics and home visiting programs.

FTT Evaluation

The following is included in the medical evaluation of a child whose growth is below expectation:

1. Comprehensive medical history with prenatal, feeding, and dietary history.
2. Complete physical examination, including measurement of growth parameters (weight, height/length, and head circumference), body mass index (BMI), and review of prior measurements.
3. Laboratory workup, specifically indicated by history and physical examination.

Table 7.5 Overview of evaluation of FTT

History	Birth history (premature, IUGR, twin, birth weight)
	Familial history (short stature)
	Growth history (growth charts)
	Diet history
	Past medical history
	Past surgical history
	Psychosocial history (family dynamics and stressors)
Physical assessment	Growth
	Nutrition (e.g., signs of nutritional deficiencies)
	Congenital anomalies
	Evidence of neglect/abuse
Indicated laboratory studies	CBC
	Electrolytes
	Urinalysis
	Urine culture
	Sedimentation rate
Clinical observation	Child's interactions with caregiver
	Weight gain under supervision/hospitalization
	Feeding behaviors
Documentation	Frequent visits with accurate recordings on growth chart

Photo 7.2 Seven-month-old with life-threatening malnutrition and dehydration. The baby weighed less than his birth weight at the time of hospital admission (7 months old). Note the sunken eyes, muscle wasting, and scaphoid appearance of the abdomen

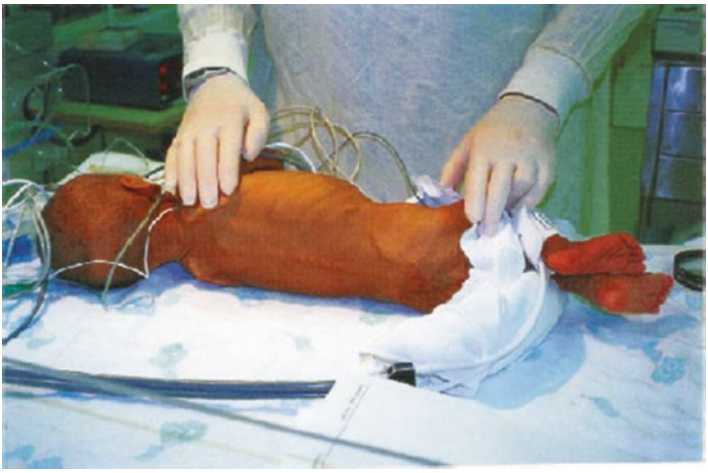

Photo 7.3 Posterior view of previous baby. Note the severe wasting. Marks on the lower back represent Mongolian spots. The baby had no evidence of physical injuries

4. Psychosocial assessment with observation of caregiver–child interactions, especially around feeding.
5. Careful documentation of all findings (See Table 7.5 for an overview of the evaluation for FTT.)

History

The evaluation of FTT includes the medical history (see Chap. 2) and specific information about nutritional status, diet, and feeding behaviors. The following are areas to highlight in the FTT history:

1. Any history of medical conditions that may affect the amount of calories ingested, excreted, or internally expended.
2. Adequacy of caloric intake. The Committee on Dietary Allowances (1980) of the National Research Council estimates that healthy infants on average require approximately 115 kcal/kg during their first 6 months of life and that this can vary from 95 to 145 kcal/kg (10th–90th percentile, respectively). From 6 months to 1 year of age, the caloric requirement, on average, decreases to approximately 105 kcal/kg, ranging from 80 to 135 kcal/kg (10th–90th percentile, respectively). Approximate targets exist for the amount of formula an infant should receive based on the standard caloric content of commercial formulas (20 kcal/oz). The health-care provider should also inquire as to the type of formula, quantity consumed in a 24-hour period, formula mixing practices, perceived special dietary needs (lactose intolerance, vegan diet, alternative animal milk sources), time to

meal completion, and the feeding environment (in front of TV, at the table, type of distractions). The provider should also observe a feed and the parental interaction during the feeding. The provider should also discuss parental perceptions of the child's weight and any concerns a parent may have about the child becoming too thin or obese.

3. History of weight gain. On average, healthy infants who receive adequate caloric intake are expected to gain weight at standard rates, although a range of normal growth exists (Gahagan 2006). The weight targets are approximately as follows:

   0–3 months of age → 27 g/day
   ≥3–6 months of age → 20 g/day
   ≥6–12 months of age → 12 g/day
   ≥12–18 months of age → 8 g/day

4. Family growth history, including information on the size, growth patterns, and timing of puberty of the biological parents as well as those of other family members. Methods exist to correct for genetic height expectations based on analysis of parental size (Himes et al. 1985; Tanner et al. 1970).

Physical Examination

A thorough physical examination focuses on findings suggestive of underlying disorders, growth parameters, and objective developmental assessment. The following are areas to highlight in the FTT physical examination:

1. *Findings indicative of underlying disease and/or physical signs of maltreatment*.

Signs of wasting as evidenced by loss of subcutaneous tissue in the buttocks, thighs, temporal and paraspinal areas, and around the rib cage (disease or maltreatment).

Nutritional deficiencies may reveal themselves through changes in the skin (e.g., dry, cracked), hair (e.g., sparse, fragile), teeth (e.g., caries, delayed eruption), and nails (e.g., dystrophic) (disease or maltreatment).

Physiological aberrations as evidenced by decreases in pulse, core body temperature, and body fat (disease or maltreatment).

Congenital syndromes with characteristic findings in the hands, feet, face, head, extremities, and body habitus (disease).

Signs of neglectful caretaking, such as dirty, poorly maintained clothing, excessive diaper rash, bald patch on the back of the head, poor grooming, and a general lack of proper hygiene (Hobbs et al. 1993).

Dental neglect should also be diagnosed when there is a delay in seeking treatment for significant dental caries or trauma, failure to complete a recommended course of treatment, or allowing the child's oral health to deteriorate avoidably

(Bhatia et al. 2014). In a recent study, a strong association was found between severe dental caries and the diagnosis of child abuse and neglect (Smitt et al. 2017).

2. *Growth measurements*. Standard growth parameters are plotted for weight, height/length, weight for height, and head circumference on growth charts of the National Center for Health Statistics (NCHS). Many suggest expressing the child's weight as a "weight age." This is done by plotting the child's current weight and determining at what age this weight would represent the 50th percentile (Goldbloom 1987). For example, a 2–year–old child at 9 kilos has a "weight age" of 10 months based on the NCHS charts.

Often, the use of a z-score may be helpful in classifying the severity of growth abnormalities and can aid in comparing growth abnormalities among children. A z-score is a value that represents the number of standard deviations from the mean value. Some are recommending that z-scores be the new gold standard in measuring malnutrition (Mehta et al. 2013). Children may demonstrate wasting, a low weight for height; stunting, a low height for age; or both. Moderate wasting and stunting are usually defined as a z-score between −2.0 and −3.0, while severe wasting and stunting are defined as a z-score less than −3.0 (Kellogg and Lukefahr 2005).

Plotting and reviewing previous growth points are an important part of the growth assessment and assist in visualizing the growth pattern over time.

Head circumference is measured for at least the first 2 years, and recumbent length is measured until age 2 and then followed by a standing height.

Correction for prematurity is necessary when plotting growth parameters. This is done by subtracting the number of weeks that the baby is premature (based on a 40-week gestation) from the baby's chronological age and then plotting the measured growth parameter against the corrected age. Head circumference measurements are plotted against corrected age until a chronological age of 18 months. Weight is corrected in this fashion until 24 months of age, and height measurements are corrected up to 40 months (Brandt 1979).

Despite age correction, extremely premature infants and infants with severe intrauterine growth retardation (IUGR) may remain short throughout life. To evaluate the growth of IUGR infants, determine whether the IUGR was asymmetric or symmetric. Asymmetric IUGR exists when weight is lower than anticipated for gestational age but head circumference and length are spared. Symmetric IUGR exists when head circumference, length, and weight are all equally reduced for gestational age. Infants with symmetric IUGR have a relatively poor developmental prognosis and often fail to grow properly.

Also, clinicians should consider the importance of photodocumentation while completing their workup. Photos of a child's face and buttocks can help clearly delineate the lack of subcutaneous fat stores or the presence of a protuberant belly in a case of kwashiorkor. Once a cause for poor growth is identified and a therapeutic treatment plan is implemented, photodocumentation further helps to record the child's progression and improvement in growth.

FTT is suspected with the following findings:

Growth parameters

(a) Weight and/or height/length measurements are less than the third percentile (Stephens et al. 2008)
(b) Weight for height is less than third percentile
(c) Weight-for-length <80% of ideal weight (Block et al. 2005)

Growth pattern

(a) Measurements that follow a curve less than the third percentile (keeping in mind that from a statistical perspective, 3% of healthy children will follow this pattern)
(b) Measurements that drop across at least two formal growth curves, namely, 95th, 90th, 75th, 50th, 25th, 10th, and fifth percentile curves
(c) Measurements that give rise to a fluctuating, "saw-toothed" pattern, suggesting normal or near-normal growth punctuated by periods of poor growth

In addition to standard growth measurements, anthropometric growth, such as mid-upper arm circumference and triceps skinfold thickness, may be assessed. This provides an objective assessment of fat and muscle mass, and these measurements are typically performed by nutritionists and dietitians (Ayatollahi and Mostajabi 2008).

3. *Assessment of developmental abilities*. Objective assessment of developmental abilities is also possible during the physical examination because components of standardized developmental screening tests are easily accomplished.

Specific, Directed Laboratory Evaluation

Laboratory tests and diagnostic procedures may be needed to evaluate FTT (Berwick et al. 1982; Homer and Ludwig 1981; Sills 1978). Laboratory tests confirm a diagnosis suggested by the clinical evaluation, but not all children evaluated for FTT need a laboratory evaluation. Specific laboratory tests are done during the workup. Random panels of tests rarely uncover etiologies not initially expected based on the history or physical examination.

Studies indicate that the usefulness of laboratory and radiologic tests alone in the diagnosis of neglect is low (Berwick et al. 1982; Sills 1978). Berwick et al. (1982) retrospectively studied 122 children (between 1 and 25 months) admitted to a tertiary care center for FTT evaluation. An average of 40 laboratory and radiologic procedures were performed per child, and only 0.8% were deemed helpful in making a diagnosis. Sills's (1978) retrospective study of 185 children hospitalized for FTT found similar results. Only 1.4% of all tests ordered were of positive diagnostic value, and no test was useful without a specific indication from the clinical evaluation.

The health-care provider presented with a child who is failing to grow considers a wide range of possible etiologies. Basic laboratory screens that may be helpful are

(a) CBC (e.g., anemia, infection); (b) erythrocyte sedimentation rate (e.g., infection, inflammation); (c) urinalysis (e.g., renal disease, infection); (d) urine culture (e.g., infection); (e) lead screen (e.g., anemia); and (f) electrolytes, including blood urea nitrogen (BUN) and serum creatinine (e.g., metabolic disorder, renal disease, renal tubular acidosis) (Zenel 1997). A bone age may be useful as well as thyroid function tests if history and physical suggest a chromosomal or endocrinologic disorder. The bone age is determined through a radiograph of the child's hand. The child's radiograph is then compared to "standards" by the radiologist, and a bone age is assigned (Zenel 1997). This bone age is then compared to the child's chronological age looking for variation. After review of other evaluation components, further laboratory or radiologic tests may be indicated based on clinician judgment.

If an inborn error of metabolism is suspected due to signs and symptoms such as organomegaly, liver dysfunction, recurrent bouts of vomiting or lethargy, loss of hearing, developmental delay, seizures, or dysmorphic features, a baseline laboratory screening should be completed. It should include a complete metabolic panel as well as a CBC and urinalysis. If an inborn error of metabolism continues to be a concern after initial laboratory screening, plasma amino acids, urine organic acids, plasma acylcarnitines, ammonia, blood lactate and pyruvate, and CK should be obtained. Normal lab values may not completely rule out an inborn error of metabolism, as the child may be in a well state at the time of analysis. Also, some diagnoses require a special test such as an enzyme analysis. A consultation with a metabolic physician is warranted if there is concern for an inborn error of metabolism. Newborn screens may also be normal in children with inborn errors of metabolism. Newborn screens do not screen for all metabolic disorders, and there may have been insufficient time for toxicity to develop during the newborn period, when these tests are performed (Ficicioglu and Haack 2009).

Psychosocial Assessment and Feeding Observations

The evaluation of FTT includes a thorough psychosocial assessment that begins at the initial assessment and continues throughout the entire evaluation. Growth failure may be one of the many indicators of psychosocial disorganization and may be associated with major life events. The health-care provider explores the caregiving environment and asks questions about marital or relationship problems, lack of prenatal and postpartum care for the mother, and lack of immunizations and other health maintenance for the child (Ludwig 1992). In addition, observation of interactions surrounding the child's feeding remains a critical component of this assessment. Areas that require specific attention include the following:

1. The caregiver's comfort with the child and his or her appreciation of the child's developmental accomplishments. Goldbloom (1987) suggests that the health-care provider ask the caregivers a simple question: "Are you having fun with the baby?" Responses that include an instant smile or a cheerful affirmation are encouraging. Delayed, equivocal, or silent responses are concerning.

2. The child's feeding/dietary history along with observations of the caregiver–child interaction during feeding reveals whether mealtime is a healthy, pleasurable experience for the pair or if it is completed in anger or with force by a rejecting caregiver (Schmitt and Mauro 1989). For example, a disturbed mother may feed her infant with disinterest or with an obvious lack of awareness of the infant's minute-to-minute needs. The observer may uncover oral motor difficulties with sucking, gagging, or swallowing, as well as ongoing struggles with feeding and food refusal.

Treatment

The design of the treatment plan for the child with FTT depends on the results of the evaluation. If psychosocial concerns are prominent, a multidisciplinary treatment plan is ideal because it draws on the expertise of physician, nurse, social worker, and nutritionist. The treatment plan consists of standard therapy for the condition in the relatively uncommon situation in which FTT is caused purely by a medical condition with no psychosocial overlay. For example, if the child's FTT resulted from chronic diarrhea secondary to a bacterial infection, then the appropriate treatment is antibiotics and careful refeeding.

More commonly, medical conditions coexist with psychosocial problems. In this situation, complex management plans are necessary. Table 7.4 lists a differential diagnosis for FTT. In addition to the indicated treatment for specific medical conditions, one needs to address the following: (a) nutritional requirements for catch-up growth and feeding behavior, (b) inpatient versus outpatient therapy, (c) comprehensive follow-up programs, and (d) whether a child protective services (CPS) report should be filed. Each component is discussed below:

1. *Nutrition and feeding*. Children with FTT require significantly more calories than the standard, recommended amount. To achieve "catch-up" growth, Krugman and Dubowitz (2003) recommend that a child will need on average 50% above the recommended requirement. Thus, an infant with an average need for 105 kcal/kg/day would require approximately 160 kcal/kg/day to achieve catch-up growth. If a baby weighs 6 kg and drinks a standard 20 kcal/oz formula, then he or she needs 32 oz (640 kcal) for routine growth and an additional 16 oz (total of 48 oz, 980 kcal) to ensure catch-up growth.

The requirement for catch-up growth frequently proves to be too large a volume for the child drinking a standard 20 kcal/oz formula. The caregiver can reconstitute concentrated or powdered formula using less water and achieve a higher caloric content. If the child is no longer on formula but on whole milk, the milk can be fortified with nonfat dry milk or instant breakfast preparations to increase its caloric content. In addition, several high caloric beverages are commercially available that may be used for supplementation.

In older children, caloric intake is more difficult to measure because of solid foods in the diet that are more variable in nutritional content. Baby food jars of fruits and vegetables contain approximately 15 kcal/oz, and those of meats and desserts are 25–30 kcal/oz (Schmitt and Mauro 1989). In addition, the caloric value of the child's foods can be enhanced by adding high-calorie food fortifiers such as (a) butter (40 kcal/tsp), (b) cheese (100 kcal/oz), (c) peanut butter (100 kcal/tsp), and (d) sour cream (30 kcal/tsp) (Tougas, cited in Bithoney et al. 1992).

Adequate management by a primary care provider of mild to moderate malnutrition is possible if he or she has experience with such cases. Nutritional consultation is recommended for more severe malnutrition in order to provide appropriate nutrients and calories and to guard against refeeding syndrome.

If feeding behaviors are poorly developed or dysfunctional, the caregiver requires (re)training that addresses general parenting skills, feeding routines, mealtime behaviors, and modeling of positive caregiver–child interactions. Videotaping of the caregiver–child interaction around feeding may provide the caregiver insight into what some of these problems are.

2. *Inpatient* versus *outpatient therapy*. In the past, virtually all children who presented with FTT were admitted to the hospital for long lengths of stay to observe feeding and weight–gain patterns. The changing health–care environment discourages hospitalizations for children with FTT and, increasingly, shifts from inpatient care to outpatient care. However, clinical indications exist for both inpatient and outpatient care.

Inpatient stays offer the opportunity to provide close supervision and control over the amount and frequency of feeding. They are criticized as being artificial and potentially confusing to the caregiver if weight gain does not occur. In addition, requiring hospitalization to get a child to feed and gain weight may reinforce a sense of helplessness in the caregiver. Hospitalization of infants with FTT may be indicated if any of the following situations are present:

- Nonaccidental trauma
- Risk for nonaccidental trauma
- Sibling previously abused
- Caregiver appears angry, violent, or volatile
- Severe malnutrition, marasmus, kwashiorkor, or emaciation
- Weight less than birth weight at 2 months of age or older or no weight gain in more than 2 months
- Severe hygiene neglect, such as filthy, unwashed skin or severe diaper rash
- Severely disturbed caregiver
- Negative caregiver–child interaction
- Outpatient treatment failure: no weight gain with 1-month trial of increased caloric feedings
- Caregiver refuses assistance with child's problem

The presence of a previous complex chronic medical condition increases the chance of readmission to the hospital once a diagnosis of FTT is made. Children

with prematurity-related conditions and low median household income are also unique populations at risk for FTT readmissions (Puls et al. 2016). Each case must be handled individually, viewing the above criteria as clinical practice guidelines.

Outpatient trials have the advantage of being more natural and replicating what is possible at home. However, there is less control and supervision in the outpatient setting. Outpatient trials are recommended for less severe cases when there is no immediate danger to the child's health. Outpatient management for children with FTT is typically appropriate in the following circumstances:

- Child over 12 months of age
- State of malnutrition is in the mild to moderate range
- The caregiver–child interaction has some positive aspects
- The caregivers are accepting of help
- Absent risk factors for nonaccidental injuries

3. *Follow-up*. Active, ongoing, and continuous involvement by the health-care provider with the child and caregiver (and CPS worker, if involved) is essential to ensure that the treatment plan is working. Medical appointments, in-home services, and psychological services for the caregiver(s) are frequently necessary over a period of months to years, depending on the family and how successful the original regimen was in fostering growth. (See Chap. 14 for further discussion of CPS and maltreatment follow-up.)
4. *Whether a CPS report should be filed*. Whether to report a case of FTT to CPS remains a primary management decision in the treatment of FTT. Laws guiding the reporting of neglect and FTT are intentionally vague to allow for clinical judgment. Cases where clear-cut parental misinstruction is the cause of the problem are best handled through education and close follow-up. For example, a case in which the caregiver misunderstood formula preparation instructions and mixed one part of formula with two parts of water (instead of the correct one part of water) may best be solved with caregiver education and careful follow-up in the health-care provider's office.

CPS reporting is typically done in clinical situations with the following characteristics:

1. Physical abuse is present
2. Pervasive patterns of neglect or cruelty are uncovered
3. The caregivers appear incapable of adequately caring for the child (e.g., caregivers who are seriously mentally ill, substance abusers, severely cognitively impaired, homeless, or resistant to accepting assistance with their child's problem)

CPS may recommend foster placement as being in the child's best interest. In general, foster placement is considered in FTT cases if the caregiver:

1. Rarely visits the child if hospitalized
2. Demonstrates a negative, punitive, or indifferent attitude toward the child
3. Remains uncooperative in the treatment protocol
4. Is an active substance abuser
5. Suffers from severe psychiatric illness
6. Is found to be severely cognitively impaired
7. Holds to dietary beliefs that are dangerous to the child's well-being (e.g., believes that the child should feed only on fruits)

Protein–Energy Malnutrition

Protein–energy malnutrition (PEM) is often considered problematic in resource-poor countries in which undernutrition tends to be a more common occurrence. However, PEM and its sequelae can very well be seen in neglected or undernourished children in resource-rich countries (see Table 7.6). Severe acute malnutrition (SAM) is classically divided into two clinical subtypes: marasmus (wasting) and kwashiorkor (edematous malnutrition) (see Table 7.7). However, with further study, this disease process tends instead to lie on a spectrum with marasmus and kwashiorkor lying on opposite sides. Many children will demonstrate characteristics of both marasmus and kwashiorkor and can be considered to display qualities of marasmic kwashiorkor. Originating from Ghana, the word "kwashiorkor" means "disease of a baby deposed from the breast when the next one is born" (Encyclopedia Britannica), which serves to highlight the link between weaning and the development of malnutrition. This spectrum of protein–energy malnutrition can be seen in abused and neglected children as well as children subjected to poverty.

Marasmus typically occurs due to the lack of all nutrient sources, or total calories, and manifests with wasting of muscle and adipose tissue. Kwashiorkor is marked by symmetric edema with a wasting of muscle tissue but often with normal or increased fat stores (Photo 7.4).

Table 7.6 Effects of severe PEM by organ system

Liver – steatosis and pancreatic atrophy
Kidneys – loss of ability to concentrate urine, leading to polyuria and dehydration
Bone – decreased bone mass and delayed ossification; development of growth arrest lines
Brain – atrophy, neuronal damage, altered mental function
Psychomotor – irritability, apathy, increased sleepiness or lethargy
Immune system – thymus atrophy, immune suppression, opportunistic infections

Adapted from Piercecchi-Marti et al. (2006). Used with permission

Table 7.7 Comparison of kwashiorkor and marasmus

	Kwashiorkor	Marasmus
Type of energy deficiency	Protein[a]	Balanced/global
Affect	Apathetic	Irritable
Laboratory findings	Hypoalbuminemia Hypoproteinemia Hypolipidemia Anemia	Hypoglycemia Ketosis Anemia
Physical exam findings	Moon face Hypothermia Bradycardia Hepatomegaly Distended abdomen Edema Hypopigmented hair	Large head compared to body Hypothermia Bradycardia Shrunken arms, thighs, and buttocks Generalized wasting Sparse hair

[a]A deficit in protein is no longer thought to be the sole cause of edema in kwashiorkor

Photo 7.4 Child demonstrating physical characteristics of kwashiorkor. Child has a moon face, protuberant belly, muscle wasting, and hypoalbuminemia

It was once thought that a relative deficit in protein is what contributed to the edema in kwashiorkor, as these children often had hypoalbuminemia, which improved with adequate nutrition. However, some edematous children do not exhibit hypoalbuminemia, and some children develop edema while taking in adequate amounts of protein. Research attempting to identify the physiology behind the development of edematous malnutrition is ongoing – even the child's enteric microbiome is thought to play a role (Manary et al. 2009; Golden 2015).

Medical Neglect

Caregivers may be deemed neglectful by refusing to meet or delaying the health-care needs of their child (Jenny and Committee on Child Abuse and Neglect 2007) (See Photos 7.5 and 7.6).

Such health-care needs include:

- Routine preventive medical and dental care
- Timely access to acute care for illness or injury
- Meeting the ongoing care demands of a given condition (e.g., the chronically ill child) (DePanfilis 2006)

Medical neglect may present to the health-care provider in a number of ways. Typical presentations include:

- Delay in seeking care for an injury or illness
- Failure to administer prescribed medications
- Administration of recommended medications in a manner or schedule that impairs appropriate care
- Noncompliance with routine preventive care needs (such as immunization schedules, lead and anemia screening, and dental checkups)
- Noncompliance with the treatment needs for both acute and chronic conditions (such as failure to suction a tracheostomy according to the neonatologist's instructions)

Photo 7.5 Child with FTT and chronic wounds from repetitive spanking with a slipper. No medical care was sought

Photo 7.6 Same child as in Photo 7.5. Note improved wound healing after child received medical attention and appropriate nutrition. Repeated delays in seeking treatment led to poor probability for full healing

Variability in the range of presentations exists. For example, reported cases of medical neglect in asthmatic patients include parents who fail to administer medicines properly as well as those who refuse to remove or separate the child from household pets that are known triggers of the child's asthma exacerbations (Boxer et al. 1988; Franklin and Klein 1987). Ninety-one percent of children reported to CPS for medical neglect had chronic illnesses, with type 1 diabetes, organ transplantation, and prematurity-related conditions being the most common (Fortin et al. 2016).

A distinction exists between noncompliance and medical neglect (Ludwig 2005). Noncompliance occurs when the caregiver fails to carry through on the recommendations of the treating health-care provider. This may or may not have negative consequences for the child. Medical neglect, on the other hand, occurs when the noncompliance or delay in seeking care results in further illness or worsening injury (see Photo 7.7). The distinction rests on the presence or absence of identifiable harm.

One controversial example of medical neglect is the presence of severe childhood obesity and the development of comorbidities such as insulin resistance, sleep apnea, and fatty liver disease. These disease processes can progress and contribute to an early death if left unchecked. Severe childhood obesity may be considered neglect if (a) there is a high likelihood that serious imminent harm will occur, (b) a reasonable likelihood that coercive state intervention will result in effective treatment, and (c) there is an absence of alternative options for addressing the problem (Varness et al. 2009). Other measures can be taken before coercive state action is considered, such as home health nurse visitation, multidisciplinary team involvement with school nurses, counselors, and community-based social service agencies. Mandated behavioral and psychological evaluations would also prove useful.

Photo 7.7 Child whose body cast was left in place beyond the recommended removal date. Note areas of erythema and skin breakdown

The treatment of medical neglect is tailored to each case, depending on the child and caregiver. The evaluated level of risk or injury to the child will determine whether reporting medical neglect cases to CPS may be indicated. Hospitalization and/or removal from the home and placement in foster care may also be necessary if the child is at risk for injury or illness. Appropriate follow-up plans are essential to ensure compliance and assess adequacy of ongoing care.

Other Forms of Neglect

The health-care provider faces children with other forms of neglect including the following:

- *Supervisional*. Children who are abandoned may be brought to an emergency department for evaluation after a neighbor or relative alerts authorities to the possibility of supervisory neglect. Children may also sustain injuries due to inadequate supervision and require medical intervention. Abandonment is supported by a physical examination that reveals (a) poor hygiene, (b) hoarse cry, (c) excessive hunger, or (d) dehydration. Appropriate management requires reporting the case to CPS and placing the child in a safe, properly supervised environment with either a family member or a foster parent. Another area that relates to supervisional neglect is children who sustain accidental injuries due to inadequate supervision. The American Academy of Pediatrics believes that supervisory neglect occurs whenever a caregiver's supervisory decisions or behaviors place a child in his or her care at significant ongoing risk for physical, emotional, or psychological harm. Some child injury risks are unpredictable or unavoidable, and counseling regarding improved supervisory techniques may be an acceptable first step when speaking with families (Hymel and Committee on Child Abuse and Neglect 2006).

- *Emotional*. Emotional (psychological) neglect is a form of maltreatment that involves caregiving that fails to provide a nurturing, development-promoting environment for the child's psychological and emotional well-being. The impact on the child is impaired psychological and emotional functioning. Many consider emotional neglect and emotional abuse synonymous because the damage inflicted upon the child's mental health by either is similar and often pervasive. Believed to be the most common form of maltreatment, emotional neglect is the least well-defined, the least diagnosed, and the least understood. The caregiving to which the child is exposed creates an environment in which he or she is at:

  1. A disadvantage in accomplishing developmental, peer, school, and community tasks
  2. Risk for experiencing chronic and severe anxiety, agitation, depression, social withdrawal, or unreasonable fears about his or her life
  3. Risk for failing to receive proper therapy for psychological or emotional problems (Ludwig 2005)

The caregiving that the child receives is characterized by repetitive episodes that include belittling, neglect, humiliation, and verbal attacks on the child's value and worth. The child's self-image is destroyed, and a myriad of dysfunctional behaviors, attitudes, and perspectives ensue (see Table 7.1). Diagnosis of this form of maltreatment requires careful observation and documentation of the caregiver's interactions with the child, both verbal and nonverbal. Management and treatment for the emotionally maltreated child will require the skills of mental health professionals, and close follow-up is essential (DePanfilis 2006).

- *Educational*. Educational neglect is a manifestation of a caregiving environment that fails to provide adequately for a child's school attendance and performance. This situation may be due to a wide variety of reasons, ranging from a caregiver who is overwhelmed by life circumstances to a caregiver–child dynamic where the child's absences are encouraged through excessive dependency (DePanfilis 2006). Psychosocial assessment is essential, and the root causes for the failure to comply with the needs for formal schooling need to be addressed. Management and treatment require attention to the underlying causes and an approach that supports the child and caregiver in complying with educational obligations.
- *Religiously motivated medical neglect*. Medical neglect should focus on the child's needs rather than the caregiver's motive or belief system. While adults may refuse medical care, the US Supreme Court has ruled that parents do not have the right to deny their children life-saving medical care, and this stance was supported in *Prince* vs *Massachusetts* in 1944 (Jenny and Committee on Child Abuse and Neglect 2007): "The right to practice religion freely does not include the liberty to expose the community or child to communicable disease, or the latter to ill health or death…Parents may be free to become martyrs themselves. But it does not follow they are free, in identical circumstances, to make martyrs of their children…" (*Prince v Massachusetts*. 32 US 158, 64 SCt 438, 88 LEd 645 [1944]).

In Brief

- Neglect is the most commonly reported form of child maltreatment.
- A child's response to neglect depends on the type of neglect, the developmental stage at which the neglect occurred, the severity of the unmet need, the length of time that the child's need was not adequately met, and the effectiveness of the intervention by caring adults to halt the neglect.
- FTT is a term rooted firmly in clinical practice and remains the working diagnosis for children not growing as expected.
- The evaluation of FTT includes the medical history and specific information about nutritional status, diet, and feeding behaviors.
- The physical evaluation of FTT focuses on findings suggestive of underlying disorders, growth parameters, and objective developmental assessment.
- Observation of the child's feeding interactions is a critical component of the FTT assessment.
- The design of the treatment plan for the child with FTT depends on the cause of the growth failure.
- Reporting a case of FTT to CPS remains a primary management decision in treatment of FTT.
- Laws guiding the reporting of neglect and FTT are intentionally vague to allow for the clinician's judgment.
- The changing health-care environment discourages hospitalizations for children with FTT and increasingly shifts care from inpatient to outpatient evaluation.
- Noncompliance occurs when the caregiver fails to carry through on the recommendations of the treating health-care provider.
- Medical neglect occurs when the noncompliance or delay in seeking care results in further illness or worsening injury (Ludwig 2005).
- Emotional (psychological) neglect is caregiving that fails to provide a nurturing, development-promoting environment for the child's psychological and emotional well-being.
- Educational neglect is a manifestation of a caregiving environment that fails to adequately provide for a child's school attendance and performance.

Note

Refeeding syndrome initially described the severe metabolic complications observed when a severely malnourished person was given concentrated calories via total parenteral nutrition. The term is now used more broadly and refers to the physiological complications that occur when a severely malnourished person is reintroduced to "normal" foodstuffs in an uncontrolled manner. In addition to phosphorus depletion, shifts in humoral potassium, magnesium, and glucose may have serious, even fatal, cardiovascular and neurologic consequences (Solomon and Kirby 1990).

Case A

E.T. demonstrates that medical causes of FTT may coexist with overwhelming social causes.

E.T. is a former 6 lb. 1 oz. term infant born to a teenage mother with an uncomplicated pregnancy and delivery. The baby was noted to be gaining weight appropriately until age 6 months. Between 6 and 9 months of age, the health-care provider became increasingly concerned about the child's weight gain. The other had difficulty keeping appointments, and the infant's weight began to drop off significantly (points C on growth chart in Fig. 7.1). The evaluation revealed a sketchy history of intermittent constipation and physical examination notable for hypotonicity and significant developmental delay. Due to the mother's noncompliance with scheduled health care, the health-care provider consulted social work services and arranged for home nursing visits.

Psychosocial evaluation uncovered a chaotic household and an inadequate diet due to the mother's lack of funds to purchase the infant's food. The health-care providers considered that the "constipation" might be related to the poor diet. Between 9 and 11 months (C–C on growth chart in Fig. 7.1), weight gain was noted but still below the fifth percentile. (In retrospect, this appears to have been related to severe constipation/impaction.) At age 12 months, weight loss was again noted, and the child was admitted to the hospital for an inpatient evaluation. E.T.'s length leveled off between 6 and 12 months as well (see Fig. 7.2).

Workup revealed Hirschsprung's disease. E.T. underwent surgical repair including placement of a colostomy (Point S on growth chart). On follow-up, E.T. began to gain weight, and his development improved. Social services remained involved to assist with the psychosocial issues uncovered during the evaluation.

Case B

T.H. demonstrates that observation over time provides useful information that may clarify the etiology of the growth failure.

T.H. is a term infant born to a 23-year-old mother who had an uncomplicated prenatal course with no history of smoking or drug use. The infant was first seen in a well-baby clinic at 2 weeks of age for routine care. She was breastfed until 1 month of age, when the mother stopped due to unsuccessful breastfeeding. The infant was initially placed on Isomil and then switched to Similac at 6 months of age. By 7 months of age, the baby's weight was noted to be dropping across percentiles (see Figs. 7.3 and 7.4 for T.H.'s growth charts). This seemed to correlate with the introduction of solids. She continued to be closely followed and was referred to an early-intervention feeding program.

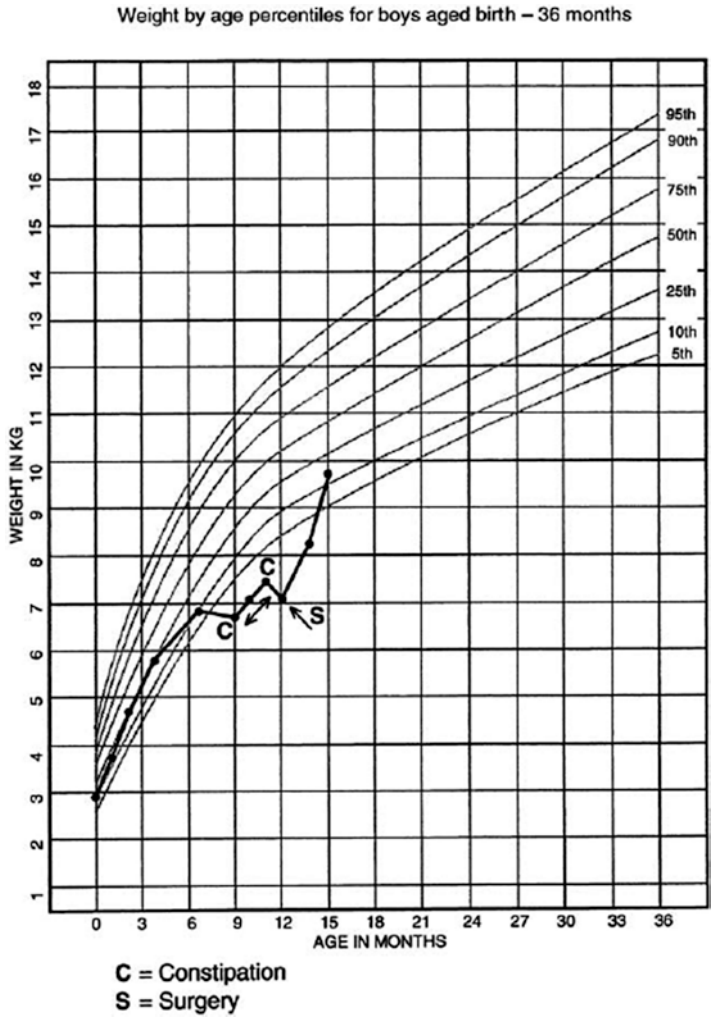

Fig. 7.1 Case A: E.T.'s weight by age chart

Over the next 6 months, she was followed closely with frequent weight checks. Her weight gain continued to be poor (see Fig. 7.3), and she was now below the fifth percentile. Length remained at approximately the 50th percentile (see Fig. 7.4). Initial evaluation consisted of basic laboratory testing, and results were unremarkable. At 13 months of age, after no sustained improvement in weight gain, T.H. was hospitalized for an inpatient workup. She was able to demonstrate weight gain during the hospital stay.

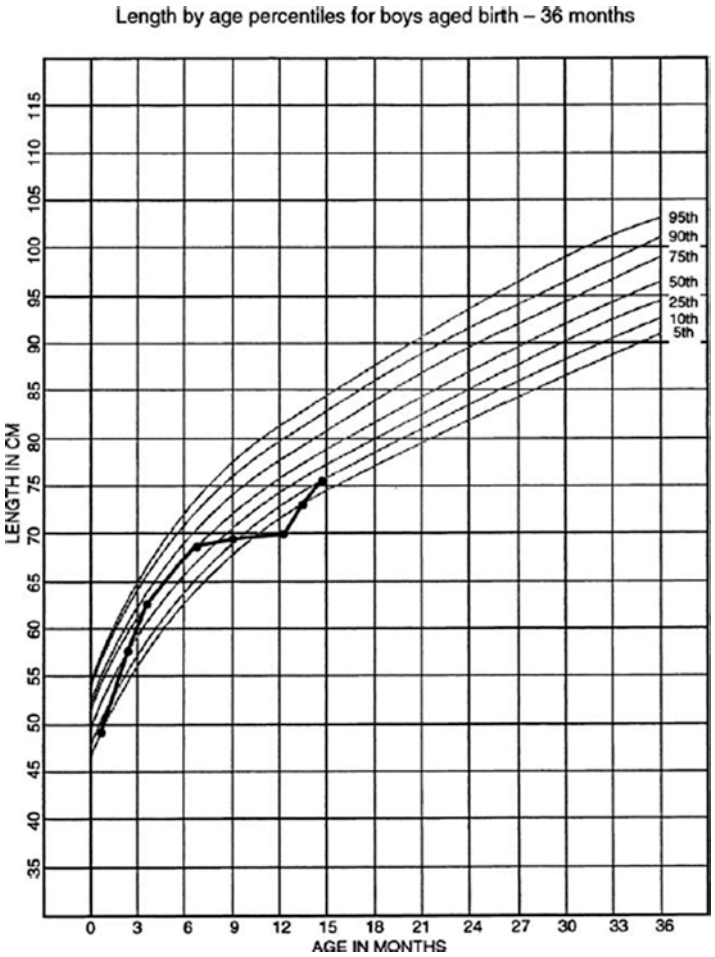

Fig. 7.2 Case A: E.T.'s length by age chart

Psychosocial evaluation noted that the mother appeared depressed with a sullen expression and a flat affect. During ongoing care, the mother was noted to be losing weight herself. When questioned about her personal eating habits, she revealed a childhood history of multiple caregivers and foster care placement. She related being force-fed to vomiting for almost 1 year and appeared terrorized when recounting that experience. The mother said she was afraid of making her daughter vomit. The mother also related how she could go a day or more without eating solids. "I sometimes don't feel hungry, so I don't eat."

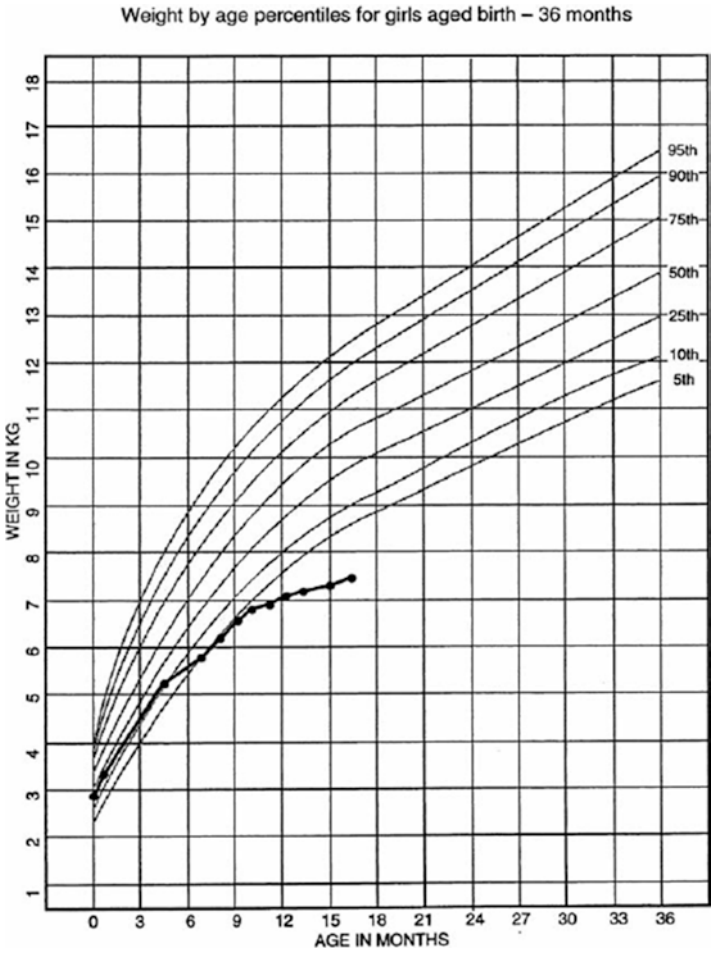

Fig. 7.3 Case B: T.H.'s weight by age chart

The mother was unreceptive to the health-care provider's suggestion that the mother seek psychological counseling, although she did agree that she was depressed. The child was referred to CPS for supportive services.

Case C

S.S. demonstrates how careful assessment of the social environment and correlation to the growth pattern observed over time may uncover the cause of a child's growth failure.

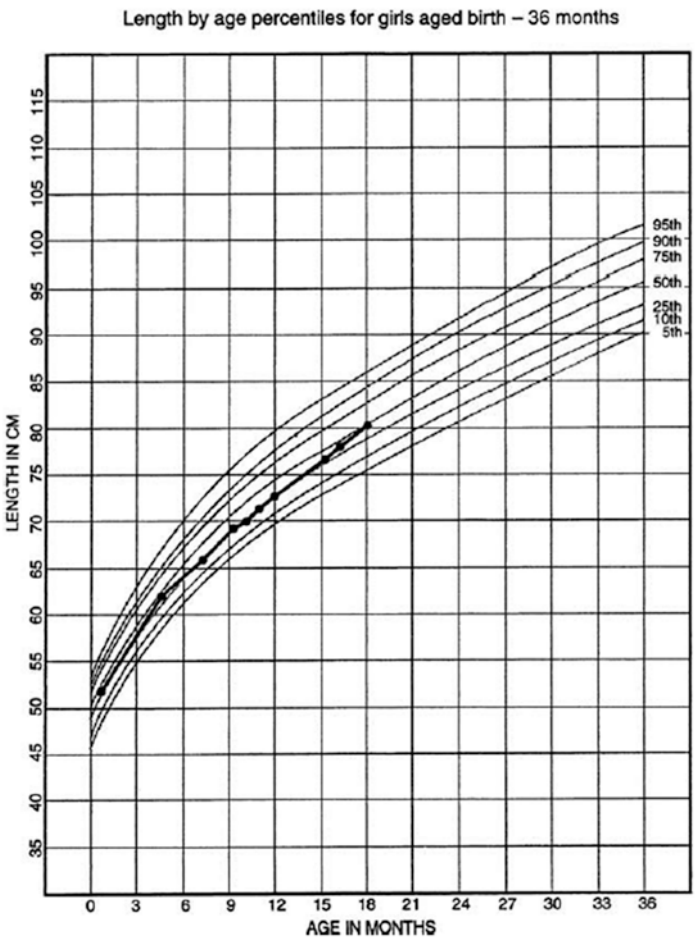

Fig. 7.4 Case B: T.H.'s length by age chart

S.S. is a small-for-gestational-age (SGA) term infant born to a 17-year-old mother in 11th grade. S.S. is cared for by her mother during summer vacations (A on growth chart in Fig. 7.5) and by her maternal grandmother during the school year (B on growth chart in Fig. 7.5). Initially, her growth was consistent with an SGA infant whose mother was 5 ft., 2 in. tall. Her growth pattern over 18 months revealed intermittent periods of growth retardation (A on growth chart in Fig. 7.5). Basic laboratory findings were unremarkable. Length seemed to follow a pattern

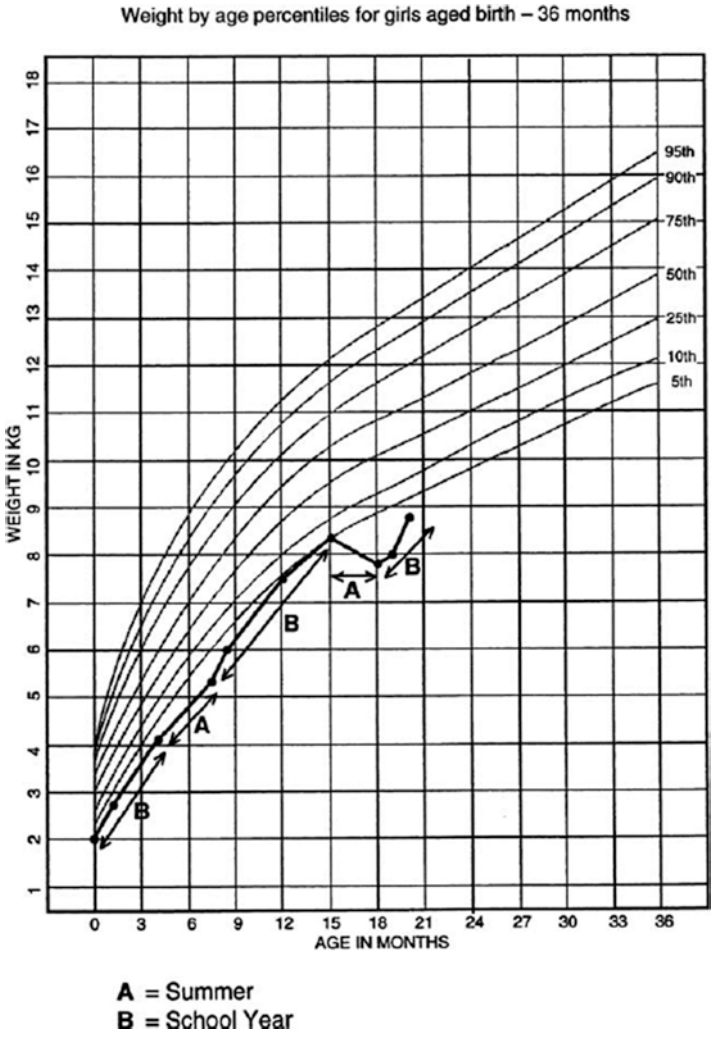

Fig. 7.5 Case C: S.S.'s weight by age chart

consistent with an SGA infant (see Fig. 7.6). At S.S.'s 18-month visit, the health-care provider correlated the episodes of poor weight gain with the primary caregiver transition from grandmother to mother that occurred during summer vacations.

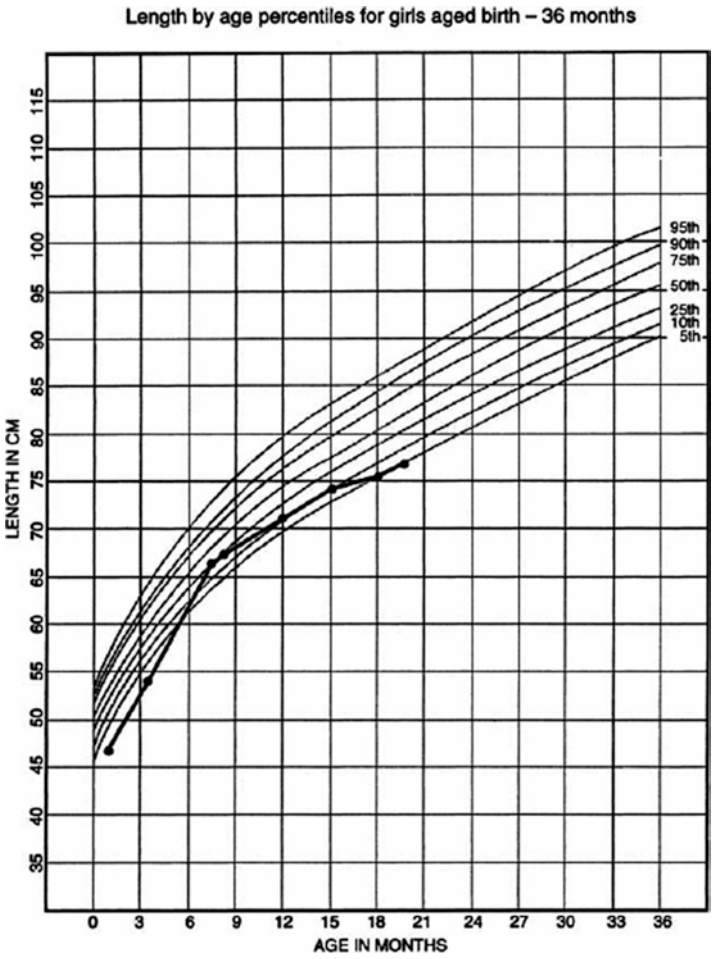

Fig. 7.6 Case C: S.S.'s length by age chart

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Chapter 8
Medical Child Abuse

Reena Isaac

Introduction

Since its initial citing as Munchausen syndrome by proxy (Meadow 1977), many attempts to bring a consensus among medical professionals on the labeling of the condition have resulted in varied proposed and controversial nomenclatures, including pediatric condition falsification (Ayoub et al. 2002), child abuse in a medical setting (Stirling and Committee on Child Abuse and Neglect 2007), medical child abuse, and caregiver-fabricated illness in a child (Flaherty et al. 2013). Regardless of the selected term, this is an unusual form of child maltreatment in which harm or potential harm is enacted onto the child by using or manipulating the medical system at the instigation of the caregiver. Medical child abuse (MCA) is a serious and potentially fatal form of child abuse (Roesler and Jenny 2009). The use of direct, clear terminology in the description of this form of child maltreatment is necessary when communication of a complicated medical case to the nonmedical child protective, investigating, and prosecutorial agencies may involve actions necessary to ensure the continued safety and protection of the child.

Medical Child Abuse

The condition of MCA has often been described as an unusual and rare phenomenon that occurs possibly once in a primary care physician's career. The lack of a standardized definition of MCA over the last several decades may have limited our understanding of the true scope of the problem. Many cases may have been

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overlooked as MCA or categorized under another form of child maltreatment, identified instead as physical abuse or medical neglect. The diagnosis of MCA is often difficult and elusive, with an average time from onset of symptoms to diagnosis of 14.9 months (range, 0–240 months) and 21.8 months (range, 0–195 months) reported, respectively, in two large series (Rosenberg 1987; Sheridan 2003). There is no one typical presentation for this form of abuse, although there are often commonalities in symptoms and diagnoses. In selected case series, the mortality rate has been defined as 6–9% (Rosenberg 1987; Sheridan 2003). The morbidity rate for cases is 100%. It must be understood that the diagnosis of MCA is made from the perspective of the pediatric clinician (providing focus onto the child as the victim of abuse) rather than an adult psychiatric vantage (attempting to diagnose a condition of the caretaker), as the determination of harm on the child victim is made by the pediatric clinician regardless of the caregiver's motivation or cause.

Case Report

A 6-month-old baby boy had a history of multiple presumed diagnoses of gastroesophageal reflux, laryngomalacia, plagiocephaly, obstructive and central sleep apnea, and other reported medical conditions. The patient was rehospitalized for a month for the inability to tolerate oral feeds. After an extensive medical workup identified no definitive medical cause, the child was discharged on nasoduodenal feeds. The infant was readmitted after the mother reported projectile vomiting episodes and the inability to maintain feeds. During the admission process, it was noted that the child had normal electrolytes, normal vital signs, and no significant weight loss or dehydration. The infant underwent a fundoplication and gastrostomy tube placement during this hospitalization.

Medical and surgical staff began raising concerns regarding the history provided by the mother as the child's symptoms were not congruent with the clinical picture. The chart documented numerous lab reports with findings that were normal or equivocal. The mother frequently reported that the child was in pain. However, during documented observations and interviews, staff usually described the child as "smiling and in no distress." The mother said the child had a helmet fitted in the neonatal unit to treat a "flattened head" (presumed diagnosis of plagiocephaly). However, the child at 8 months had a well-formed, round head. The mother, nevertheless, insisted on the child wearing the helmet. She complained to the hospital intern that the baby had a "very horrible diaper rash" and needed medicated cream. The intern examined the baby and did not see a rash of any kind.

The child's mother was quite active socially on the wards, walking with the baby in his helmet around the halls of the floor and entering other patients' rooms despite requests by the nursing staff to respect the patients' privacy and concerns for infection control. She inquired about the medical status of patients.

These concerns prompted a report to child protective services. The medical staff recommended the mother be removed from the hospital to allow a clear and unobstructed medical assessment of the child. During this period, all of the prior

presumed diagnoses except laryngomalacia were eliminated, and the child was taken off all medications. Eventually, the baby was found to eat adequately without the need of the gastrostomy tube, which was quickly removed. The child was placed in foster care, as there were concerns that the mother would likely continue to have access to the child if placed with a family member. Child protective services reported a month after the child's discharge that the mother insisted that the baby had a sponge accidentally left behind during a previous surgery. She insisted that the baby be reevaluated. A radiograph of the child's abdomen did not reveal a foreign object.

A 9-year-old sibling of the baby was subsequently removed from the mother when it was discovered that the sibling's medical visits and investigations increased significantly in the period after the baby's removal from the mother's care.

Identifying Medical Child Abuse

As with other forms of abuse, the first step in identifying that a child is possibly being harmed is to consider that maltreatment might be taking place. The inclusion of child abuse in the list of possible differential diagnoses may be the first step in arriving at some clarity with a case. In MCA, physicians may need to consider whether their (or other colleagues') previous diagnostic and therapeutic considerations were in error. This requires that doctors have the confidence to question previous care, the clarity to see clinical decisions based on potentially false information, and the fortitude to correct a medical plan and protect a child from further harm.

First and foremost is the child's safety and protection. Essential components that provide the blueprints of medical investigations into a diagnosis of MCA and possible management and monitoring methods follow (Stirling and Committee on Child Abuse and Neglect 2007).

Conservative Medical Investigations

The pursuit of an elusive medical diagnosis that defies objective medical theory and management may drive the medical team to investigate by increasingly more invasive and painful means. Sensible and balanced testing may minimize unnecessary intervention and harm to the child. The decisions for diagnostic investigations should be based on medical necessity, a consideration of risk/benefit analysis, low morbidity, and the ability to distinguish between a true organic condition and MCA (Mian 1995). Cautious consideration must be practiced when relying on a potentially offending caretaker's observation. The physician may need to reevaluate a clinical decision and clinical course and ensure that reported observations of the child's medical course are not being filtered through a questionable source. When the diagnosis is elusive and diagnostic efforts become more aggressive, the physician must always weigh risks to the patient against the benefits of an accurate diagnosis.

In some cases (i.e., poisoning), one may need to collect samples to identify extraneous or foreign substances. It is prudent to have a system in place that allows for a "chain of custody" protocol in handling such specimens. For example, if MCA is strongly suspected in a child who has recently vomited, the vomitus may be collected and analyzed for the presence of emetine while making sure that proper handling of the specimens is in place to satisfy later forensic needs.

Other investigations may require not only the presence of a substance (qualitative) but also the measured levels (quantitative) of the material. Such information can allow us to know when substances were introduced to the patient. A discussion with a local toxicologist may assist in clarifying such situations while addressing compounding factors such as the child's symptoms, medications genuinely prescribed, and underlying medical conditions and situations.

Collection of Medical Information (Child's Medical History): Comprehensive Medical Record Review

In complicated and potentially severe presentations, medical record review is the central feature of the evaluation (Roesler and Jenny 2009; Sanders and Bursch 2002). It is a long and tedious process, made more difficult by the large number of records usually involved and by the complexity of the medical issues (i.e., true medical conditions that are concurrent with suspected spurious symptoms). The process may begin with the birth records of the child and may involve constructing a timeline that includes every medical event in the child's life.

- To begin, attempt to obtain all of the child's medical records. Various social and legal agencies can assist in obtaining information that may otherwise be difficult to retrieve. Some cases may involve several different medical institutions, different subspecialists, and/or different cities or states. Figure 8.1 is an example of a useful timeline including the child's medical history, dates and locations of treatment, the chief complaints, supporting medical information, the treatments

Date	Patient	Event	Location/ Provider	Diagnosis/ Complaint	Comment
4/19/2008	Brittany	Admitted	West Hosp.	Acute gastroenteritis	No vomitus seen
4/25/2008	Brittany	Office visit	Dr. Apple	Otitis media	Antibiotics given, despite normal exam
4/27/08	Brittany	Phone call	Dr. Apple	Difficulty breathing	

Fig. 8.1 Chronology of events

given, and specific comments. Hospitalizations, office visits, and phone calls may also be included.

- Next, search for patterns. Attention is paid when medical events cease for a significant period. It is important to consider why care stopped (e.g., a sibling was hospitalized; the mother was pregnant). Or alternatively, consider when medical appointments became more frequent and why (e.g., parents separated or divorced; a period of stress is recognized). Occasions may be noted where multiple providers are treating the same reported condition.
- Special appraisal must be taken not only of the physician notes but also of nursing documentation and ancillary staff notes (from occupational therapists, speech therapists, social workers, and others). These disciplines may have more frequent interactions and might note observations that are sometimes not apparent to the physician who has been investigating a particular symptom for an extended period of time.
- Note documented inconsistencies within the records. In a complicated case, it is often necessary to request medical records for the index patient, the siblings, and the parents or caretaker suspected of abusing the child (Trent 2008). At some point, a threshold is reached, and the decision must be made whether the child needs protection from ongoing unnecessary medical care.

Clear and Watchful Monitoring

There are times when objective observation of the child is required to determine what is true and what is clinically spurious. In these circumstances, the admission of the child to a hospital setting, where his or her actual signs and symptoms can be monitored (as opposed to the signs and symptoms being filtered through the report of the parent), can prove valuable. This consideration is important if the caretaker tends to exaggerate or fabricate the child's pain, disability, or other symptoms.

Placing a child in a hospital setting is only useful if it can be ensured that the parent cannot continue to act in a way that will result in harmful care. One might need to order constant observation of the child (having a hospital aide to sit and monitor the child) or even exclude the parent from the hospital completely. Such a scenario requires the assistance of an outside child protection agency to provide such action.

Covert Video Surveillance

One diagnostic tool that has received considerable attention is covert video surveillance. This involves using a hidden video camera to observe a parent interacting with her child without being aware she/he is being watched. There are published

reports of video evidence being used to convict perpetrators who smothered their children, committed physical abuse, or were discovered to induce an illness (e.g., injecting fecal material into the child's IV line) (Southall et al. 1987). Despite Hall's recommendation that every child's hospital has the capacity to do covert video surveillance, few facilities are actually equipped to do so (Hall et al. 2000).

Instituting a program of covert video surveillance is not a simple task and has its own ethical considerations. A responsible staff person must be available 24 hours a day to observe the behavior of the mother and child on a remote monitor. Without this element, the child is exposed to potential and preventable harm. It is clearly unethical to establish a monitoring system, allow abuse to take place, and then view the video evidence hours or days later. Another difficulty arises when a mother who might be harming the child at home chooses not to do so in the hospital environment. A video that does not show harm could be used to prove that no harm has taken place when in fact the opposite is true.

Final Diagnosis

While many various professionals may raise the suspicion of the possibility of MCA, the ultimate medical diagnosis must be determined by a physician. The evaluation for suspected MCA is essentially a sum of its parts: careful, detailed history taking, physical examination, laboratory/diagnostic analysis, and comprehensive chart review. Such medical investigations are pursued with a conservative, measured approach.

Presentation

There is no one typical way children can be victimized by receiving excessive medical care. All organ systems are potential targets. Symptom presentations are limited only by the perpetrator's medical knowledge, sophistication, and imagination. Actions taken by perpetrators that create the charade of organic conditions include the following examples:

- *Exaggeration*: embellishing or heightening an existing medical condition or symptom in order to obtain more medical attention and care.
- *Fabrication*: lying about nonexistent symptoms.
- *Persuasion*: repeatedly demanding medical care until the physician gives in to the demand; altering perceptions of a child's condition.
- *Simulation*: contaminating specimens collected for laboratory analysis.
- *Induction*: actually directly hurting the child and then seeking unnecessary medical treatment for the induced condition.

Box 8.1 Common Presentations and Examples of How They May Produced
Apnea: Manual suffocation, poisoning, induced hypoglycemia.
Seizures: Lying, poisoning, suffocation.
Diarrhea: Laxative poisoning, salt poisoning, contamination.
Vomiting: Poisoning (ipecac ingestion), lying.
CNS depression: Drugs, suffocation.
Bleeding: Blood-thinning medications, exogenous blood applied, paints/dye.
Rash: Drug, caustics.
Fever: Contamination with infected material, falsifying temperatures.

(Meadow 1977; Southall and Samuels 1996; de Ridder and Hoekstra 2000; Carter et al. 2006; Holstege and Dobmeier 2006; Aranibar and Cerda 2005; Boyd et al. 2014)

Box 8.1 displays examples of commonly reported symptoms and how they may be surreptitiously fabricated or induced.

Physician–Health System

Challenges within the health-care system that have the potential to facilitate the festering of MCA cases include the following (Squires and Squires 2010):

The Evolution of the Practice of Medicine

The rise of hospitalists has reduced the requirement for the primary care physician to monitor patients during hospital admissions and to follow evolving medical assessments. Multiple subspecialists and numerous rotating physicians within a group further create an environment in which medical histories may change over time, the treatment regimen may be modified, and communication is fractured. These factors allow cases of MCA to flourish and/or provide cover to the perpetrator.

Electronic Medical Record

With the impetus to improve the quality and efficiency of healthcare, the US Congress in 2009 provided physicians and hospitals with significant financial incentives to adopt and implement the use of the electronic medical record (EMR). While providing an efficient system for documentation and billing for services, the EMR

has been shown to be a difficult method of tracking trends and determining the origins of evolving cases of MCA. The creation of designed templates and pre-populated options can potentially reduce clarity of a complex clinical picture.

The Internet

Contributing factors of the Internet related to health issues include, but are not limited to, websites that explain signs and symptoms of various medical conditions and treatment options, blogs that allow a patient to chronicle a medical experience, social-networking sites that allow connections of patients and families with a common condition, and charity donation sites that provide a platform for solicitation of monies to meet mounting healthcare expenses. The Internet has been shown in recent years to be an interesting additional element to MCA investigations (Feldman 2000). The inclusion of the Internet into these cases dispels the historically held notions of a majority of perpetrators having a medical or nursing background or employment.

The worldwide exposure of the Internet can provide to perpetrators with a platform that motivates them to seek attention. A review of virtual journals can provide understanding and insight into motivations while comparing the true clinical picture of a patient with a fantastical retelling online (Brown et al. 2014). Significant financial gains can be garnered from such exposure and solicitations.

Motivation

As in other forms of child abuse, the reason why the perpetrator committed the act becomes an important factor when a determination is to be made about whether the child can remain safely in the home. It is not necessary to know why a person harmed the child to determine if the child was hurt and whether it should be stopped. As with other forms of child abuse, there can be many motivations for why a parent might expose her child to unnecessary medical care. Levin and Sheridan (1995) wrote "Motivations of the perpetrator are probably not uniform, and may include components of help seeking; a delusion that the illness is real; rage at the victim, healthcare provider(s), or significant others; and tangible secondary gain." The physician's role is to diagnose harm in the child. The determination of motivation and its consequences are best left to the legal realm.

Multidisciplinary Team

The treatment of MCA, as with other forms of child abuse, is best done in conjunction with an active child protection multidisciplinary team. Attempting to conduct a child abuse evaluation and treatment for a MCA case on the serious end of the

spectrum without the use of a multidisciplinary team is almost impossible. Often, it is the nurse, pediatric intern, social worker, or speech therapist who has more consistent, close interaction with the abuser during a child's hospitalization and raises the initial suspicion (Bursch et al. 2008). While other professionals may note suspicions and concerning behaviors, MCA remains a pediatric condition, and it is the physician who makes the final medical diagnosis.

Child protection and law enforcement professionals can add valuable collateral information from interviews with school officials and community members involved with the family, as well as gather evidence of drugs or medical equipment that may be available to the suspected abuser. Having multiple points of view allows for comparison between these accounts and the story derived from the primary caretaker. The child protection and law enforcement professionals can also assist in obtaining medical records from other sources. As some cases may be quite complex, it is prudent to have seasoned, experienced investigators knowledgeable about MCA involved. Mothers who have abused their children in the medical setting can be disarmingly charming and elicit little suspicion for many years. Once a report is made, the child protection and law enforcement professionals should become part of the multidisciplinary team to optimize case management and ensure communication and coordination of interventions.

Treatment

As stated above, the treatment of MCA follows the general principles involved in the treatment of all child abuse. The first step is recognizing that abuse is taking place. The second step involves stopping the abuse. Stopping MCA is somewhat different from stopping physical or sexual abuse. Stopping medical abuse means ending harmful medical treatment. This can happen only when medical personnel in charge of the treatment come to realize that it is based on false information and decide to halt the treatment and repair any damage. Thus, while medical care personnel are necessary for the commission of medical abuse, they are also necessary for bringing it to an end.

The next step in child abuse treatment involves the provision for the ongoing safety of the child. To provide for the ongoing safety of a child who has been receiving harmful medical care, the medical care delivery team must revise the treatment plan and get the cooperation of caretakers to follow the treatment. This step in medical abuse treatment might be as simple as holding a meeting with parents and announcing the new medical care plan. It might also trigger a realization that the perpetrator of the abuse is unable or unwilling to cooperate with appropriate medical care. It would be at this point that child protective services would most likely become involved.

As soon as the safety of the child can be ensured, evaluation can begin to assess and treat the physical and psychological consequences of the abuse. These consequences can be mild or devastating. Treatment is tailored to the needs of the individual child. The prognosis of the child victim depends on the extent, scope, and

Box 8.2 Spectrum of Interventions, Least to Most Intrusive
Provide counseling in office setting
Refer patients for therapy/medication
Refer for family counseling
Involve outside agencies to monitor care
Refer for partial hospitalization
Include inpatient trial of separation from parents
Refer to social services
Remove child from home
Terminate parental rights
Prosecution/incarcerate the perpetrator

length of time the child has endured the abuse. McGuire and Feldman (1989) reported a range of psychological problems exhibited by such child victims, including infant feeding disorders, withdrawal, hyperactivity, hysteria, and adoption of Munchausen behavior in the child. Box 8.2 provides a range of potential interventions for mild to severe presentations of MCA. The intervention need only be as powerful as necessary to make sure that treatment can proceed and result in a safe outcome.

The final step in a child abuse treatment is to attempt to maintain the family's integrity as much as possible while protecting the child (Roesler and Jenny 2009). In the mild to moderate forms of MCA, just as with other forms of child abuse, having the child remain with the family is often possible. This is usually predicated on the perpetrator understanding the consequences of her actions and entering into a reasonable treatment relationship with those attempting to help. If the perpetrator denies responsibility and is unable to see how her actions have affected her children, then, just as with other abuse victims, more significant intervention in the life of the family is necessary. In instances of severe forms of MCA, the child must be separated from the perpetrator to ensure the future safety of the child.

Pediatricians will rarely become involved in the rehabilitation of adult perpetrators of medical abuse just as they are seldom asked to take part in the treatment of sexual perpetrators. However, they are often asked to continue to treat the child with the remaining family unit that may or may not include the person who harmed the child in the first place.

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Chapter 9
Other Patterns of Injury and Child Fatality

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Abbreviations

ALTE	Apparent life-threatening event
BRUE	Brief resolved unexplained event
CDR	Child Death Review
CPS	Child protective services
CRP	Citizen Review Panel
SIDS	Sudden infant death syndrome
SUDC	Sudden unexpected death of a child
SUID	Sudden unexpected infant death

Introduction

In addition to overt skin, head, and abdominal injuries, there are more subtle ways in which parents and caregivers physically harm their children. These are more insidious injuries to the mouth and teeth through abuse or neglect, or children can be intentionally poisoned with drugs or chemicals. In a small fraction of cases, they

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die as a result of maltreatment. This chapter reviews medical and forensic issues related to physical trauma to the oral and pharyngeal tissues, bite marks, dental neglect, poisoning, and fatalities and the evaluation for the physician, dentist, and pathologist when faced with these child maltreatment findings. This chapter discusses a wide range of less common injuries found in abused children, some of which are easily identified as inflicted whereas others are more easily overlooked.

Oral and Dental Trauma and Neglect

Oral injuries are among the visible sentinel injuries which have been identified as hallmarks of potential abuse which should be recognized to prevent further harm to a child (Sheets et al. 2013). More than half of child abuse injuries are to the head and neck, clearly visible to the dental team or knowledgeable observers such as teachers, social workers, health-care professionals, or law enforcement (Christian and Committee on Child Abuse and Neglect 2015). Injuries and infections in and around the mouth appear often in children who are maltreated and may occur when caregivers react violently during developmentally normal fussiness at mealtime or bedtime. Injuries that may be signs of child abuse or neglect are included in Table 9.1.

In a review of 300 records of nonaccidental injuries at a children's hospital over 5 years, the head, face, neck, and mouth were involved in 67% of the cases (Naidoo 2000). The face was most attacked (41%), with the cheek being the most common

Table 9.1 Injuries concerning for abuse

Bruises on the lips, gums, tongue, or soft tissue inside the mouth from eating utensils or a bottle during forced feeding
Burns or blisters from scalding liquids; fractures to teeth, facial bones, or jaw bones; or scars or blackened teeth from previous injuries
Skin irritation, bruising, or scarring at the corners of the mouth, which could be from gags applied to the mouth in forceful attempts to quiet a child
Injuries to the back of the throat, sometimes intentionally inflicted, to make a child cough up or vomit blood or create other symptoms that would require medical attention and care
Injuries and infections tied to forced oral sex, such as tears and other signs of trauma inside the mouth or sores or rashes caused by sexually transmitted disease
Bite marks inside the mouth from the child's own teeth, which sometimes are caused by physical or sexual abuse
Soft tissue bruising, i.e., cheeks or neck
Pattern injuries such as bite marks, handprints, finger or nail marks, and belts; injuries with identifiable shapes from cords, belts, irons, etc.
Bruises or fingernail marks on the pinna of the ear
Any facial fracture, including fractured teeth
Lacerations of the mouth or frena and injuries to the corners of the mouth due to gags

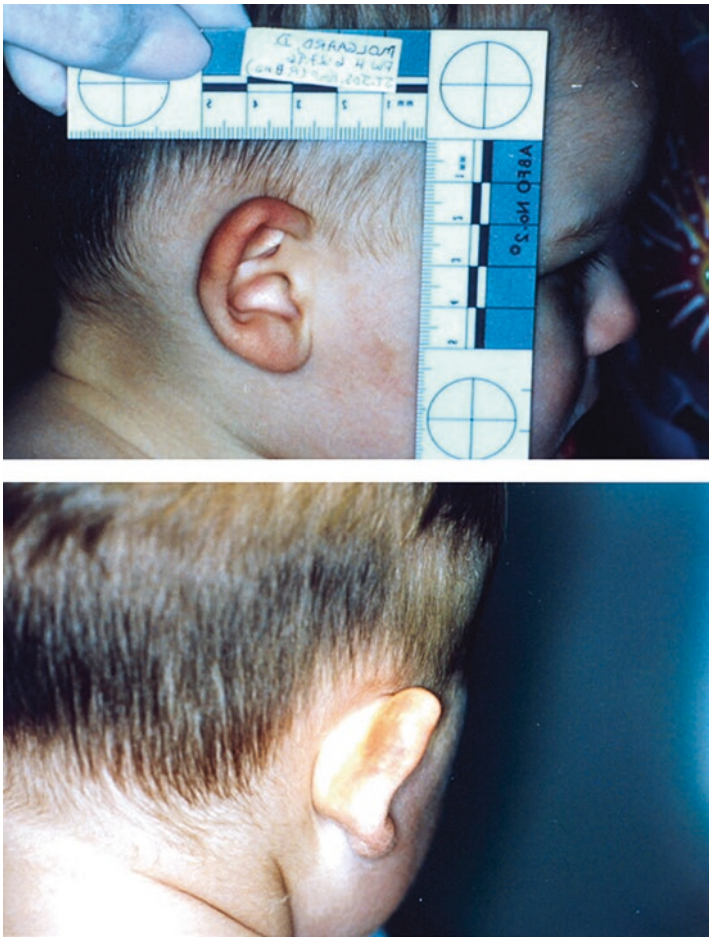
Adapted from Fisher-Owens et al. (2017)

site for injury. Orofacial injuries included fractures of the skull and facial bones, intracranial injuries, bruises, burns, and lacerations. Injuries to the mouth included fractured and avulsed teeth; lacerations to the frenum, tongue, and lips; and jaw fractures. The head and face are thought to be frequently attacked because they represent the sense of "self" of the child, the center of communication and nutrition. The mouth is often injured due to the abuser's desire to silence the child's crying. Despite the high incidence of facial injuries in abused children, dentists infrequently report suspected abuse (Needleman 1986). Likewise, physicians are not always thorough in their examination of the mouth, so that many injuries may go unrecognized. The dentist and physician should consider nonaccidental injuries when there are one or more concerning injuries present, particularly in young children (<2 years). Bite marks are a skin injury that can sometimes be linked forensically to the alleged offender. There is a bimodal age distribution of affected children, with the majority of injuries occurring in the 0- to 4-year age group and another peak occurring during adolescence (da Fonseca et al. 1992).

Physical Examination

The face and mouth examination of the abused child is simple if the child is cooperative and not in a great deal of pain. Important abnormalities are detected by a thorough mouth examination. Examiners should be sure to look for Battle's sign, bruising of the pinna, nail marks, and/or scratches in the scalp behind the pinna, since children are often picked up or dragged by their ears (Figs. 9.1, 9.2, 9.3, 9.4, and 9.5). One should also examine for partial alopecia due to being picked up/swung by the hair. Begin by examining the face for symmetry and external injuries. If possible, have the child open and close his or her mouth a few times and observe for asymmetry or difficulty; listen for any noises. One should palpate along the mandibular borders, zygoma, nasal areas, and around the eyes, searching for areas of tenderness or evidence of fractures. Examine the child's teeth and look for bleeding, missing or injured teeth, malocclusions, and caries.

When assessing for tooth mobility, fingers are inaccurate. Use a mouth mirror handle and an explorer (as fingers may compress around the tooth). Have the child bite down and assess for pain. Reflect the lips back individually to examine for frenum lacerations, scars, burns, and abrasions. Sublingual frenum tears (which are often missed) can be indicative of abuse with forced feeding with a spoon, nipple, or pacifier. Move the upper teeth back and forth between the fingers to check for maxillary fractures, loose teeth, and instability. Examine the molars for caries and check the buccal mucosa for injuries. Finally, have the child stick out his or her tongue. Check for injuries and lift the tongue to examine the lingual frenum. Diffuse, superficial bruising of the floor of the mouth was the only apparent sign of abuse on clinical examination in the case of a 7-month-old girl who was brought to the hospital by her mother for decreased oral intake (Lin et al. 2009).



Figs. 9.1 and 9.2 Ecchymosis on pinna of right ear

The pharynx is a frequent site of sexual abuse in children (Kellogg and Committee on Child Abuse and Neglect 2005; Schlesinger et al. 1975). Most injuries are nonspecific, and the diagnosis of abuse rests on the history or additional physical findings that indicate trauma. Unexplained erythema or palatal petechiae at the junction of the hard and soft palate could indicate forced fellatio. Certain sexually transmitted infections in the mouth or pharynx are pathognomonic of sexual contact. The most common sexually transmitted infection in child abuse is gonorrhea; there may be mucosal or pharyngeal lesions that are generally asymptomatic. Condylomata acuminata (genital warts) and syphilis also manifest with oral lesions. Detection of semen in the oral cavity is possible for days after exposure, and swabs should be taken from the buccal mucosa and tongue after recent contact.

Figs. 9.3 and 9.4 Nail marks on scalp behind pinna

Fig. 9.5 Nail mark (cut) on pinna

Lips and Frena

Abusive perioral injuries are widely distributed, the lips and labial frenum being the most common areas injured. There may be contusions of the tongue, buccal mucosa, gingiva, hard and soft palate, and lingual frenum. Fractures of the facial bones, jaws, or teeth are suspicious, as are teeth that are displaced or avulsed. Teeth that are discolored due to pulpal necrosis can indicate previous abuse. Other abusive intraoral injuries are widely distributed to the lips, gums, tongue, and palate, and fractures are seen with intrusion and extrusion of the dentition, bites, and contusions. Injuries may be inflicted by blunt trauma or with instruments such as eating utensils, feeding bottles, pacifiers, fingers, or hot or caustic liquids. Mucosal injuries are rather common and include burns, contusions, and lacerations. Direct blows to the mouth that trap the lip between the teeth and the external object can result in abrasions, contusions, or lacerations. Lacerations may require suturing, which is best done by a plastic or oral surgeon.

Frenum or frenulum tears have been noted to occur during attempts to silence a crying infant or to feed a refusing child if hands, pacifiers, bottles, or eating utensils are forced into a child's mouth. A frenum tear has been thought to be indicative of abuse in young infants and is managed conservatively but may require suturing if the injury is extensive or the alveolar bone is exposed (Needleman 1986). Thackeray (2007) reported three infants with labial or lingual frenulum tears who later returned with manifestations of severe abusive head injury. It is now thought, however, that labial or lingual frenum tears may result from either accidental or inflicted trauma. Upper frenum tears are common accidental injuries in older infants and young toddlers who are unsteady on their feet, because the child may fall and strike his or her mouth against the ground or other hard objects. Associated abrasions or contusions to the lip or philtrum may be found (Maguire et al. 2007b). Teece and Crawford (2004) concluded that there "seems to be no evidence for the sensitivity/specificity of torn frenum in the investigation of nonaccidental injury." A systematic review of these injuries found nine studies documenting torn labial frenula in young children and abuse fatalities (Maguire et al 2007a). Most children were younger than 5 years, but many were fatally abused. Only a direct blow was substantiated as a mechanism of injury. A more recent review noted that the maxillary frenum can be accidentally torn in falls during the early stages of walking, in car accidents with airbag deployment, or after cardiopulmonary resuscitation (Delli et al. 2013). Tears of the frenum are one of the most frequent intraoral findings in child abuse, but there were no studies comparing the incidence of torn frena in abused and nonabused children. Delli et al. (2013) concluded that a torn frenum alone cannot be considered pathognomonic of child abuse, but the presence of this condition, especially in combination with signs of trauma on other parts of the body without conclusive anamnestic data, should alert health-care professionals. One might therefore conclude that while a frenum injury represents trauma, the exact nature of that injury, accident, and abuse need to be routinely considered (Delli et al. 2013).

Fractures

Facial fractures are relatively uncommon abusive injuries, representing less than 5% of facial injuries (Becker et al. 1978). The most commonly reported injury is to the mandible, although the nasal bone, mandible, zygoma, or maxilla may be fractured. Mandibular fractures are usually bilateral, can be missed on skeletal survey, and are better detected clinically. There may be contusions over the fracture. Palpation of the mandibular condyles will elicit pain, and jaw opening may be difficult. All children with mandibular fractures should be referred to an oral surgeon for full evaluation (including radiographic evaluation) and treatment.

Dentition and Dental Neglect

Injuries to the teeth of children are very common accidental injuries; none is pathognomonic for abuse. Da Fonseca et al. (1992) reported that of more than 1200 cases of child maltreatment reviewed, only 5 tooth injuries were reported to child protective services. It is not known whether this is an underrepresentation of the actual number of inflicted tooth injuries. The management of loose teeth is dependent on the age of the child. Direct blows to the mouth may result in loosening of a tooth or teeth. Severe blows to the incisal edge of the teeth may cause tooth intrusion into the alveolar bone. Intruded teeth may appear shorter than the surrounding teeth, and those completely intruded may appear to be missing. In this case, radiographs identify the location of the tooth. A severe blow to the mouth that results in avulsion, or removal, of the teeth more commonly occurs to the permanent teeth. Immediate dental referral is arranged when permanent teeth are avulsed because the tooth needs to be placed back in the socket as soon as possible to salvage it. Fractures to the anterior teeth occur from direct blows, commonly with falls. Finally, dental color changes resulting from previous pulpal injuries may be seen in accidental injury or abuse. All children with tooth injuries should be referred to a dentist for definitive evaluation and treatment.

Dental neglect is the chronic failure of a parent or guardian to provide a child under the age of 18 years with basic dental care. The definition of dental neglect varies by state, institution, and individual and is imprecise. There are numerous factors that contribute to the neglect of oral health, including parental ignorance, family isolation, financial restraints, and lack of perceived value of oral health. As defined by the American Academy of Pediatric Dentistry (2003), dental neglect is "the willful failure of a parent or guardian to seek and follow through with treatment necessary to ensure a level of oral health essential for adequate function and freedom from pain and infection." Most often physical and dental neglect occur simultaneously; therefore, the oral cavity of the neglected child should be examined by a dentist when there are concerns of other neglect. Dental neglect affects the child's ability to perform basic functions of attending school, playing, or working.

In cases of dental neglect, untreated cavities and gum disease interfere with a child's ability to eat, communicate, grow, and develop properly. Dental infections can cause chronic pain and life-threatening abscesses, retard a child's growth and development, and make routine eating difficult or impossible (American Academy of Pediatric Dentistry 2010). There is also evidence that children with mouth or dental abnormalities are frequent targets of bullying and face increased risk of depression and suicidal thoughts or actions. In addition, the estimated 100,000 US children involved in sex trafficking or forced prostitution each year have oral and dental problems from abuse and from malnutrition, which can lead to poorly formed teeth, cavities, infections, and tooth loss (Fisher-Owens et al. 2017). One study (Sillevis-Smitt et al. 2017) noted that 205 children who underwent multiple tooth

extractions under general anesthesia for caries were also known to a national agency for domestic violence and child abuse. Child abuse and neglect was established in 47 of these children (23%), 27 of whom had the procedure before child maltreatment was established. Sillevis-Smitt et al. (2017) concluded that there appears to be a strong association between severe dental caries and child abuse and neglect, and severe dental caries could be regarded as an early symptom of child maltreatment. A systematic review noted that differentiating dental caries from dental neglect is difficult, and there is a paucity of data on precise clinical features to aid in this distinction (Bhatia et al. 2014). Thus, while there are several ethical issues to be considered, a health-care professional should educate the family regarding the effects of dental neglect, and if attempts to improve oral health fail or the child's oral health has been adversely affected, a report to the child protective services (CPS) is indicated (Kochhar 2017).

Bite Marks

Bite marks are patterned injuries, essentially tool marks that can exhibit highly individual characteristics of the biter's teeth (Bush et al. 2009). Bite marks are found on the living and on the dead, perpetrators and victims, and sometimes both. Teeth are weapons and have always been used as such. Bite marks occur frequently in violent assaults, child abuse being no exception. Bite marks are often underreported because they are not always recognized or are dismissed as having little significance. However, there may be teeth marks around the periphery, and collecting salivary DNA is possible and desirable in an unwashed wound.

In child abuse cases, there is usually a small population that has access to the child, and bite marks can be used to rule in or rule out those individuals. When evaluating an injury pattern as a possible bite mark, one should be suspicious of all annular lesions that would approximate dental arch size or form. Most often, both arches will mark. Almost half of bite marks are to the head and neck, and when one is found, they are often on a remote area of the body. Therefore, when a bite mark is found, a full-body skin examination is indicated without the diaper in place (Sirakova and Debelle 2014).

Children are often bitten on their hands and feet, fingers, and toes. Their small hands and feet will fit almost entirely in the biter's mouth. When teeth marks are found, one should make certain to examine the dorsal and ventral surfaces of the extremity, since both dental arches may leave marks. Following the periphery of the arches, there may be a series of individual abrasions, contusions, or lacerations that can reflect the tooth size, shape, arrangement, and distribution of the biter's teeth. Bite marks may have a central area of ecchymosis due to tissue crushing. Distinguishing pediatric from adult biters can be difficult. The intercanine distance in adult bites is approximately 3 cm and the ark has an ovoid shape. Pediatric bites have an intercanine distance less than 2.5 cm and have a flatter ovoid pattern, with diastemas distinguishable between the anterior teeth. Distinguishing animal bites

Fig. 9.6 A 4 year-old with multiple bites from a collie and a shepherd/wolf mix. There are multiple pattern marks over the torso and legs with tearing of tissues

from human bites is easier, as animals do not have the same dental formula as humans. Humans have four incisors, two canines, four premolars, and three molars. Dogs and cats have six incisors, two long curved canines, two premolars, and three molars. Differentiation can be made on the size and shape of the bite as well. Human bite marks are ovoid and superficial, usually with an abrasion pattern. Animal bites demonstrate deep puncture wounds with laceration and tissue tearing. Animals also have a long arch with a short, straight anterior segment (Hammel 2011). Some of this can be seen in Fig. 9.6, which shows multiple dog bites and tearing from multiple animals in a 4-year-old child.

Bite marks should be evaluated as to location, body part, multiplicity, size, contour, and color. They often indicate abuse and should be examined by a forensic odontologist or a forensic pathologist if an odontologist is not available. Photographic documentation should be done both with orientation and close-up, high-quality images, with and without a scale in place. The ABFO #2 Scale should be used and placed in the same plane as the bite mark. It is not possible to state with accuracy who the biter is; however, dentitions can be ruled in or out. At the present time, the American Board of Forensic Odontology Bite Mark Guidelines (American Board of Forensic Odontology 2016) state that bite mark findings can be inconclusive/not a bite mark, dentition can be included, or dentition can be excluded. The forensic odontologist is often not involved in the initial examination and collection of bite mark evidence, but this does not preclude their ability to render a valid opinion using high-quality photographic evidence.

Poisoning

There are over 1.2 million ingestions of potentially poisonous substances annually among children under 6 years of age in the USA (Committee on Injury, Violence, and Poison Prevention 2003). There are also 250,000 outpatient prescription medicine errors annually which are unintentional; 1 in 6 children will experience a medication error (Institute of Medicine 2007). The peak age for accidental poisoning is 2 years of age. Most pediatric poisonings result in minor or no injury; however, severe outcomes can occur. From 2000 to 2010, there was a 53% increase in severe medical outcomes after poisonings in young children, including 119 deaths. The most common causes of poisoning-related deaths in children younger than 5 years in 2011 were analgesics (21.1%), stimulants and street drugs (11.5%), cough and cold preparations (9.6%), cleaning substances (7.7%), and hydrocarbons (7.7%) (Canares 2015). Marked decreases have been noted overall in accidental poisonings due to child-resistant containers, safer products, anticipatory guidance given to families, general public education about medication storage, and establishment of a national network of poison control centers (Paschall 2005).

Intentional Poisoning

Poisoning as a pattern of abuse has been a poorly understood and underreported form of child maltreatment (Dine and McGovern 1982; Fazen et al. 1986; Rogers and Bentovim 1981; Sibert and Murphy 1980; Watson et al. 1979). The American Association of Poison Control Centers has reported that intentional poisoning is noted in 0.5% of reported poison exposures, and there is increased risk of subsequent physical abuse and death as compared to accidental poisoning cases (Committee on Injury, Violence and Poison Prevention 2003). Early reports of intentional poisoning noted the use of common substances such as salt (Baugh et al. 1983; Meadow 1993), water (Arieff and Kronlund 1999), acetaminophen (Hickson et al. 1983), iron (Black and Zenel 2003), and mental health medications (Watson et al. 1979). Infants and teens are more likely to have been intentionally poisoned (Bays 1994). Intentional or abusive poisoning is more deadly than accidental poisoning, with higher fatality estimates due to, as in the example of acetaminophen, delays in seeking medical care and nonspecific symptoms on presentation for medical care (Alander et al. 2000).

The motive for poisoning varies from parents who are vindictive and seeking to teach their child a lesson to parents who are themselves addicted to drugs such as methadone or cannabis and involve the child from an early age, to others who seek to make a healthy child seem to have a chronic illness (Meadow 1989). Intentional poisoning with sedatives may be used to control a child's behavior, but other prescription medications or over-the-counter items such as iron or caffeine are also very common and potentially deadly, given the inaccurate or absent medical history

being provided by their parents (Black and Zenel 2003; Perez et al. 2004; Rivenes et al. 1997). Dine and McGovern (1982) and Bays (1994) reported that approximately 20% of their respective samples of abusive poisoning cases also had evidence of additional physical abuse. Fischler (1983), as modified by Perez et al. (2004), organized intentional poisoning into seven patterns: (a) impulsive parental acts related to stress (e.g., use of sedatives, alcohol, antihistamines, or paregoric to quiet a child); (b) neglect (e.g., unsupervised ingestions of medications or alcohol or repeated ingestions); (c) bizarre parenting practices (e.g., toxic doses of vitamins, minerals, or herbs and water or salt intoxication); (d) punitive acts to control child behavior; (e) when the caretaker gets a child "high" as a form of entertainment; (f) to dispose of the child by a premeditated act; and (g) medical child abuse (e.g., medication or chemical given to create a fictitious illness).

Commonly used poisons in reported cases of abuse now include iron, alcohol, caffeine, benzodiazepines, glutethimide, insulin, ipecac, laxatives, marijuana, oral hypoglycemics, pepper, salt, and a variety of other prescription and illicit substances (Bays 1994; Shnaps et al. 1981). In addition, the health-care provider must consider substances used in complementary or alternative medical practices (Oral et al. 2011). A retrospective study (Yin 2010) of all pharmaceutical exposures involving children <7 years old reported to the US National Poison Data System from 2000 to 2008 for which the reason for exposure was coded as "malicious" found a total of 1439 cases, with an annual mean of 160 cases (range, 124–189) that showed an increase over time. The median age was 2 years. Of these exposures, 172 resulted in moderate or major outcomes or death, and 9.7% of cases involved more than 1 exposed substance. The most common reported major pharmaceutical categories were analgesics, stimulants/street drugs, sedatives/hypnotics/antipsychotics, cough and cold preparations, and ethanol. In 51% of cases, there was an exposure to at least one sedating agent, and there were 18 deaths (1.2%).

Parental Substance Abuse and Opiates

The explosion of opiate use and abuse among adults and teens has been associated with a concomitant rise in the number of young children poisoned and killed with a variety of potent narcotics and anesthetics (Spiller et al. 2013). Similar rises in accidental ingestions of cannabis have also been reported as more states legalize its use (Claudet et al. 2017). As medications such as methadone and opiates were prescribed to help parents safely withdraw from narcotics, they were intentionally given by them to their children (Lee and Lam 2002; Perez et al. 2004). The rise of legal marijuana use for adults has also been linked to an increase in cannabis ingestions in children (Pelissier et al. 2014). One study (Bond et al. 2012) evaluated 453,559 children for ingestion of a single pharmaceutical product and found that child self-exposure was responsible for 95% of medical visits. Child self-exposure to prescription products dominated the health-care impact, with 248,023 emergency visits (55%), 41,847 admissions (76%), and 18,191 significant injuries (71%).

The greatest morbidity followed self-ingestion of prescription products, particularly opioids, sedative-hypnotics, and cardiovascular agents. Burghardt et al. (2013) found that adult medication prescriptions were significantly associated with exposures and poisonings in children of all ages, with the strongest association observed for opioids.

Across medications, the greatest risk for opioid exposure was among children 0–5 years old, followed by 13- to 19-year-olds. Finkelstein et al. (2017) conducted a population-based, nested case-control study in Ontario, Canada, between 2002 and 2015 to identify children aged ≤10 years whose mothers received publicly funded prescriptions for an opioid or a nonsteroidal anti-inflammatory drug. They found 103 children who presented to the hospital with opioid overdose, and half of the children were <2 years old. Compared with controls, children with an opioid overdose were far more likely to have a mother who received a prescription opioid and who was prescribed antidepressants. The most commonly implicated overdose opioids were codeine (53.4%), oxycodone (32.0%), and methadone (15.5%).

In another study (Allen et al. 2017), poison control centers received reports of 188,468 prescription opioid exposures among children <20 years old from 2000 to 2015. The annual number and rate of exposures increased early in the study period, but declined after 2009, except for buprenorphine exposures, which increased during the last 3 study years. Hydrocodone accounted for the largest proportion of exposures (28.7%), and 47.1% of children exposed to buprenorphine were admitted to a health-care facility. The odds of being admitted were higher for teenagers than for children aged 0–5 years, and teenagers also had greater odds of serious medical outcomes. While many of these ingestions were accidental or the result of poor supervision or home safety practices, a small but important number reflected intentional chemical abuse of children made easier by the wide availability of these compounds. Unfortunately, there are a number of confounders such as poor health literacy which can affect parents' ability to safely administer medications (Bailey et al. 2009). Recommendations have been made for physicians, pharmacists, and parents to take measures to mitigate the risk of opioid-related harm to children by prescribing smaller quantities, emphasizing the importance of secure medication storage and prompt disposal of unused opioids (Finkelstein et al. 2017).

Distinguishing Accidental from Intentional Poisoning

Intentionally poisoned children may be presented for medical care with a history of "accidental" ingestion, signs of poisoning without history, recurrent unexplained illnesses, apparent life-threatening event, or unexpected sudden death (Bays 1994). History to be obtained to assist in determining whether a poisoning is accidental or intentional includes a complete list of drugs in the child's environment, including transdermal patches, herbal remedies, alternative or complementary medicine, and over-the-counter preparations (Wood et al. 2012). Information should be sought regarding the quantity and storage of these items as well as safety measures

employed. A developmental history of the child's abilities is important to aid in the assessment of access to these potential poisons, and formal testing may be needed when disparities arise. The degree of parental supervision and stresses in the home should also be reviewed, particularly when recurrent poisoning is being considered, as such family stresses are correlated with repeated ingestions. Historical factors that raise the concern for intentional poisoning include (a) previous poisoning in the child or a sibling, (b) implausible history, (c) changing history, (d) history discordant with the child's development, (e) child or sibling blamed, (f) excessive delay in seeking treatment, (g) infancy, and (h) unexplained symptoms (such as an apparent life-threatening event) that resolve when the child is not in the care of a suspected perpetrator (Perez et al. 2004; Pitetti et al. 2008). A summary of potential clinical indicators is listed in Table 9.2.

Intentional poisoning, with vague or absent history provided, is fundamentally different from accidental poisoning. Common scenarios for accidental ingestion include toddlers visiting grandparents who had one or more prescription medications without proper safety provisions or supervision of the child. However, clinical presentations of intentional and accidental poisoning overlap. Common symptoms include altered states of consciousness, cardiorespiratory depression or excitation, gastrointestinal symptoms, seizures, and other challenging and unexplained symptom complexes (Wiley 1991). While a detailed review of poison presentations and treatments is beyond the scope of this text, the neurologic manifestations of medical child abuse have been found to include false reports of apparent life-threatening events and seizures and reports of induction of symptoms from poisoning. Failure to correlate objective findings with subjective complaints may lead to unnecessary and potentially harmful testing or treatment, and it is important to include medical child abuse in the differential diagnosis of a wide variety of neurologic manifestations (Doughty et al. 2016).

Table 9.2 Potential clinical indicators of intentional poisoning

Infancy
History inconsistent with child's development or nonexistent
Prior poisoning in this child or family
Poisoning inconsistent with medications in home, safety procedures, or physical environment
Sibling blamed
Delay in seeking medical care
Other signs of abuse or neglect
Bizarre drugs or substances of abuse
Multiple agents
Unexplained seizures
Brief, resolved unexplained events
Sudden, unexpected, or unexplained infant or child death
Chronic unexplained symptoms that resolved when removed from caretaker and/or placed in a safe environment

Adapted from Bays (1994) and Paschall (2005)

Laboratory Evaluation

Laboratory assessment plays an important role in identifying the poison in many cases (Wiley 1991). However, the yield in infants remains relatively low despite improvements in testing and detection. Cocaine and its metabolites are most readily identified, as are alcohol and other drugs of abuse. Testing procedures may not be able to differentiate toxic levels vs. mere presence, and care should be taken to set detection limits as low as possible for nontherapeutic agents. Laboratories frequently receive inadequate specimens, mostly because of a common misperception that a blood sample alone is sufficient. Proper toxicologic screening requires both blood and urine; gastric contents can be a useful addition if available. The urine sample allows for qualitative determinations of substances, whereas the blood sample allows for specific quantitative analysis. In addition, not all drugs and chemical compounds can be identified by standard laboratory processes used for toxicologic screens. There are wide local and regional variations in which drugs and substances are screened for on "drugs of abuse" tests. Substances such as ipecac, ammonia, clonidine, chloral hydrate, cyanide, insulin, petroleum distillates, gamma-hydroxybutyric acid (GHB), and sodium sulfate (found in shampoo) are best identified when specific testing is requested (Fazen et al. 1986; Wiley 1991). Therefore, the health-care provider is encouraged to contact the reference laboratory used at his or her own institution to obtain a list of what the screen tests for, which screens need a special request, what is not available, and what needs to be sent to a reference laboratory.

Death of the Abused Child

When a healthy child dies suddenly and unexpectedly, the cause of death may be mistakenly certified as sudden infant death syndrome (SIDS). The sudden, unexpected death of an infant (SUID) or child raises the possibility of homicide, and a careful, thorough approach with autopsy, scene investigation, and medical history review with full multidisciplinary review are helpful for identifying other potential causes, such as suffocation, or rare disorders. One should always approach the family in a supportive way in a medical setting given the medical and legal uncertainties and the stress being placed on parents, caregivers, and other children in the family. Fatal child abuse has been mistaken for SIDS. Sudden, unexplained deaths should be comprehensively investigated, and new tests and forensic procedures may more accurately identify the cause of death when infants and children die unexpectedly. SIDS is more common than child abuse fatality, and parents of SIDS victims want and deserve to be approached in a nonaccusatory manner (Hymel and Committee on Child Abuse and Neglect 2006). Communities can learn how to reduce these tragedies by using multidisciplinary death reviews (Committee on Child Abuse and Neglect 2010).

Epidemiology

Child maltreatment causes infant death in a number of ways (Palusci and Covington 2014). In some cases, it may be difficult or impossible to differentiate between a natural unexplained infant death, an unintentional or accidental infant death, and an unnatural (intentional or neglectful) infant death. Recent literature has suggested that natural or accidental sudden unexpected deaths are more common than child abuse fatality, with approximately 3500 infants dying annually in the United States from sleep-related infant deaths, including SIDS, ill-defined deaths, and accidental suffocation and strangulation in bed, although these are likely underestimates (Moon & Task Force on Sudden Infant Death Syndrome 2016; Commission to Eliminate Child Abuse and Neglect Fatalities 2016; Schnitzer et al. 2008).

For federal fiscal year 2015, an estimated 1670 children died from abuse and neglect at a rate of 2.25 per 100,000 children in the U.S. (U.S. Department of Health and Human Services 2017). An exact number is difficult to assess given that the accurate identification and collection of child abuse and neglect deaths depends on a variety of agencies and the child welfare system. This rate has remained fairly constant in data collected by the National Child Abuse and Neglect Data System administered by the US government, and has not significantly decreased despite repeated national outcries for system improvement and prevention (U.S. Advisory Board on Child Abuse and Neglect 1995).

The actual total number of child abuse and neglect deaths is thought to be higher. Fatal maltreatment is underestimated because of both underascertainment of child homicides and inaccurate classification of pediatric fatalities in official reports, and child homicides are often misclassified as occurring from accidents, drowning, falls, natural illness, or undetermined causes (Ewigman et al. 1993; Overpeck et al. 2002). McClain et al. (1994) and McClain, Sacks, Froehlke, and Ewigman (1993) estimated that between 15% and 30% of official death records are properly coded to identify the fatality as due to child abuse and neglect. Homicide, the legally determined death of a person at the hands of another, includes maltreatment deaths and those from nonfamilial persons. For example, the National Violent Death Reporting System noted that the 2003 homicide rate for children 0–4 years of age was 3.0 per 100,000, with African Americans 4.2 times more likely than Whites to be victims of homicide. The vast majority of deaths occur at the hands of parents and caretakers, however, with weapons including household objects and direct blows (King et al. 2006; Bennett et al. 2006).

Factors identified in families with increased risk for child maltreatment fatality include poverty and unrelated male caregivers. Racial disparities exist (Pressley et al. 2007). The index of suspicion for unnatural death should be higher, particularly in families in which an unexplained infant death or nonaccidental trauma has occurred previously (Schnitzer and Ewigman 2005; Farrell et al. 2017; Putnam-Hornstein et al. 2014). A proportion of recurrent, unexplained infant deaths in a family may be, in fact, natural. Among U.S. infants, a unique pattern of homicide has emerged with the first week of life posing the greatest risk (Paulozzi 2002). Death rates due to

abuse also vary geographically, with the highest rates reported in the South and West of the U.S. and the lowest rates in the Northeast (McClain et al. 1994).

Identifying Child Maltreatment Fatalities

Neither child abuse fatality nor SIDS is rare. Some young victims of nonlethal child maltreatment will die from SIDS. In such cases, the failure to differentiate objectively between fatal child abuse and SIDS could result in an inappropriate criminal investigation and/or prosecution for homicide. Terminology is important, and comprehensive medical evaluation, scene investigation, and autopsy have been recommended to improve identification and reporting of the cause of sudden infant deaths in the hospital and emergency department (Barfield and Committee on the Fetus and Newborn 2016; Moon and Task Force on Sudden Infant Death Syndrome 2016; Committee on Pediatric Emergency Medicine et al. 2014; Hymel and Committee on Child Abuse and Neglect 2006). Multidisciplinary reviews of fatalities are recommended and have been associated with fewer deaths (Committee on Child Abuse and Neglect 2010; Palusci et al. 2010). Historically and even today, it is been difficult, if not impossible, however, to distinguish at autopsy between SIDS and accidental or deliberate suffocation with a soft object, and it is important to be sensitive to this uncertainty when initially speaking with families (Coe and Hartman 1960; Levetown and Committee on Bioethics 2008).

Consistent patterns emerge in the epidemiology of child maltreatment deaths. Three-quarters (74.8%) of all child fatalities are younger than 3 years and the child fatality rates mostly decrease with age. Children who were younger than 1 year died from maltreatment at a rate of 20.91 per 100,000 children in the population younger than 1 year. This is 3 times the fatality rate for children who were 1 year old (U.S. DHHS 2017). Boys had a higher child fatality rate than girls. Younger children are thought to be more vulnerable to fatal maltreatment because of their small size, their inability to communicate verbally, and because they live a relatively isolated existence, out of contact with adults other than their caregivers (Christian and Committee on Child Abuse 2015). Increased intentional injury deaths have been noted among children in poorer social classes (Roberts et al. 1998). Certain circumstances in the medical history which can indicate an increased risk for the possibility of intentional suffocation are listed in Table 9.3.

Interestingly, of the children who died from maltreatment, 72.9% suffered neglect and 43.9% suffered physical abuse either exclusively or in combination with another maltreatment type (U.S. DHHS 2017). A 25-year retrospective review of neglect deaths identified starvation and dehydration as the most common causes, followed by “accidental” ingestions, exposure to the elements, delayed medical care, electrocution, and drowning/aspiration (Knight and Collins 2005). In general, while most maltreatment deaths (75.9%) are caused by one or more parents, 27.4% are caused by the mother alone. Schnitzer and Ewigman (2005) noted that children residing in households with unrelated adults were nearly 50 times more likely to die

Table 9.3 Risk factors for intentional suffocation

Recurrent cyanosis, apnea, or brief resolved unexplained event (BRUE; formerly ALTE) occurring only while in the care of the same person
Age at death older than 6 months
Previous unexpected or unexplained deaths of one or more siblings
Simultaneous or nearly simultaneous death of twins
Previous death of infants under the care of the same unrelated person
Evidence of previous pulmonary hemorrhage (such as marked siderophages in the lung)

of inflicted injuries than were children living with two biological parents. In their sample, most perpetrators were the child's father or the boyfriend of the mother. Overall, children known to CPS agencies have increased risk of death from all causes, including child maltreatment (Sabotta and Davis 1992). In one study, however, a prior referral to CPS did not increase the risk that their infant's death was caused by inflicted injuries (Krous et al. 2006). Many children have evidence of prior injury at the time of death, and some have findings that could have allowed for protective actions to prevent fatality (Brewster et al. 1998; Jenny et al. 1999).

The US Commission to Eliminate Child Abuse and Neglect Fatalities (2016) noted that children who die from abuse and neglect are overwhelmingly young; approximately one-half are less than a year old, and 75% are under 3 years of age. A call to a child protection hotline is the best predictor of a child's potential risk of injury death before age 5. The commission also found that a number of children who died were not known to CPS but were seen by other professionals (e.g., health care), highlighting the importance of coordinated and multisystem efforts. Unfortunately, they also concluded that we know a lot about what puts children at risk, but there are few promising solutions and only one evidence-based practice shown to reduce fatalities—the Nurse-Family Partnership.

Patterns of Injury in Fatal Child Maltreatment

Perhaps the most important and disconcerting diagnostic issue in fatal child abuse is that there may not be a distinct pattern of injury noted at autopsy. A child can be injured fatally without any external signs of trauma.

Head injury is the most common cause of fatal child abuse, especially under the age of 1 year. This can happen without any external evidence of injury, whether by shaking or blunt trauma to the head (Gilliland and Folberg 1996). Although violent shaking of the child's head is controversial, it is likely that it happens at least some of the time. Indeed, shaking as a mechanism of injury is generally accepted among medical professionals who are experienced in managing these cases (Narang 2016). Confessions have been collected and documented in the literature (Starling et al. 2004), and prospective comparisons of confessed abuse and witnessed accidents resulting in head injury have been published (Vinchon et al. 2010). It is also possible

that when a child's head impacts a softer surface such as a mattress or a firm pillow, it partially molds itself around the infant's head thus distributing the impact over a larger surface area and blurring any evidence of impact (Case 2007). Be that as it may, catastrophic head injuries, whether or not they result in the child's death, do not occur spontaneously and, as with most trauma, the extent of the injury reflects the magnitude of the energy that impacted on the child's head (Duhaime et al. 1998). Subdural hemorrhage is one of the characteristic findings of abusive head trauma and is usually present (Christian et al. 2015). As asserted by Narang (2011), in a review of over 700 articles, there is so far not a single reference that finds a statistical association of subdural and retinal hemorrhages with accidental trauma rather than with abusive head trauma. Figure 9.7 shows the skull of a 13-month-old child who died with extensive bilateral subdural hemorrhage and swelling of the brain so intense that it caused diastatic separation of the sagittal and coronal sutures. The gap between the bony plates is evident. There is no discrete impact site. Figure 9.8 shows the brain after removal of the calvarium. The dura over the right hemisphere is reflected upward, showing the extent of the subdural hemorrhage, which was similar on the left hemisphere.

More commonly, impact sites are present on the scalp and on the skull. Typical cortical cerebral hemispheric contusions may be evident, as will *contrecoup* contusions if the head was moving and stopped suddenly by striking a firm surface. Because the head is shaped partially like a sphere, diffuse hemorrhagic infiltration of the scalp indicates that the head suffered multiple impacts whose individual signatures became blurred by the confluence of the bleeding. Fractures of the skull are not always present because the elasticity of bones in children allows some deformation of the skull to occur before the bone fails. Fatal head injury often

Fig. 9.7 Skull of a 13-month-old child who died with extensive bilateral subdural hemorrhage and swelling of the brain that caused diastatic separation of the sagittal and coronal sutures

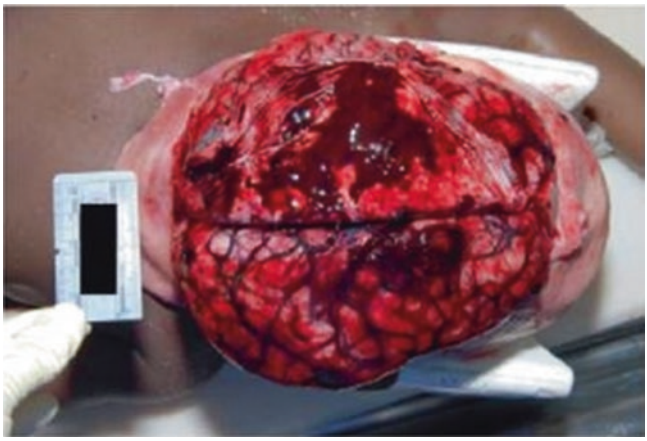


Fig. 9.8 The brain after removal of the calvarium

Fig. 9.9 The reflected scalp of a child who suffered numerous, confluent impacts to the scalp

occurs without a skull fracture (Itabashi et al. 2007). However, fractures suffered from a simple fall tend to be linear and often occur in the parietal region; the context in which the child is brought for treatment will generally confirm the mechanism of injury. Fractures due to abuse tend to be multiple, often radiating from a central defect if the head was struck by an object with a narrow profile, and tend to cross the midline or traverse a suture. If there are multiple fractures, each one tends to correspond to an individual impact, which is useful for documentation when there is confluent hemorrhagic infiltration of the scalp due to multiple blows. Figure 9.9 shows the reflected scalp of a child that suffered numerous, confluent impacts to the scalp. Although impact sites are often present on the visible skin, the definitive way to document them is to reflect the scalp.

Other useful markers of abusive head trauma are perioptic nerve sheath hemorrhage and retinal hemorrhage, especially as markers of the severity of injury (Case et al. 2001). The former is shown in Fig. 9.10 and retinal hemorrhage in Fig. 9.11.

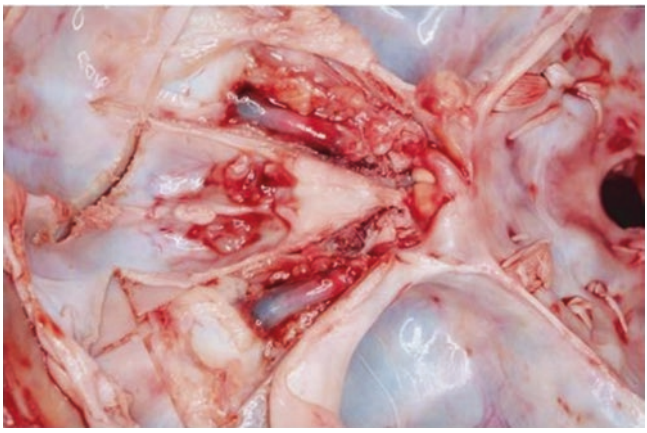


Fig. 9.10 Perioptic nerve sheath hemorrhage on a gross specimen of a child who suffered from severe abusive head trauma

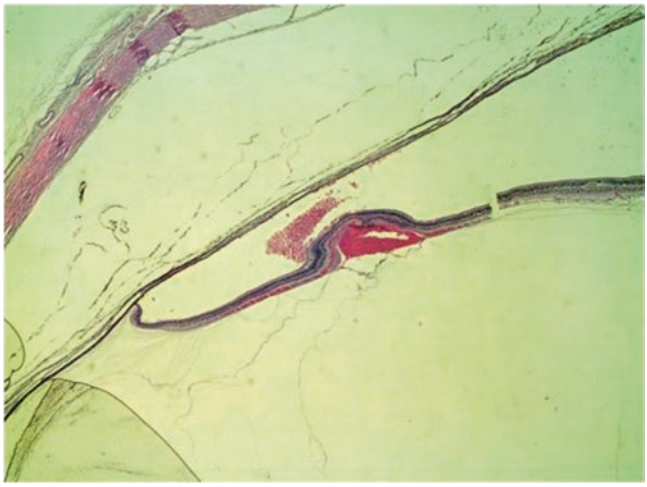


Fig. 9.11 Microscopic examination showing retinal hemorrhage

This picture shows hemorrhagic infiltration near the ora serrata. More anterior distribution of hemorrhage in the retina is associated with abusive head trauma. Often, useful signs are present in the mouth. Figure 9.12 shows a 2-year-old child whose upper lip is hemorrhagic due to tearing of the mucosa by the teeth at the moment the child was slapped and traumatic rupture of the frenum. The healing scabbed lesions on the face were due to chickenpox.

The lack of a pattern injury is even more likely to occur in the chest and abdomen. This is because of the absence of a firm bony surface, unlike the skin over the skull, and the skin's inherent elasticity. The extent of trauma that a child can suffer without evidence of impact is impressive. Figure 9.13 shows the back of an infant's

Fig. 9.12 A 2-year-old child whose upper lip is hemorrhagic due to tearing of the mucosa by the teeth at the moment the child was slapped; traumatic rupture of the labial frenum is also noted

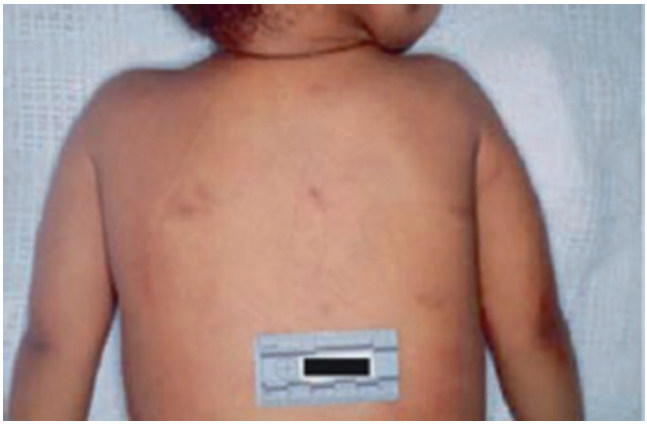


Fig. 9.13 The back of an infant's body with some barely visible ecchymoses

body with some barely visible ecchymoses. Figure 9.14 shows the hemorrhagic infiltration of the skin. The width of the area of hemorrhage and its sharply demarcated upper and lower boundaries helped associate it to the causal object, a metal rectangular bedpost. In this case, there were no rib fractures, but there were hemorrhagic contusions on the pleural surfaces of the lungs. Sometimes, if the chest is struck at end-diastole, rupture of the heart can occur.

In abdominal trauma, the magnitude of injury can be astounding (Dolinak et al. 2005). Figure 9.15 shows multiple tears of the right lobe of the liver. The hint of a semicircular outline to the tears is due to the imprint of the ribs on the liver. Depending on the rate of bleeding, these children can survive for hours after the injury happens. Figure 9.16 shows the posterior surface of the organ block from a 3-month-old infant. There is profuse hemorrhage in the right retroperitoneum that completely surrounds the right kidney and splits the right adrenal gland in half. Hemorrhages in such anatomically protected areas implicitly point to the extent of the force inflicted on a child.

Fig. 9.14 Hemorrhagic infiltration of the skin which shows the extent of the injury despite barely visible superficial bruises

Fig. 9.15 Multiple tears of the right lobe of the liver

Sometimes injuries are caused by an object whose profile is not hard to define, as when a child is struck by a belt, hair curler, or some other portable object. The left panel of Fig. 9.17 shows the head of a child that was struck multiple times with a belt buckle (right panel). The numerous circular and semicircular scars and the erosion in the center of the head indicate abuse that took place over a period of time. Figure 9.18 shows another child in a similar circumstance, but the inset shows the looped electrical cord with which he was beaten. These kinds of injuries have other implications aside from the time span during which these children suffered. These children are often kept sequestered at home or some similar environment so that the abuse is not detected. An injury pattern should prompt the search for the object that caused the lesion. The location of some injuries also aids in determining what caused them. Figure 9.19 shows tears in the pharynx of an infant. This was caused by the forceful insertion of a curling iron in the child's mouth. A feature of child

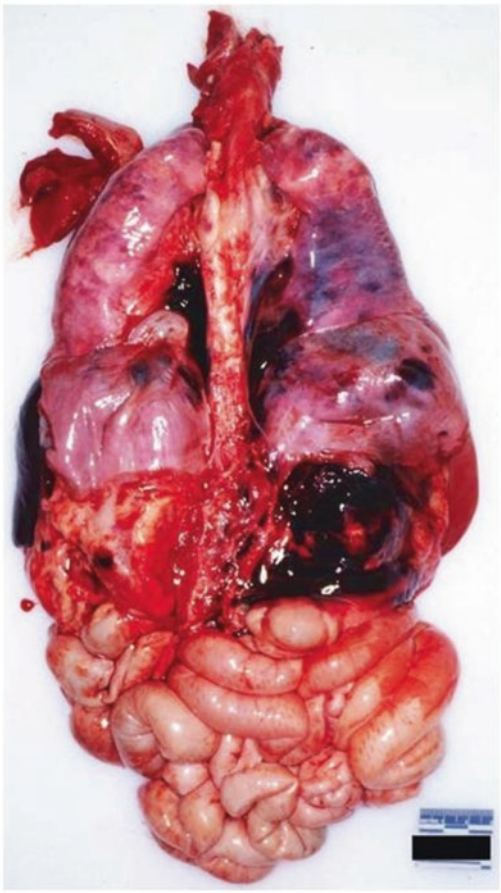


Fig. 9.16 The posterior surface of the organ block from a 3-month-old infant which demonstrates profuse hemorrhage surrounding the right kidney

abuse that is not appreciated as widely as it should be is its association with mental illness of the perpetrator (Mullick et al. 2001). This can lead to some of the more horrific instances of child abuse. Figure 9.20 shows an infant whose airway was stuffed with gauze and then packed with a towel. The mouth was then sealed with tape, and the child was placed in a plastic bag for disposal. The perpetrator complained of being afraid of the infant's secretions and was acutely psychotic.

Death by neglect often occurs by failing to take care of a child's medical needs or by malnutrition. While neglect alone accounts for a substantial proportion of child maltreatment fatalities, there can also be co-occurring physical or sexual abuse (U.S. DHHS 2017). Figure 9.21 a–b show a malnourished child with inflicted fractures.

Fig. 9.17 The head of a child (left panel) who was struck multiple times with a belt buckle (right panel)

Fig. 9.18 The back of a child who was struck multiple times with a looped electrical cord (inset)

Distinguishing Fatal Child Abuse from Accident and Sudden Infant Death Syndrome

SIDS is defined as the sudden and unexpected death of an infant under 1 year of age only when the case remains unexplained after a thorough investigation with performance of a complete autopsy, examination of the death scene, and review of the clinical history (Moon and Task Force on Sudden Infant Death Syndrome 2016).

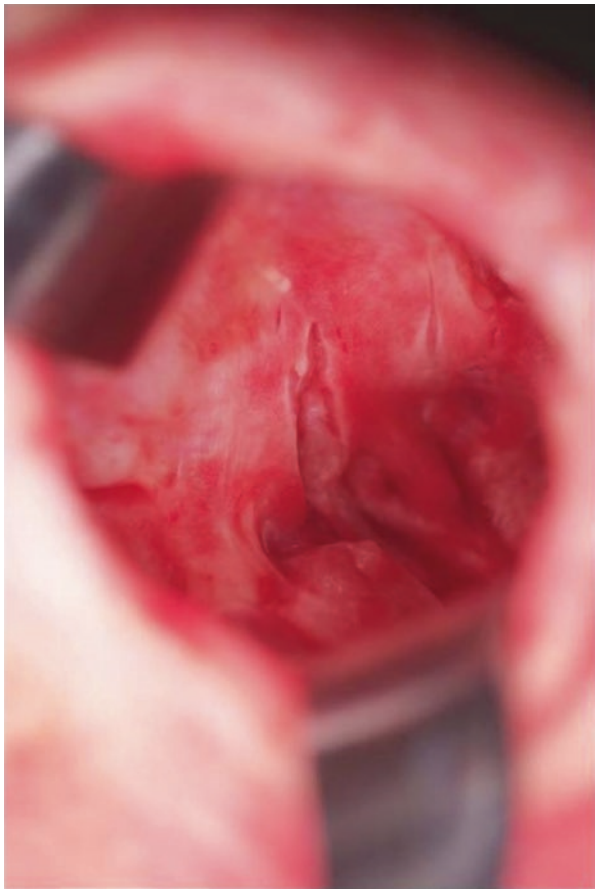


Fig. 9.19 Tears in the pharynx of an infant caused by the forceful insertion of a curling iron into the child's mouth and throat

Fig. 9.20 Infant whose airway was stuffed with gauze and then packed with a towel and whose mouth was sealed with tape

Fig. 9.21 (**a**) This infant was starved and beaten. Multiple physical signs of malnutrition and dehydration are evident, including her muscle wasting, bloated abdomen, and decreased skin turgor. (**b**) The malnourished child in (**a**) had a wrist deformity (top panel) and fracture on radiograph (bottom panel). This fracture could not have happened accidentally in this infant, given her developmental abilities, without a clear account of significant accidental trauma

Before investigation, the sudden death of an infant is more properly described as a SUID—the sudden unexpected death of an infant (Barfield and Committee on the Fetus and Newborn 2016). Beyond infancy, the term SUDC denotes sudden, unexplained deaths in children. SIDS is rare during the first month of life, peaks at 2–4 months of age, and then declines. SIDS accounts for more than 5000 deaths in the USA each year (0.5–0.6 per 1000) and is the leading cause of infant death between 1 week and 1 year of age. Rates were twice as high before "Back to Sleep" campaigns were begun to address unsafe prone and side-sleeping positions. Other epidemiologic factors consistently identified in multiple studies include sleeping on a soft surface, maternal smoking during pregnancy and after the birth, preterm birth, low birth weight, overheating, and late or no prenatal care. Higher rates are found in African American and American Indian/Alaskan Native children. None of these factors is proven to cause SIDS, and it is presently impossible to predict which infants will ultimately die of SIDS. There is growing recognition of the difficulties surrounding the diagnosis of SIDS, and some have called for a change in nomenclature (Nashelsky and Pinckard 2011). When the cause of death remains unexplained after complete autopsy, investigation of the circumstances of death, a detailed scene investigation, and case history review including medical records, the case may be more properly called SUDI (sudden unexplained death of an infant) (Loughrey et al. 2005).

Recent research has highlighted additional potential risk factors and the increasing incidence of identified positional asphyxia (Pasquale-Styles et al. 2007). The typical history of a SIDS death is as follows: A previously healthy infant is put down for a nap or for the night. Some infants have a history of recent upper respiratory infection but are otherwise healthy. Sometime later, the baby is found dead. No struggle or crying was heard. At times, some pink, frothy discharge may be found at the nose, at the mouth, or on the sheets, and postmortem lividity may be present. The caregiver immediately calls for emergency help and the infant is brought to the nearest hospital or pronounced dead at the scene. Head covering has been linked with increases in SIDS, and fan use is associated with an 80% or more reduction (Mitchell et al. 2008; Coleman-Phox et al. 2008). With more thorough investigations, many infants are found in situations which, while previously labeled as SIDS, are actually more consistent with overlay or other unintentional suffocation. Bed sharing with an adult can place the infant at increased risk for overlay under certain conditions, but this is controversial. Confounders include parental smoking, substance abuse, and alcohol ingestion. The risk is even higher with multiple bedsharers or when the bedsharer is overtired. The most protective sleep environment for infants is thought to be on their backs in an empty crib in the parent's room. Home monitoring has not been found to prevent SIDS (Committee of the Fetus and Newborn 2003), and there is no evidence that recurrent episodes of cyanosis, apnea, or BRUEs (brief, resolved, unexplained events, which were formerly called ALTEs or apparent life-threatening events) increase the risk (Tieder et al. 2016). This differs from intentional poisoning or suffocation in which a history of BRUEs has been found.

There have been numerous theories that attempt to explain the biologic etiology of SIDS, but the cause with the most scientific support appears to be related to local carbon dioxide buildup and rebreathing (Paluszynska et al. 2004). Abnormalities in

the arcuate nucleus in the brainstems of some SIDS victims suggest a role of poor arousal or cardiorespiratory control (Hymel and Committee on Child Abuse and Neglect 2006). However, to date, there is no well-defined neuropathologic abnormality that has been causally or functionally linked to SIDS (Moon et al. 2016). A respiratory cause is supported by seasonal variations in SIDS deaths, the frequent association of upper respiratory infection shortly before death, and the characteristic intrathoracic petechiae found on postmortem examination (Culbertson et al. 1988). Fifteen percent or more of unexpected infant deaths are discovered to have a known cause by postmortem examination (Keens and Davidson Ward 1993). Congenital and cardiac anomalies, metabolic diseases, infection, tumors, and accidental or inflicted trauma may all cause sudden and unexpected death that is not identified until autopsy (Emery et al. 1988). Death scene investigation is invaluable for identifying environmental factors that contributed to death (Bass et al. 1986; Holton et al. 1991).

The possibility of child abuse is sometimes raised when an infant dies suddenly and unexpectedly. Many of the risk factors reported for infant mortality overlap with risk factors for abuse, causing further concern. In reality, only a small percentage of SIDS deaths are attributable to fatal child abuse, and the investigator's and healthcare provider's approach to families of SIDS fatalities should be supportive and not accusatory throughout the investigation (Smialek and Lambros 1988; Hymel and Committee on Child Abuse and Neglect 2006). A comprehensive approach recommended by the National Association of Medical Examiners includes a detailed scene investigation, review of the child and family history, and certain autopsy procedures (Corey et al. 2007). There are also standards for reporting SIDS on death certificates. Although differences may identify some children who are intentionally suffocated, differentiating fatal abuse by suffocation from SIDS remains difficult (Hymel and Committee on Child Abuse and Neglect 2006). The findings on postmortem examination in cases of SIDS and suffocation can be indistinguishable (Smialek and Lambros 1988), and the death scene investigation can therefore contribute much more to the investigation of SUID. This is why SIDS is a term used only to describe infants who die suddenly and unexpectedly and whose cause of death remains unknown after a full postmortem evaluation, including death scene investigation, and clinical review of all information. It should be reserved for that circumstance only, and the infant should have been sleeping alone in a safe sleep environment. SIDS remains a diagnosis of exclusion, and there must be a full investigation of the cause of death in all infants and children before the death is labeled SIDS.

Child Death Review

Since differentiating fatal abuse from natural and accidental causes of death may be difficult, some have suggested that child fatality review offers an opportunity to more accurately collect identification and improve investigation (Durfee et al. 1992). Differentiating SIDS, metabolic diseases, accidental suffocation, and other

natural causes of death from homicide requires a careful, complete investigation. Active surveillance by review teams at the time of death is costly (Schloesser et al. 1992), and few jurisdictions in the USA have the resources—both money and properly trained personnel—to conduct an immediate, thorough investigation into each childhood death. Most states and many jurisdictions have developed review teams to retrospectively understand the causes of childhood deaths and develop prevention strategies.

Child death review teams were initially established to review suspicious childhood deaths, although many jurisdictions now review all pediatric deaths. Members of the review team vary by jurisdiction but are generally composed of professionals from specific disciplines. Standard team members include coroners and/or medical examiners, forensic pathologists, law enforcement agents, prosecuting attorneys, CPS workers, pediatricians, and public health professionals. Additional representatives can come from mental health agencies, schools, fire departments, and prevention agencies (Durfee et al. 1992). Child death review teams provide an important method for systematic review of the factors contributing to pediatric deaths which can lead to preventing further fatalities. Multidisciplinary reviews can be more complete than are single-agency reviews, can more easily identify suspicious deaths, and can provide the opportunity to review protocols within and among participating agencies. Implementation of death review teams may also improve the quality of death investigations at the local level, identify barriers to death investigations, allow for better allocation of limited resources, and improve the understanding of the causes of child death (Committee on Child Abuse 2010). Retrospective reviews at the state level using multiple data sources have improved identification of maltreatment deaths, but these reviews occurred 1–3 years after the death (Schnitzer et al. 2008; Palusci et al. 2010).

Most child death review teams in the US have been developed during the past 25 years, but national outcome data are limited (U.S. Commission to Eliminate Child Abuse and Neglect Fatalities 2016). It is hoped that death investigations will improve prevention strategies, hold more adults responsible, and better protect siblings of murdered children from future harm. Improvements have been made in death certificate identification, and International Classification of Disease coding has been updated to more completely identify the maltreatment nature of some deaths. Many states, like Missouri, now mandate review of all child deaths, and most have adopted prevention as the primary focus of the child death review program but are inadequately funded (Webster et al. 2003). In Arizona, the state review team was able to identify and correct an incorrect cause of death in 13% of death certificates and suggested that 38% of all child deaths after the first month of life could be prevented. Several areas for work to prevent childhood deaths from a variety of accidental and intentional causes were identified (Rimsza et al. 2002). Internationally, reviews have produced policy changes and the identification of system themes in effective prevention, including assessment, interagency communication, responsibility, the number of professionals involved, the role of general practitioners, training, and parental choice (Sanders et al. 1999).

In a separate but related development, case reviews of children in the child welfare system have been mandated by the US government in an effort to improve outcomes in the child protective, adoption, and foster care systems (U.S. DHHS 1998). These citizen review panels, or CRPs, were first required in 1996 for US states as part of reauthorization of the Child Abuse Prevention and Treatment Act (CAPTA), and many states have instituted CRPs to review child maltreatment fatalities (U.S. DHHS 2017). CRPs are ideally made up of a representative sample of the community, meet at least quarterly, and fulfill a broad mandate, which includes ensuring that the state is in compliance with CAPTA, Title IV-E programs, and child fatality review requirements (Jones et al. 2003). CRPs have had some impact on child welfare policies, although several obstacles to their effectiveness have been noted (Bryan et al. 2007; Palusci et al. 2010). It should be noted in closing that, regardless of the process involved, physicians and especially pediatricians have an important role to play in reviewing child deaths and assisting the community in its efforts to prevent future fatality (Committee on Child Abuse and Neglect 2010).

In Brief

- Orofacial injuries are common in abused children, and there are certain findings concerning for maltreatment.
- There is a high incidence of orofacial injuries in abused children that go unreported by medical and dental professionals.
- Most oral injuries that result from physical abuse are nonspecific, and the diagnosis of abuse rests on the history or additional physical findings.
- Infant frenum tears occur when hands, pacifiers, bottles, or eating utensils are forced into a child's mouth in an attempt to silence a crying infant or feed a refusing child. They can also occur accidentally.
- Bite marks can help in the identification of the biter, but there are important limitations.
- Cases of accidental poisoning can appear to be similar to chemical abuse, and a comprehensive psychosocial assessment can help in determining the underlying cause.
- Child maltreatment fatalities are underidentified in the US because of both underidentification of child homicides and inaccurate classification of pediatric fatalities in official reports.
- Child abuse deaths may have few or no external signs, and a comprehensive autopsy can reveal certain patterns of head and other organ injury that allow accurate determination of the abusive nature of the death.
- Death review teams may improve the quality of death investigations, identify barriers, allow for better allocation of limited resources, improve the understanding of the causes of child death, and help in designing prevention activities to reduce further deaths.

- A small percentage of SUID deaths are attributable to fatal child abuse, but investigators and physicians should take a supportive and not accusatory approach during the investigation of a sudden, unexpected infant death.
- A comprehensive investigation including scene investigation, autopsy, and review of clinical history is needed to make a diagnosis of SIDS.

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Part III
Related Issues

Chapter 10
Maltreatment of Children and Youth with Special Healthcare Needs (CSHCN)

Heather C. Moore and Angelo P. Giardino

Introduction

Children with special healthcare needs are a readily identified pediatric population with increased risk for child maltreatment (Sullivan and Knutson 1998, 2000; Turner et al. 2011; Child Welfare Information Gateway 2018). The maltreatment of these children and youth is frequently unrecognized and undiagnosed in healthcare settings. Consequently, healthcare providers require education regarding the risk factors associated with maltreatment in children with special healthcare needs. Pediatric providers must be attentive in medical evaluations of children with diagnosed and suspected disabilities. The following chapter provides a review of characteristics related to maltreatment risk factors, perpetrators, and disabilities in children and youth with special healthcare needs. Practical guidelines for pediatricians in identifying maltreatment among children with special healthcare needs are presented along with guidelines for working with families. Case study examples of neglect, physical abuse, medical neglect, and medical abuse of children with special healthcare needs are also given.

The maltreatment of children with special healthcare needs is a significant public health issue. Reduction of childhood maltreatment and maltreatment-related deaths is a leading health indicator in Healthy People 2020. While chil-

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dren with special healthcare needs are not specifically referenced in Healthy People 2020 with respect to childhood maltreatment, they are discussed as a pediatric subpopulation requiring access to family-centered, coordinated, and comprehensive health systems. With increased access to such care, the likelihood of detecting maltreatment in special-needs children increases. Children and youth with special healthcare needs are defined by the US Department of Health and Human Services (HHS), Health Resources and Services Administration (HRSA), and Maternal and Child Health Bureau (MCHB) as:

> …those who have or are at increased risk for a chronic physical, developmental, behavioral, or emotional condition and who also require health and related services of a type or amount beyond that required by children generally. (US Department of Health and Human Services 2008)

This definition is broad and inclusive in emphasizing the common characteristics of children with a wide range of medical diagnoses. The National Survey of Children with Special Healthcare Needs (NS-CSHCN) is a compendium of state and national data on the epidemiology of children with special healthcare needs. This survey is sponsored by the MCHB and conducted by the National Center for Health Statistics within the Centers for Disease Control and Prevention. It provides detailed information on prevalence, demographic characteristics, types of medical services needed, as well as access to and satisfaction with the services received. The survey does not gather child maltreatment information. Children are identified by use of publically funded healthcare services. Accordingly, their numbers are defined by socioeconomic parameters that do not include children from all socioeconomic strata. The 2009–2010 survey found that 15% of US children have special healthcare needs and 23% of households with children have at least one child with a special healthcare need. Thus, children with special healthcare needs are a significant group of US children.

Research on Maltreatment of Children with Special Healthcare Needs

There is a growing body of research conducted in medical settings on the maltreatment of children with special healthcare needs. Nearly three decades ago, Sullivan, Brookhouser, Scanlan, Knutson, and Schulte (1991) found that sexual abuse and a combination of sexual and physical abuse perpetrated by family members were the most common forms of maltreatment in a sample of 482 consecutively referred, maltreated children with medical disabilities in a specialty hospital setting. The medical diagnoses included communication disorders, learning disabilities, and cleft lip and/or palate. Males had high rates of sexual abuse, and placement in a residential school was identified as a major risk factor for sexual abuse among deaf and hearing-impaired children.

Researchers in Norway completed a retrospective study of 1293 hospitalized patients, aged from infancy to 16 years, admitted to 26 pediatric hospitals. Mailed questionnaires requested information on the incidence of children receiving medical services for suspected sexual abuse, including demographic characteristics of disability type, age, gender, and determination of the abuse allegations (Kvam 2000). Of the hospitalized children, 6.4% were identified as medically disabled. Diagnoses included intellectual disability, cerebral palsy, physical disability, and deafness. Children with these diagnoses had elevated risk for sexual abuse, and this risk increased with disability severity. The most susceptible children were those with behavior disorders, intellectual disability, and physical disabilities.

In the USA, Giardino, Hudson, and Marsh (2003) conducted an archival study of the medical records of consecutive referrals to a hospital-based healthcare team conducting medical evaluations for suspected child maltreatment in children with special healthcare needs. Sixty records, of children ranging from 3 to 16 years, were examined, and 31% of the children were victims of maltreatment. The recorded special healthcare needs diagnoses included attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorders, blindness, cerebral palsy, developmental delay, hearing impairment, intellectual disability, and speech/language delays.

Sullivan and Knutson (1998) completed a population-based study of maltreatment incidence and characteristics of all children seen at the Boys Town National Research Hospital over a 10-year span. A hospital-wide maltreatment prevalence of 15% was reported, and 6000 maltreatment incidents were recorded. Turner et al. (2011), using the 2008 National Survey of Children's Exposure to Violence, studied a representative national sample of 4046 children aged 2–17 years and examined the associations between several different types of disability and exposure to multiple forms of child victimization. Overall, children with any disability reported significantly higher rates of all forms of victimization, compared to children without disabilities. Children with physical disabilities experienced more maltreatment, sexual abuse, and property crime but were not subjected to increased rates of peer victimization. Results suggested that ADHD elevates the risk for peer victimization (bullying) and property crime, such as personal property theft. Patients with internalizing psychological disorders, such as post-traumatic stress disorder (PTSD), anxiety disorders, and depression, experience substantially higher levels of all four types of victimization, with particular risk for sexual abuse and maltreatment. Of note, mood disorder will often present in children with symptoms of irritability manifesting as tantrums, anger/rage exhibited with violence, or school refusal, instead of depression and withdrawal. Developmental/learning disorders only heighten the risk for property crime. The study did conclude that physical disability did not increase the risk for any type of victimization once confounding factors and co-occurring disabilities were controlled. Interestingly, all four types of victimizations increased with the age of the children but also among respondents whose mother had a psychological or behavioral diagnosis. Male respondents experienced greater odds of peer victimization but lower odds of sexual abuse relative to females. Socioeconomic status (SES) factors such as single-parent families, stepfamilies, and households with nonparent caregivers had increased odds of maltreatment and property crime – 2.3–2.4 times

the odds when compared with two biological parent families. Of note, this study utilized the special-needs children as respondents, so an underrepresented population is those children with more severe disabilities.

With respect to children younger than 2 years, Van Horne et al. (2015) utilized data from state statistics of live births, birth defect surveillance data, and substantiated reports of child maltreatment to examine a cohort of children with three birth defects: Down syndrome, cleft lip with/without cleft palate, and spina bifida. In the Down syndrome group, the prevalence of maltreatment was not statistically different from the prevalence in unaffected children. However, the children with spina bifida and cleft lip with/without palate demonstrated significantly higher prevalence rates than unaffected children. Neglectful supervision was the most common maltreatment form for all children in the study. Compared with unaffected children, the risk of neglectful supervision was similar (Down syndrome) or significantly lower (cleft lip/palate and spina bifida). However, medical neglect risk was 3.6 to 6.2 times higher in the cleft lip with/without palate and spina bifida groups compared with the unaffected group.

Finally, Turner et al. (2011) sought to further understand the connection of specific types of disabilities and the risk for particular types of victimization via an analysis of a nationally representative sample of 4046 children aged 2–17 years from the 2008 National Survey of Children's Exposure to Violence. Findings from this study showed that not all forms of disability were associated with equivalent levels of risk for various forms of victimization and that attention to sociodemographic variables as well as parental characteristics was important for adequate understanding of the risk for child maltreatment (Turner et al. 2011). In the authors' words:

> Findings also point to the importance of accounting for sociodemographic variations across disability groups as well as parent characteristics, such as psychological disorder, that may contribute to some types of child disability as well as some types of child victimization. Simple correlational studies between disability and victimization may overstate the degree of relationship unless these overlapping risk factors are controlled. Findings also suggest that victimization risk associated with one type of disability may often be confounded with other co-occurring types. Thus, controlling for other forms of disability is essential for understanding the types of victimization risks that arise from particular forms of disability. (p. 7)

Table 10.1 provides a summary of characteristics of children with special healthcare needs and the risk of child maltreatment.

In summary, children with disabilities – or more general, those with special healthcare needs – are at risk for various forms of child maltreatment, causing the US Department of Health and Human Services' Children's Bureau to conclude:

> Children with disabilities are at least three times more likely to be abused or neglected than their peers without disabilities (Jones et al. 2012), and they are more likely to be seriously injured or harmed by maltreatment (Sedlak et al. 2010). Even among children with disabilities, the risk of maltreatment varies by disability type (Jones et al. 2012; Lightfoot 2014; Turner et al. 2011). (Child Welfare Information Gateway 2018, p. 1)

Table 10.1 Characteristics of children with special healthcare needs and child maltreatment

Characteristics	Description
Types of maltreatment	Special-needs children are at elevated risk for all forms of maltreatment: physical neglect, medical neglect, physical abuse, sexual victimization, property crime Many special-needs children experience multiple types of maltreatment
Gender of victims	Males have higher odds of peer victimization (Turner) Females have elevated risk of sexual victimization (Turner)
Type of disability/ abuse associations	Children with special healthcare needs overall have higher risk: Maltreated children are 2.2 times more likely to have medical disability (Sullivan) Physical disability – highest risk for maltreatment and property crime (Turner) Developmental/behavioral disorder – most risk for property crime, neglect (Turner) ADHD/ADD – significant risk for peer victimization, maltreatment, property crime (Turner) Internalizing disorders – elevated for all forms of maltreatment, but particularly sexual victimization (Turner) Overall, interpersonal disorders and behavior disorders are mostly strongly associated with victimization risks (Turner)
Age of first maltreatment	>50% of children are abused before age 4 years (Sullivan, Turner)
Severity of maltreatment	Special-needs children experience more severe maltreatment, especially neglect, medical neglect, and sexual victimization (Sullivan)
Duration of maltreatment	Special-needs children experience longer duration of maltreatment, especially sexual, neglect, and medical neglect (Sullivan)
Perpetrators	Special-needs children are most likely to be maltreated by known individuals. Parents account for 95% of neglect perpetrators, 76% of physical abuse perpetrators, and 39% of sexual abuse perpetrators (Sullivan) Young, unmarried, lower educational attainment mothers have a higher risk of maltreating their children (Van Horne) Special-needs children born to pregnant women on Medicaid are at increased risk (Van Horne) Extrafamilial individuals account for 40% of sexual victimization of special-needs children (Sullivan)
Parental chronic illness or disability	~20% of maltreated special-needs children have a parent with chronic illness/disability compared with 10% of parents of nondisabled maltreated children (Sullivan) Maltreatment of special-needs children is significantly greater if the mother has a diagnosis of psychological/behavioral disorder (Turner)
Socioeconomic factors	Significantly more maltreated children with disability live in single-parent, stepparent, or nonparent caregiver households (Turner)

From Turner et al. (2011), Sullivan and Knutson (1998) and Van Horne et al. (2015)

Table 10.2 Significant associations between family socioeconomic stressors and disability group

Disability	Description of family socioeconomic stressors
Behavior/ developmental disabilities	Parental psychological/behavioral diagnosis, difficult parenting due to "unresponsive" children, school difficulties such as bullying, property crime, delinquency, disabled child in family, and child alcohol/drug abuse
Communication disorders	Difficult parenting, inadequate housing, financial problems, pregnancy/ birth of newborn, parental psychological/behavioral diagnosis, social isolation, and fetal alcohol syndrome
Health-related disabilities	Difficult parenting, financial problems, pregnancy/birth of newborn, parent is ill/disabled, parental psychological/behavioral diagnosis, social isolation, disabled child in family, and fetal alcohol syndrome
Mental disabilities	Difficult parenting, financial problems, pregnancy/birth of newborn, parent is ill/disabled, parental psychological/behavioral diagnosis, social isolation, disabled child in family, and fetal alcohol syndrome
Multiple disabilities	Pregnancy/birth of newborn and disabled child in family
Maltreatment type	Description of family socioeconomic stressors
Neglect	Difficult parenting, inadequate housing, financial problems, pregnancy/ birth of newborn, parental psychological/behavioral diagnosis, social isolation, and legal system involvement
Physical abuse	Parental psychological/behavioral diagnosis, parental drug/alcohol abuse, social isolation, and legal system involvement
Emotional abuse	Difficult parenting, inadequate housing, financial problems, pregnancy/ birth of newborn, parental psychological/behavioral diagnosis, parent is ill/disabled, parental drug/alcohol abuse, social isolation, and legal system involvement

Family Socioeconomic Stressors

Family socioeconomic stressors have been associated as correlates in the maltreatment of children with special healthcare needs (Table 10.2). Substantially more familial SES stressors are present in households with maltreated disabled children than in those of maltreated nondisabled children. Significant associations between family SES stressors, maltreatment, and disability have been identified in multiple research studies (Sullivan and Knutson 1998; Turner et al. 2011; Van Horne et al. 2015).

For Pediatric Providers

Hibbard and Desch (2007), in collaboration with the Committee on Child Abuse and Neglect and Council on Children with Disabilities of the American Academy of Pediatrics (AAP), developed guidelines for pediatricians to follow in their evaluations of suspected abuse in children and adolescents with special healthcare needs and disabilities. These are summarized as follows (adapted from Hibbard et al. (2007)):

1. Recognize signs and symptoms of maltreatment in all children and youth, especially those with special healthcare needs and disabilities.
2. Be aware that some disabilities can both mimic abuse and are at increased risk of accidental injury that gives the appearance of abuse.
3. Offer emotional support and referral for resources to the parents and family.
4. Evaluate all maltreated children for the presence of a disability.
5. Advocate for and assist families in acquiring a medical home.
6. Participate in both collaborative team evaluations and treatment plans for children with disabilities.
7. Assess a family's strength and need for resources to help with stress factors faced by the family.
8. Advocate for wraparound services for children with disabilities within the medical home to include identification, intervention, and prevention of maltreatment.
9. Advocate for the use of positive behavioral interventions and the elimination of aversive interventions, including physical restraints in home, school, and institutional settings for children with special healthcare needs.
10. Advocate for comprehensive healthcare coverage from both private and governmental insurers for children with all types of disabilities (see Table 10.3).

The families of children with special healthcare needs are essential partners for professionals in the care and support of these children. Table 10.4 offers suggestions for working in collaboration with those families in a respectful manner that ideally creates a partnership with them.

Case Studies

Case studies are briefly presented to illustrate the neglect and physical abuse of children with special healthcare needs.

Case 1: Physical Abuse

A 33-month-old male with global developmental delay, blindness, and seizures presented with erythema, swelling, desquamation, and blistering of the right hand and forearm. At the proximal forearm was a very distinct demarcation between normal skin and injured skin. His mother indicated that she had placed tube socks around his wrists during the night to keep him from hurting himself. While this boy had documented self-injurious behaviors (i.e., striking his face and eyes and scratching his skin), this injury pattern was consistent with an immersion burn, not a restraint injury (see Photo 10.1).

Table 10.3 Recommended protocol for health providers' evaluation of suspected abuse in children with special healthcare needs

Recommended protocol
1. Conduct a thorough physical examination
2. In so doing, look for signs of maltreatment including neglect and physical and sexual abuse
3. Is there a disclosure of maltreatment? Yes ___ no ___
Does the child's condition fit with the caregiver's explanation?
Does the explanation change or vary over time?
Is the explanation inconsistent with the child's developmental abilities?
Is there a credible disclosure of abuse?
Are there physical or historical findings consistent with abuse?
Is there evidence of poor physical care, inadequate nutrition, emotional neglect, or physical neglect?
Is there failure to follow through on medical recommendations or meet medical appointments?
4. Does the child have a disability or special healthcare need?
5. If yes, how does this disability or medical condition affect this child?
6. Gather collateral information about the child (school, family, and medical history)
7. Are there any conditions or syndromes that could be confused with abuse? (Monteleone 1998)
Mongolian spots
Folk medicine: Vietnamese coining, cao gio, Chinese spooning, Russian cupping, Mexican fallen fontanelle
Easy bruisability: hemophilia, vitamin K deficiency, leukemia, Henoch-Schonlein, erythema multiforme, Ehlers-Danlos syndrome
Burns and burn-like lesions: impetigo, car seat burn, frostbite
Congenital indifference to pain
Osteogenesis imperfecta
Hair tourniquet
Congenital syphilis
Copper, vitamin C or D deficiency
Toddler's fracture or fractures from passive exercise
Self-inflicted injuries, Cornelia de Lange syndrome, Lesch-Nyhan syndrome, headbanging

Case 2: Physical Abuse

A 9-year-old girl with mild intellectual disability was presented with linear bruising and scratches in the middle of her back. She had temporal lobe seizures and was exhibiting aggressive outbursts in school; subsequently her teacher had pushed her to the floor, pulled her arms behind her, and held her down by pushing his shoe in the middle of her back, causing the injuries to her back (see Photo 10.2).

Table 10.4 Suggestions for working with families

Suggestion	Description
Help the parents to	Focus on the child rather than on his/her disability Understand disability facts and issues, in order to work with their child constructively Acknowledge and respond to their feelings regarding the disability Accept the disability without devaluing the child Assist the child in developing individual and family potentials, together and independently Connect with local resources which would benefit the child and family members
Determine what the family knows about	Their child's disability, including his/her medical prognoses Educational implications and programs for their child Assistive devices for their child Available support groups for parents and their child
Enlist the father's participation since it provides	Paternal support, involvement, and commitment to the child, mother, and other family members Gender balance, strengthening the family bond, and lessening the risk of spouse abuse
Doctor-parent communication should be relevant to the parents'	Intellectual ability, language, communication methods, culture, and lifestyle Model effective communication and problem-solving skills Discuss and interpret available information Clarify problems and goals Facilitate problem resolution through collaboration Encourage boundary setting
Abuse prevention	Improve parental awareness and encourage proactive behavior across settings and situations Gain the cooperation and involvement of the parents in abuse prevention Build upon parents' love and commitment to their child Encourage parents to use the effective parenting skills they possess and to develop new skills as needed Provide guidelines to assist parents with selecting safe caregivers using personal references, state license, credential checks, police checks, and unannounced visits to the care center

Adapted from Sullivan (1996)

Case 3: Physical Abuse

A 12-year-old male with Kallmann syndrome (delayed or no puberty, no sense of smell), hearing loss, mutism, severe autism, intellectual disability, failure to thrive, short stature, and gastrostomy tube feeds was presented to the special-needs clinic with human bite marks on multiple parts of his body. Prior to the abusive injuries, the child had been placed in a group home with three other patients. These patients were all grown men with intellectual disability and inability to live independently. The patient visited the clinic that day to meet with his child psychiatrist and adjust his behavior medications. The group home staff member noted the patient had new

Photo 10.1 Injury consistent with immersion burn

Photo 10.2 Linear bruising and scratches on child's back

"bruises" on his back, legs, and upper posterior thighs. Upon examination, the bruises were determined to be consistent with adult-sized human bite marks and in locations the child would be unable to reach with his own mouth. A full investigation ensued with Child Protective Services (CPS) and Adult Protective Services (APS), but the perpetrator was not discovered and the child returned to the home.

The patient was followed, and it was documented that the bruising from the bite marks had mostly resolved, until return to the clinic 2.5 months later. At this visit, new adult-sized human bite marks were noted on bodily areas the patient would be unable to reach on his own. Referrals were again sent to CPS and APS. The child currently remains in the group home without positive identification of the offender.

Case 4: Physical Abuse

Deep bruising of the upper arm, upper chest, and abdominal wall was found in this adolescent with mental retardation. Bruising of cavitous areas, such as the abdomen, is especially concerning for inflicted trauma (see Photo 10.3).

Photo 10.3 Bruising

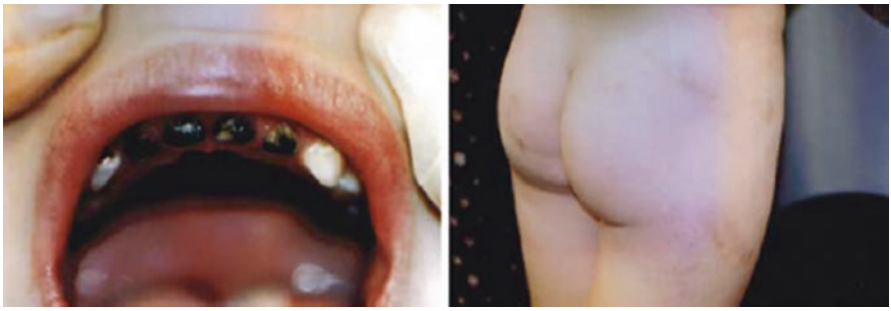

Photo 10.4 Decayed front teeth and bruising

Case 5: Physical Abuse and Neglect

This $4^{1}/_{2}$-year-old boy was taken into protective custody in the aftermath of a violent, domestic altercation between his inebriated parents. In foster care, he was noted to be developmentally delayed, especially in the areas of speech and self-care skills. He was microcephalic and had other physical features consistent with fetal alcohol syndrome. His upper front teeth were carious, and he had deep, old bruising and subcutaneous fat necrosis of the buttocks and outer thigh (see Photo 10.4).

Case 6: Neglect and Physical Abuse

A 16-month-old boy born with global developmental delays and hypotonia had been placed in medical foster care due to allegations of neglect and abandonment. Prior to entering foster care, a developmental assessment was performed confirming

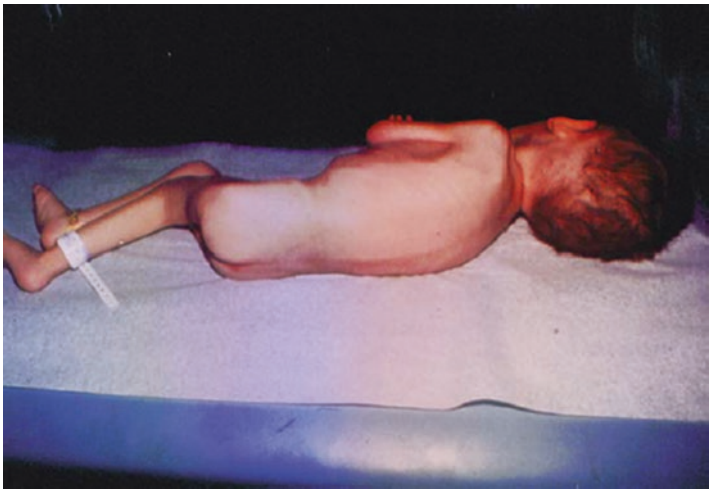

Photo 10.5 Emaciated child with diffuse osteopenia and old fractures

his diagnoses. At the time of the assessment, the child could sit with pelvic support and was beginning to roll over. He had started to finger feed and could hold a bottle by himself. He was alert and social with emerging expressive and receptive language skills. Within days of entering foster care, his condition deteriorated quickly and significantly, including dramatic weight loss, recurrent bruising, broken bones, retinal hemorrhages, and subdural hematomas. He was admitted to the hospital numerous times, each time discharged to his foster mother. The possibility of maltreatment was not initially considered because the foster mother was a nurse. Just prior to his discharge back to foster care after the third hospitalization, the nursing staff consulted the hospital child abuse team. They had long-standing concerns regarding the child's well-being and the foster mother, who exhibited controlling, disruptive, and possessive behavior during each of the child's hospitalizations. Physicians had repeatedly dismissed the nurses' concern. The child abuse team reviewed the child's history and physical examination and recommended a skeletal survey. He was found to have diffuse osteopenia and old fractures of his right proximal femur and left distal femur (see Photo 10.5).

Case 7: Neglect

This 4-year-old was discovered in an extremely deprived environment. He had marked developmental delays, short stature, and abdominal distension. He appeared to be a much younger child than his chronologic age. In foster care, he made significant gains in his development and growth (see Photo 10.6).

Photo 10.6 Child with short stature and distended abdomen

Case 8: Neglect

A 2-month-old female infant presented to the special-needs clinic to establish care. The child had a severe upper airway anomaly requiring placement of a tracheostomy tube and use of a ventilator to maintain normal breathing. Along with the tracheostomy tube, a gastrostomy tube was placed to ensure the child received adequate nutrition, as eating by mouth was difficult and potentially harmful for the infant. At the second clinic visit, it was noted the mother refused to have the patient weighed (she had been weighed in another clinic earlier that day), and when the mother's inappropriate feeding of the child was broached by the provider, the mother reportedly became agitated and refused to heed the provider's advice. This occurred despite noted weight loss in the infant. Recommendations were again made to the mother, but the mother stated, "The babies in the NICU are too fat, and I will not let my daughter become fat." She also conceded that she had discontinued any gastrostomy tube feedings, giving only oral nutrition.

At each subsequent visit, the infant's weight gain was deemed inadequate, and every attempt to engage the mother was fraught with hostility. The mother refused feeding increases, despite stagnant weight gain. The mother had the patient's gastrostomy tube removed against medical advice. Upon further investigation, it was revealed the child was receiving no therapy interventions and not attaining any developmental gains. After multiple clinic visits, psychiatry was brought in to evaluate the mother, but she refused. The mother then fired the special-needs clinic and the infant's pulmonologist, who both had discussed CPS involvement. The infant was evaluated by a community pediatrician who documented weight loss on two

separate visits and subsequently hospitalized the child. During this hospitalization, the diagnosis of neglect was documented, the gastrostomy tube was replaced, and the child was removed from the mother's custody. The child has since been placed in medical foster care and is growing appropriately and gaining developmental milestones with therapy intervention.

Case 9: Medical Child Abuse

A 2-year-old female followed closely in the special-needs clinic was diagnosed as a victim of medical child abuse after at least 1 year of suspicion by the primary medical provider. The child was a former extremely premature infant who had a prolonged NICU stay and had diagnoses of subglottic laryngeal clefts, ventriculomegaly, bronchopulmonary dysplasia, and reflux. Medical child abuse was initially suspected at 10 months of age, due to more than seven hospitalizations for apneic episodes. The child abuse physician followed the child for 1 year as the primary care pediatrician, and it was noted that the mother repeatedly notified the on-call providers of apneic episodes so severe that CPR was required. On further inquiry, the child always returned to baseline, and the mother was the only witness, despite having home nursing. Seventeen office visits to the special-needs clinic alone were documented over a 1-year period. The mother maintained the use of supportive respiratory equipment and convinced multiple subspecialists to prescribe inappropriate medications, based on symptom report only; the lab testing was normal in these instances. The infant was admitted for a therapeutic separation from the mother after it was determined that the mother repeatedly exaggerated symptoms, likely falsified symptoms, and maintained inappropriate treatments for the child.

While hospitalized and removed from the mother's care, the patient was weaned off her seizure medication after it was determined she did not have seizure activity. Her respiratory support machines were discontinued after studies indicated no need, and the child required only one medication for her mild chronic lung disease. She is currently in the father's custody and has supervised visitation with the mother.

Toward Prevention

Professionals who participate in the evaluation and response for suspected child maltreatment also participate in prevention efforts directed at preventing the problem before it actually occurs and thus avoiding the harm and its aftermath. The Children's Bureau, part of the US Department of Health and Human Services, offers guidance on child maltreatment prevention efforts directed at children with special healthcare needs at the community, family, and child levels of action, which are summarized in Table 10.5.

Table 10.5 Prevention strategies

Prevention level	Focus area	Description
Child "Teaching children with disabilities about the risks of abuse and neglect, as well as improving their ability to advocate for themselves, can help reduce maltreatment among this population" (p. 11)1.1.	*Help children protect themselves*	Involve children at risk of maltreatment in group-based educational opportunities about abuse and neglect Could include involving children in opportunities to: Learn about their body parts and functions What constitutes abuse and neglect How to communicate with a trusted adult if the need arises Distinguish between appropriate and inappropriate social interactions
	Maximize children's communication skills and tools	Provide opportunities to practice using effective communication skills Model healthy relationships and positive interactions with other children and adults and encourage others involved in children's lives to do the same Increasing children's verbal development and communication skills can help them advocate for their own needs and report maltreatment if it does occur
	Reduce children's social isolation	Children with disabilities may have limited involvement in developmentally appropriate activities (e.g., clubs, sports, jobs) that can help reduce social isolation Work with multidisciplinary teams of parents, foster parents, educators, and others to identify opportunities and assist caretakers in: Enrolling their children in appropriate activities Supporting them as they form and strengthen relationships with peers and trusted adults
Family "Parents and other caregivers spend the most time with their children; therefore, it is important to connect them with prevention programs that help them raise their children without resorting to maltreatment" (pp. 9–10)1.1.1.	*Home visiting*	Professional or paraprofessional staff can visit families to provide support and services in their homes. The visitor partners with the family to assess the family's strengths and needs and enhance their protective factors
	Parenting classes	General parenting classes should include a focus on parenting children with disabilities and accessing supports and services
	Support groups	Parents can share their experiences in a supportive group setting and trade information on resources, address issues related to their children's disabilities, and create informal support networks
	Respite care	Taking a break from the demands of caring for a child with disabilities can help parents reduce stress and the risk of abuse or neglect

(continued)

Table 10.5 (continued)

Prevention level	Focus area	Description
Community "…build upon general child maltreatment prevention efforts by incorporating the following strategies to raise awareness of the maltreatment of children with disabilities and help change societal attitudes about children with disabilities" (p. 9)1.1.1.	*Ensure community members are aware of the heightened risk*	Community members may not realize that children with disabilities are at an increased risk for maltreatment or understand how they can better identify, support, and protect children with disabilities who have been or are at risk for maltreatment
	Help others see children with disabilities as valued and unique individuals	Counteract negative attitudes by discussing the strengths of children with disabilities and their families and the unique perspectives they bring to their communities
	Promote inclusion of children with disabilities in everyday life	Identify and address physical and social accessibility barriers for children with disabilities and their families (e.g., access to public buildings and parks, equal opportunities to participate in sports or social events) to promote greater exposure and decrease isolation
	Encourage communities to share the responsibility for the Well-being of children with disabilities	Encourage greater community involvement to create a larger support network for children with disabilities and their families Help create and promote policies and educational opportunities that support the Well-being of this population

Child Welfare Information Gateway 2018. https://www.childwelfare.gov/pubPDFs/focus.pdf

Conclusions

Child maltreatment is a significant public health issue and should be an integral part of pediatric care, particularly for infants, toddlers, and preschoolers less than 5 years of age. Healthcare professionals need to be aware of the increased incidence of maltreatment among children referred to them for care and treatment and, accordingly, need to screen for histories of maltreatment and be alert for signs and symptoms of abuse and neglect. Given the high percentage of children with disabilities among maltreated children, healthcare professionals also need to routinely screen for disabilities so this information can be available to law enforcement and social service personnel in the conduct of child maltreatment investigations. Medical personnel play a key role in the identification and treatment of maltreated children with special healthcare needs. Pediatricians, in particular, play a significant role in the well-being of children with special healthcare needs. It is critical that they be well informed on maltreatment risks and characteristics as well as educate parents, caregivers, and other professionals about them. Pediatricians must not only provide a comprehensive medical evaluation but also play the crucial role in the prevention of child maltreatment as well. In so doing, healthcare professionals can impact the child victims and their families and help shape more informed public health policy.

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Chapter 11
Intimate Partner Violence

Jennifer J. Tscholl and Philip V. Scribano

Abbreviations

ACE	Adverse childhood experience
CDC	Centers for Disease Control and Prevention
IPV	Intimate partner violence
SDOH	Social determinants of health

Introduction

Intimate partner violence (IPV) is characterized by a pattern of coercive behaviors by a current or former intimate partner, which may include physical assault, psychological abuse, sexual assault, progressive social isolation, deprivation, and intimidation. These patterns of abuse are used to maintain power and control within the context of an adult or adolescent intimate relationship. IPV is often used interchangeably with the terms domestic violence and family violence, is used to describe violence in relationships more broadly, and is distinguished from other types of violence experiences, i.e., peer violence. An intimate partner is defined by the Centers for Disease Control and Prevention (CDC) as a current or former spouse,

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boyfriend/girlfriend, dating partner, or ongoing sexual partner. Other literature has defined an intimate relationship more broadly and may include any close personal relationship that is not necessarily sexual in nature, such as dating and live-in partners, married couples, same-sex couples, adults who share a child in common, two adult relatives who live together, adolescents in a dating relationship, ex-partners, or parents and their adult or teenage children (Burke et al. 2004; Toohey 2008; Rhatigan et al. 2005).

The CDC defines IPV as a spectrum, which includes five behavior types (Breiding et al. 2015; Smith et al. 2017):

1. *Physical violence*
2. *Sexual violence,* ranging from rape to noncontact unwanted sexual experiences, such as unwanted exposure to pornography or threats of sexual violence
3. *Stalking,* which is a pattern of repeated, unwanted attention and contact that causes fear or concern for one's own safety or the safety of someone else
4. *Psychological aggression,* which is the use of verbal and nonverbal communication with the intent to harm another person mentally/emotionally and/or exert control over another person
5. *Control of reproductive or sexual health,* which includes the refusal by an intimate partner to use a condom or sabotage of birth control efforts and coercion to maintain a pregnancy and/or terminate the pregnancy

Although IPV victimization is not gender-specific, the majority of victims are women who are perpetrated by male partners. In the most basic conceptual framework, IPV is thought of in terms of one partner exerting power over another via the behaviors listed above. Figure 11.1 (Power and Control Wheel) demonstrates specific behaviors by which one partner attempts to exert his/her power and control over the other. Specifically, that power and control may manifest as physical or sexual violence, and the means by which these power and control are demonstrated include social isolation, as well as threats on self, children, and other relationships.

It is important to recognize that an individual experiencing IPV may not initially recognize the behavior as unacceptable or as a problem. The transtheoretical model (TTM, also known as the stages of change model) has been proposed as a contextual framework for the process of behavior changes that may occur in individuals experiencing IPV (Table 11.1) (Reisenhofer and Taft 2013). While the proposed stages of change do not necessarily occur in a sequential fashion, and there is not necessarily always forward movement through the steps, this framework aids clinicians in a better understanding of how to offer assistance, support, and protection for these individuals and their families. This model makes it apparent that ending IPV, even on an individual basis, is a process which occurs over time. This can be frustrating for some medical providers who may feel uncomfortable with the decisions an IPV victim makes. However, maintaining an empathic approach can facilitate a more effective, nonjudgmental clinical encounter to support individuals affected by IPV and understand their decision-making in regard to their violence exposures.

The TTM framework for IPV has specific differences from how it relates to other health behaviors, such as smoking. Since IPV is not entirely under individual control, it must be addressed in the context of an interdependent two-person

Fig. 11.1 Dynamics of IPV – "Power and Control Wheel." (Reproduced with permission from DAIP 2018)

Table 11.1 Stages of change for IPV

Stage of change	Description
Precontemplation	The victim does not recognize the behavior as abusive/problematic; assumes personal responsibility; is not interested in change
Contemplation	The victim recognizes the abusive behavior as a problem; has awareness of pros and cons of change; may undertake conscious actions to protect self from harm
Preparation	The victim recognizes the abusive behavior as a problem, intends to change, and is actively preparing to do so
Action	The victim is actively engaged in making changes related to ending/escaping the abusive behavior
Maintenance	Target behavior changes maintained long term (6+ months)

Adapted from Reisenhofer and Taft (2013)

relationship (Burkitt and Larkin 2008). Understanding the TTM specifically as it relates to IPV may assist medical providers in better anticipating potential barriers that may impede progression through the stages of change. Factors that may become barriers include children in the home, absence of external support, financial insecurity, cultural beliefs/societal norms, mental health diagnoses, etc. It is also important to consider the stages of change in the context of the target change of the IPV victim, as the intended outcome may not be to leave the relationship.

Epidemiology

Nearly eight million women are estimated to be victims of IPV annually, and more than 1 in 3 (37.3%) women report a lifetime prevalence of IPV (Smith et al. 2017). Nearly five million are physically assaulted by their partners each year.

In 2014, the Federal Bureau of Investigation's Uniform Crime Reporting (FBI UCR) Program reported 2681 female murder victims, and in those for whom the relationships to their offenders were known, 35.5% were murdered by their husbands or boyfriends (FBI Uniform Crime Reporting data 2014). Additionally, 38% of the reported incidents of IPV against women had children residing in those households. These statistics support a need for greater efforts to address this as a public health problem, given that exposure to this type of violence greatly impacts physical/mental health and quality of life and has financial repercussions resulting from increased healthcare utilization and lost productivity (i.e., nearly 25% of female IPV victims report needing to miss at least 1 day of work or school, due to the IPV) (Smith et al. 2017).

Rates of IPV generally increase during pregnancy, but estimates vary considerably and are influenced by sociodemographic characteristics (Chisholm et al. 2017). These variations are likely due to the different screening tools, methods, populations, and definitions applied. A considerable amount of research has been dedicated to examine the association of IPV during pregnancy with adverse pregnancy outcomes, especially low birthweight, preterm delivery, intrauterine growth restriction, perinatal death, and induced and spontaneous abortion (Alhusen et al. 2015; Chisholm et al. 2017; Coker et al. 2004; Janssen et al. 2003). Adverse outcomes have been postulated to have multifactorial causation, including direct trauma to the fetus, maternal stress, isolation or poor prenatal care related to the abuse, and maternal risky health behaviors related to coping with the abuse (Coker et al. 2004).

Health Consequences of IPV

The acute and chronic health consequences of IPV to women and children are profound and greatly influenced by the neurobiological response to stress, often referred to as *toxic stress* once these neurobiological responses become chronic and

maladaptive. The health impact of chronic stress has been extensively described in the literature (Shonkoff et al. 2009, 2012) and includes changes in the homeostasis of important regulatory mechanisms such as the hypothalamic-pituitary-adrenal axis and epigenetic influences to gene modulation and expression (Danese and McEwen 2012). This growing area of research is continuing to validate the causation of health conditions seen in this vulnerable population.

An average 18% of women and 11% of men were medically treated for injuries sustained during IPV victimization events from 2002 to 2011 (Catalano 2013). IPV is also recognized as a significant risk factor for additional health problems, both acute and chronic (Table 11.2). These chronic health problems can cause significant morbidity and persist for years, even if the IPV exposure ends (Chisholm et al. 2017). The chronicity of IPV has been recognized within the healthcare system; however, healthcare professionals, and the systems they work within, are inconsistent in their identification and intervention for IPV (Campbell 2002). Additionally, women at highest risk (those who were either murdered or an attempt made on their life by their intimate partner) are much more likely to be seen in the healthcare system than to seek domestic violence victim services prior to the terminal event (Campbell 2004). Therefore, efforts to reduce IPV mortality may be more greatly impacted through better identification and intervention within the healthcare system than IPV service providers at the initial intervention phase.

Victims of IPV generate more healthcare costs annually than nonvictims, with mental health services accounting for the majority of increased costs (Bonomi et al. 2009). In 2007, Rivara and colleagues demonstrated that abuse-related healthcare utilization amounted to $19.3 million in excess annual costs for every 100,000 women enrolled in a large health plan. This equated to 19% higher costs compared

Table 11.2 Health problems associated with IPV

Mental health/psychiatric	*Obstetrics/gynecology*
Depression[a]	Pelvic pain
Post-traumatic stress disorders[a]	Sexual dysfunction
Anxiety/panic disorders	Unsafe sexual practices
Insomnia/sleep disorders	Sexually transmitted infections
Suicidal ideation	Unintended pregnancy
Poor self-esteem	Forced “elective” abortion
Neurologic	Missed prenatal care
Seizures	*Peripartum/perinatal*
Fainting	Fetal demise
Chronic pain	Preterm birth
Headaches	Low-birthweight infants
Fibromyalgia	Small for gestational age
Gastrointestinal	*Cardiac*
Decreased appetite	Hypertension
Eating disorders	Chest pain
Irritable bowel syndrome	*Other*
	Alcohol/substance abuse
	Social dysfunction

[a]Most prominent mental health sequelae

to women who had not experienced IPV. The increased healthcare utilization costs persisted for years, even after the IPV exposure ended (Rivara et al. 2007; Fishman et al. 2010). The estimated annual healthcare cost of IPV ranged from $2.3 billion to $8.3 billion (Brown et al. 2008; Max et al. 2004). These estimates do not take into account all economic burdens of IPV, such as lost work productivity via absenteeism or distraction (Reeves and O'Leary-Kelly 2007). Similarly, the healthcare costs and utilization for children whose mothers experienced IPV are also higher with greater emergency department visits, mental health services, primary care visits, and other ancillary healthcare utilization, and this increased cost and utilization was present even if the mothers' IPV experiences ended prior to the child being born, compared to mothers who reported no IPV (Rivara et al. 2007).

IPV and Child Maltreatment

In 2010, the American Academy of Pediatrics (AAP) reaffirmed its stance through its Committee on Child Abuse and Neglect that "it is clear that IPV is a pediatric issue" (Thackeray et al. 2010). Pediatric medical providers must be aware that abused caregivers often seek care for their children but not for themselves, placing the pediatric provider in a unique position to identify IPV (Martin et al. 2001). While we can understand and recognize the adverse effects of child maltreatment for the child and IPV for the adult, there are risks of adverse effects in children who witness IPV or live in a household where it is occurring. Exposure to IPV has significant detrimental effects on the health and well-being of children in these households. Only a fraction of children may be directly injured as a result of an IPV episode. One of the earliest studies evaluating the physical injuries sustained in children due to IPV noted a bimodal distribution of injury, with young children who were being held by the caregiver during an IPV incident or adolescents who were attempting to intervene (Christian et al. 1997).

Perhaps more significant is that children in these home environments are vulnerable to chronic stress due to repeated exposure to IPV. When children are repetitively exposed to this type of stress-inducing environment, their own natural stress response can become maladaptive and result in poor mental and physical health (Shonkoff et al. 2012; Garner et al. 2012). When compared to children who are not exposed to IPV, IPV-exposed children are shown to have significantly increased rates of both internalizing behaviors, such as anxiety, depression, withdrawal, and somatic complaints, and externalizing behaviors, such as attention problems, aggression, and rule-breaking behaviors. This can result in poor social and emotional development and difficulties with peer relationships (McFarlane et al. 2003; Bair-Merritt et al. 2006; Edleson 1999; Mohr and Tulman 2000, Jaffee et al. 2002; Litrownik et al. 2005; Kernic et al. 2003). Even when adjusting for other risk factors associated with child behavior problems, severe IPV is associated with these maladaptive child behaviors. Harsh parenting (parental psychological aggression and

use of corporal punishment) is a significant correlate of children's behavior problems (Hazen et al. 2006). Other studies suggest that maternal depression, which is commonly associated with IPV victimization, has a strong association with psychological aggression toward children in the home and also increases the risk of physical abuse of children in the home (Conron et al. 2009). Young children exposed to both IPV and parental depression are more likely to be diagnosed with ADHD after age 3 when compared to children who are not exposed to either IPV or parental depressive symptoms (Bauer et al. 2013). The ability of pediatric medical providers to optimally manage child health may be hindered if IPV is not adequately addressed. A patient's lifelong health trajectory is established in childhood; therefore, improving childhood health can have far-reaching benefits into adulthood (Bair-Merritt et al. 2013).

Adolescents with the risk factors of IPV exposure and other childhood stressors are more likely to adopt risk-taking behaviors, such as substance abuse (tobacco, alcohol, illicit drugs) and high-risk sexual activity, and more likely to be obese (Shonkoff et al. 2012). Children exposed to IPV, when compared to non-IPV-exposed children, are also more likely to experience poorer overall physical health and underimmunization (Bair-Merritt et al. 2006; Kernic et al. 2003). Figure 11.2 is a theoretical model linking a risky home milieu to eventual adverse child health outcomes (Bair-Merritt et al. 2006). By virtue of experiencing these violence exposures, neurocognitive adaptations occur, resulting in adverse physical and mental health outcomes and subsequent adoption of risky behaviors contributing to further health risks.

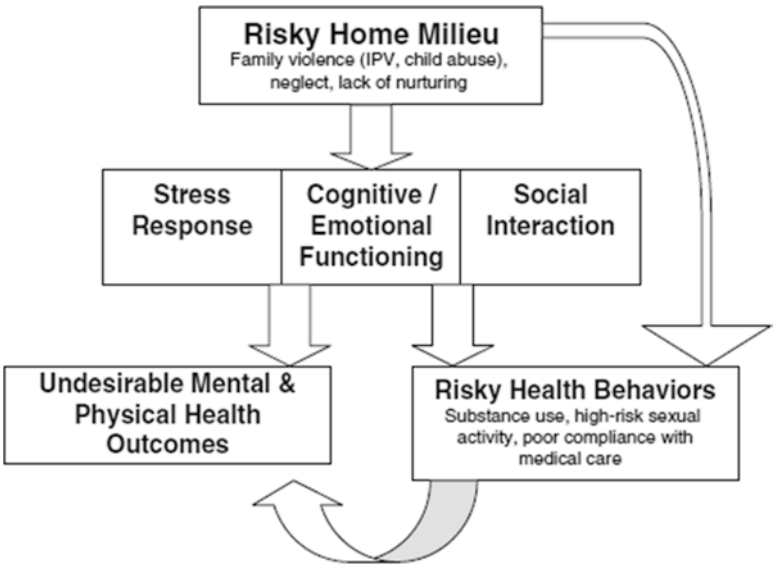

Fig. 11.2 Association of environmental (home) violence exposure, response to violence exposure, and negative health behaviors and outcomes. (Adapted from Bair-Merritt et al. 2006)

Child and adolescent experiences have been shown to have significant effects into adulthood through the work done in the adverse childhood experiences (ACEs) studies, which established how ACEs relate to health risk factors and morbidity later in life (Felitti et al. 1998; Dube et al. 2002; Kelly-Irving et al. 2013; Gilbert et al. 2015). The original ACEs which were evaluated in these studies include:

- Emotional, physical, and sexual abuse
- Emotional and physical neglect
- Household dysfunction, including parental separation or divorce, household substance abuse or other criminality, household mental illness, and *intimate partner violence*

There is a strong interrelatedness among different ACEs. Children exposed to IPV are likely to have had other ACEs. Notably, the prevalence of reporting growing up with any of the ACEs is two to four times higher among persons who report witnessing IPV compared with persons who have not been exposed to IPV during childhood (Dong et al. 2004). In addition, the most commonly reported co-occurrence with IPV in the household is physical abuse (Dube et al. 2002). In 30–60% of households in which either child abuse or IPV is occurring, the other form of violence is also being perpetrated (Edleson 1999).

The concept of social determinants of health (SDOH) encompasses ACEs, as well as other factors that can impact health outcomes, such as hardships related to housing, food security, education, and transportation (Beck et al. 2016; Garg et al. 2015). In children, SDOH can also include peer rejection, poor academic performance, growing up in poverty, and exposure to violence outside the home (Finkelhor et al. 2013). Research related to ACEs and other SDOH highlights the interconnectedness of various adverse experiences in childhood, suggesting that childhood exposure to IPV is unlikely to be an isolated adverse experience for a child. In this regard, it is imperative for the pediatric health provider to view IPV exposure in the greater context of other SDOH, which can cumulatively contribute to toxic stress and short- and long-term poor health outcomes (Finkelhor et al. 2013; Beck et al. 2016; Shonkoff et al. 2012).

Dating Violence

Teen dating violence (TDV) typically refers to the violent experiences specific to a dating relationship among adolescents or young adults. Teens are at risk for all types of dating violence (psychological, physical, and sexual) and are often unaware they are experiencing TDV. Additionally, in adolescents, there is a unique emphasis on cyberdating abuse. The ubiquitous use of electronics makes this a common medium of abuse for teenagers (Miller et al. 2015). The adolescent may not view the abuse as serious enough to call it TDV/IPV, or due to the bidirectionality of the abuse (physical and emotional), it may not be identified as such.

A national, school-based survey found that 20.9% of female students and 10.4% of male students reported experiencing some form of TDV in the preceding 12 months (Eaton et al. 2012). Adolescents who experience TDV victimization are at an increased risk for re-victimization in adulthood (Black et al. 2011; Smith et al. 2003). Another retrospective survey demonstrated that 22% of female and 15% of male adult victims of IPV reported they had experienced their first form of IPV between the ages of 11 and 17 years (Black et al. 2011). Just like adult victims of IPV, TDV victims are also at an increased risk for a wide range of acute and chronic medical and psychosocial conditions including higher rates of substance use, depression, suicide attempts and ideation, pregnancy, and sexually transmitted diseases (Silverman et al. 2004; Olshen et al. 2007; Bonomi et al. 2009, 2013; Ackard et al. 2007; Silverman et al. 2001). Recognizing TDV in the clinical setting is important in diagnosing and treating comorbid medical and psychosocial conditions, in helping to connect victims with appropriate resources, and in offering interventions to help prevent further abuse.

Adolescents report an understanding that dating violence is a struggle for control and can appreciate the connection between physical abuse and psychological abuse. Feelings of embarrassment can prevent teens from disclosing dating violence; however, they desire the skills to have healthy relationships (Sears et al. 2006).

Assessment of IPV in the Clinical Setting

In its summary, the US Preventive Services Task Force (USPSTF) found sufficient evidence to recommend routine screening of women for IPV and is consistent with and supports published policy statements by the AAP, the American College of Obstetrics and Gynecology, and the American Academy of Family Physicians (Moyer and USPSTF 2013; ACOG 2012; Dicola and Spaar 2016; Thackeray et al. 2010). In the same year, a 2015 Cochrane Review showed that routine screening does increase the identification of women experiencing IPV; however, there was no evidence of an effect on other outcomes. As such, they concluded there is insufficient evidence to justify screening in healthcare settings and cited a need for more research comparing universal screening to case finding in order to inform healthcare policy (O'Doherty et al. 2015). This divergent opinion between USPSTF and Cochrane regarding the evidence of clinical benefits of IPV screening may be left for debate; however, IPV screening has been recognized as an important tool to identify women at risk for abuse within the pediatric healthcare setting. The AAP has referred to IPV as the leading precursor of child maltreatment; therefore, being able to intervene on behalf of a caregiver experiencing IPV may be an effective means of preventing child abuse (Thackeray et al. 2010). With the AAP recommendation for IPV screening during pediatric healthcare visits, pediatricians should be aware of the dynamics of IPV and the resources available for families struggling with IPV. There have been obstacles within the pediatric healthcare community,

including lack of training, limited time, absence of resources for those who screen positive, and fear of offending or angering a caregiver.

The AAP's 2010 Clinical Report Recommendations include the following:

1. Residency training programs and continuing medical education (CME) program leaders are encouraged to incorporate education on IPV and its implications for child health into the curricula of pediatricians and pediatric subspecialists.
2. Pediatricians should remain alert to the signs and symptoms of exposure to IPV in caregivers and children and should consider attempts to identify IPV through either targeted or universal screening.
3. When caregivers are asked about IPV, pediatricians should have a plan in place to respond to affirmative screens.
4. Pediatricians should intervene in a sensitive and skillful manner that maximizes the safety of caregivers and child victims.
5. Pediatricians should be cognizant of applicable IPV law in their state, particularly as related to reporting abuse or child welfare concerns on behalf of children.
6. Pediatricians should support local and national multidisciplinary efforts to recognize, treat, and prevent IPV.

Current strategies for assessing IPV in the context of the healthcare encounter have included a more comprehensive assessment of SDOH (Garg et al. 2015; Gottlieb et al. 2014; Hassan et al. 2013; Dubowitz et al. 2009). Since these factors play a significant role in negative health outcomes of children and adults through a complex interaction of neurobiology and environment, efforts to understand the impact of the social factors on health are now in the forefront of clinical, policy, and research agendas (Schonkoff et al. 2009; Danese and McEwen 2012; Shonkoff et al. 2012). However, consensus has not been achieved in regard to the approach to detect these health-related social factors or which factors warrant systematic detection in the clinical environment. For instance, while the impact of exposure to IPV, maternal depression, substance use, and food insecurity may be substantial for child health and well-being, having a systematic method of assessment and supportive interventions is somewhat elusive in most clinical settings unless a framework is developed to improve care delivery to at-risk populations (Beck et al. 2016).

Pediatric healthcare providers are in a unique position to offer support and interventions for patients and their caregivers for IPV and other factors which can impact health. Any assessment and intervention on behalf of women struggling with IPV should include an understanding of the need to respect their autonomy and be offered in the context of advocating, collaborating, and demonstrating concern for the health and safety of them and their children (Campbell et al. 2002). To be most helpful to victims and their families, it is important to know how to advocate for them and to do so without jeopardizing their safety. Table 11.3 includes a succinct set of clinician skills to provide an adequate foundation for effective support to IPV victims.

A unique issue regarding the IPV assessment during a pediatric health visit is how these results are documented. Medical providers should be aware that the perpetrator may have access to the child's medical record and any documentation about IPV

Table 11.3 Clinician skills for addressing IPV

Education: Know the background and the magnitude of the problem of IPV
Definitions: Be able to identify the various forms of IPV
Screening: Initiate routinely and engage all members within your practice to recognize IPV as an important family issue to be addressed; consider a multifactor screener to address IPV and other social determinants of health
Safety: Recognize potential dangers for victims and children. Learn to develop effective safety plans with them (see Table 11.5)
Legal issues: Find out what types of abuse necessitate mandated reporting
Community resources: Collect a list of community resources for distribution to patients and families. Integrate efforts with the community. Provide education to families

Adapted from Knapp and Dowd (1998)

screening if that person is also a parent of the pediatric patient. Access to documentation about details of IPV may place an IPV victim at risk of harm. With this safety caveat in mind, documenting the results of universal IPV screening can be accomplished without disclosing specific details. For example, using a standardized documentation for all patient visits such as "performed screening for IPV and appropriate handouts provided per practice protocol" enables the healthcare provider to document the screening and relies upon standard practice regarding the interventions available and offered to families. The exception to this documentation challenge is if a child is being evaluated for suspected child maltreatment and the exposure to IPV may be an important risk factor in determining clinical evaluation, management, and ultimately a safety plan. Ensuring clear communication between healthcare providers is essential in a child's medical record to achieve safe and effective patient care.

IPV-mandated reporting laws vary from state to state; therefore, clinicians should be aware of their local laws. If the IPV results in harm to the child and/or a suspicion of child maltreatment exists, providers in all states are mandated to report abuse or neglect regardless of the IPV-mandated reporting laws for adult victims. Specifically, direct physical injury, serious concerns regarding the physical safety of the child, threats to the child, and/or child verbalizing feeling unsafe warrant a report to the child protective services agency.

Methods and Types of IPV Screening Tools Available

In multiple studies, it has been demonstrated that women prefer self-administered screening assessments, as opposed to verbal or face-to-face interviewing, which can be associated with lower detection rates and decreased patient/interviewee comfort. The use of a short, validated IPV measure, using a self-administered (paper or computer) interface, appears to provide the optimal detection rates with the greatest preference by women and their providers (Webster and Holt 2004; MacMillan et al. 2006; Hussain et al. 2015). Computer-based screening increases rates of communication with medical providers about IPV victimization, which then presents opportunity for counseling/referral to resources related to IPV (Rhodes et al. 2006).

This type of tool may also overcome barriers related to time constraints in busy clinical settings (Dowd et al. 2002).

There is an extensive list of instruments that can be used to screen for IPV in the clinical setting. An excellent resource from the CDC offers a compendium of these options (Thompson et al. 2006). Examples of short, efficient instruments with good detection rates are the Partner Violence Screen (PVS) and Woman Abuse Screening Tool (WAST). These are limited in the types of violence (i.e., PVS addresses physical violence only) and may still be longer to administer than is desired. IPV screening within a broader SDOH screener may be preferred in many healthcare settings. Validated screens such as the SEEK or Survey of Well-being in Young Children (SWYC) Family Question screeners have been recognized for their brief, yet multidimensional assessments (Dubowitz et al. 2009, 2012; Sheldrick et al. 2013). Several of the IPV screening tools and their descriptions are listed in Table 11.4.

Table 11.4 Commonly used IPV screening tools

Tool	Description	Targeted population	References
Revised Conflict Tactics Scales (CTS-2)	78-item scale assesses victimization and perpetration. 39-item victimization scale includes 12-item PA subscale	Partners in dating, cohabiting, and marital relationships	Straus and Douglas (2004), Straus et al. (1996)
Composite Abuse Scale (CAS)	30-item scale with 4 subscales (severe combined, emotional, physical abuse, and harassment). PA subscale includes 7 items	Females with current or former intimate partners for >1 month	Hegarty et al. (2005)
Partner Violence Screen (PVS)	3-item scale assesses past PA and current perception of safety	Females with current or former intimate partners over the past year	Feldhaus et al. (1997)
Abuse Assessment Screen (AAS)	5-item scale assesses past and present PA, SA, and perception of safety	Pregnant females with current or former intimate partners	Norton et al. (1995)
Woman Abuse Screening Tool (WAST)	8-item scale assesses relationship tension, PA, and SA	Females in relationships	Brown et al. (2000, 1996)
Hurt, Insulted, Threatened, Screamed Scale (HITS)	4-item scale that assesses physical and emotional violence and threats	Females in relationships	Sherin et al. (1998)
Multidimensional screens			
Parent Screening Questionnaire – SEEK	15-item scale assesses IPV, fire safety, food insecurity, corporal punishment, parental stress, depression, smoking, and substance use		Dubowitz et al. (2009, 2012)
Family Questions – SWYC	9-item scale assesses IPV, tobacco, substance use, depression, and food insecurity		Sheldrick et al. (2013)

Time constraints have been cited by pediatricians as one of the barriers to performing IPV screening in the clinical setting. In fact, the most time-consuming aspect should be the process of development of an effective screening program, as opposed to the process of screening once all the elements have been put into place. Of the utmost importance is gaining support and "buy-in" from the entire clinical staff and administration, so that everyone shares a common goal when instituting a new process. Choosing an appropriate screening instrument, educating all personnel, implementing a clinical protocol, identifying potential challenges, and acquiring knowledge of appropriate next steps in the setting of a positive screen are all important aspects of preparing to institute an IPV screening program. Once all clinic members have been assigned a role in the screening process and protocols are in place, the practice itself becomes more streamlined and less time-consuming to the providers.

Safety Interventions and Community Resources

The optimal care for the individual experiencing an abusive relationship depends on the medical provider's working knowledge of community resources that can provide safety, advocacy, and support. Providers must be prepared to take appropriate action when confronted with a positive screen (Groves et al. 2002). An interaction should maintain a supportive attitude with the IPV victim, express concern for safety, avoid any judgment, and provide reassurance that the victim is not to blame and is not deserving of any type of abuse. Victims may or may not be receptive to receiving information or to having resources contacted on their behalf. However, the medical provider should assess the immediate and future safety of both victim and child and be prepared to assist in establishing a safety plan with them. Specific elements of a safety plan are described in Table 11.5. Clarify if the victim would like the issue of IPV to be discussed with the child patient, as caregivers have variable comfort levels doing so themselves.

Becoming familiar with local resources will aid in making appropriate referrals for families in need. Resource mapping of local social services may be identified through web-based platforms such as (Aunt Bertha 2007) (www.auntbertha.com). This system offers a repository of social service organizations throughout the USA, identified by zip code, on a variety of domains, including IPV, to meet the needs of families. The National Domestic Violence Hotline (NDVH) is a national resource that is always available and a good starting point for any victim or provider in search of help. The NDVH can be reached online at www.thehotline.org or by calling 1-800-799-SAFE (7233).

In addition to providing support to the victim and children, providers should inform the individual experiencing IPV if there are any indications for mandated reporting, as this intervention can become a safety issue for both child and parent

Table 11.5 Basic elements of IPV safety planning

Safety during a violent incident:
Practice how to get out safely Teach children safety skills (safe place to go, do not intervene, call 911)
Safety when preparing to leave:
Plan for keys, purse, belongings, important documents, accounts Check with trusted friends for a place to stay; know shelter options Rehearse escape plan
Safety at home:
Change locks, doors; install security system, rope ladder Teach children how to access victimized parent if taken by partner Establish trusted list for permission to pick up children
Safety with an order of protection (OP):
Keep OP handy; provide copy to police Inform trusted folks (employer, close friend, minister) Contact police if partner violates OP
Safety on the job and in public:
Inform boss, security at work Screen calls Establish plan for leaving work, problems traveling home Change routines for shopping; use a different bank and hours
Safety and drug/alcohol use:
Consider risk/benefits of using alcohol or other substances Enhance safety by using in safe place with people who understand violence and are committed to client's safety Prepare a plan if partner is using Prepare a plan to safeguard children when using
Safety and emotional health:
Conserve emotional energy and avoid hard emotional times Plan for times when feeling depressed Plan for times when tempted to use drugs Develop tools for coping Assertive statements like "I can" Reading, music, call a friend Support groups

due to the nature of the disclosures that prompted an investigation. Ensuring an appropriate safety plan (as described in Table 11.5) in this setting is paramount.

IPV is a problem with family functioning and can significantly impact the physical and emotional health of the pediatric patient. Understanding the dynamics of IPV, the approach to screening in routine healthcare practice, and the needs of both adult and child can enhance the well-being of both parent and child and improve health.

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Chapter 12
Prevention of Child Physical Abuse

Christopher S. Greeley

Introduction

There is little disagreement about the moral outrage inspired by the abuse of a child, yet such abuse continues to occur. Each year, over 650,000 children are victims of child maltreatment in the United States, with over 142,000 experiencing physical abuse (US Department of Health and Human Services 2018). In greater than 80% of the cases, the perpetrator is either one or both of the child's parents. The effects of child abuse on the child are both physical and nonphysical. Child victims may suffer immediate physical injuries, ranging from the relatively minor (bruises and abrasions) to the severe and sometimes fatal. Children with inflicted brain injury are at lifelong risk for disability, feeding difficulties, seizures, blindness, and death (Barlow et al. 2005; Makaroff and Putnam 2003). Even without overt physical injury, children may still be harmed. Victims often have subtle behavioral and cognitive consequences (Stipanicic et al. 2008). While not the direct victim, a child living in an abusive or neglectful home can be negatively impacted (Middlebrooks and Audage 2008; American Academy of Pediatrics et al. 2008). Children exposed to household abuse have a greater likelihood of receiving a mental health disorder diagnosis in early adulthood (Fergusson et al. 2008).

Prevention of child abuse has been the focus of both policymakers and academicians. Despite growing attention to child welfare, there remains a disproportion between resources allocated to evaluation, investigation, and prosecution, compared with prevention, with prevention receiving orders of magnitude less (Leventhal 2005). Child abuse is a tremendous financial and resource burden on society. In 2012, Prevent Child Abuse America estimated the annual monetary cost of child abuse in the United States to be greater than US$80 billion (Gelles and Perlman

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A. P. Giardino et al. (eds.), *A Practical Guide to the Evaluation of Child Physical Abuse and Neglect*, https://doi.org/10.1007/978-3-030-00635-8_12

2012). This estimate includes US$33 billion in direct costs (hospitalization, law enforcement, and child welfare services) and nearly US$47 billion in indirect costs (incarceration, lost productivity, long-term mental and physical health services). The lifetime costs of each case of child maltreatment are estimated at $210,000 (in 2010 dollars) (Fang et al. 2012). Financial burdens are additionally felt by the surviving victims as adults. Women who are self-reported victims of child abuse use medical and mental health resources to a greater degree as an adult than those without such a history (Tang et al. 2006). Women who have been victims of both physical and sexual abuse had nearly twice the annual healthcare costs for ambulatory services than those without such a history (Bonomi et al. 2008). In the landmark Adverse Childhood Experience (ACE) Study (Adverse Childhood studies 2009), Feletti (1998) reported a dose-dependent relationship between children who are exposed to child abuse and household dysfunction and predictors of early adult death. The ACE study links nine adverse childhood experiences (recurrent physical abuse; recurrent emotional abuse; contact sexual abuse; an alcohol and/or drug abuser in the household; an incarcerated household member; someone who is chronically depressed, mentally ill, institutionalized, or suicidal; a mother who is treated violently; one or no parents; emotional or physical neglect) to adult health indicators. The greater the number of adverse childhood experiences (ACEs) a child had, the poorer the adult health will be—even to the point of shortening their lifespan. Children with significant adverse exposures during childhood had between a 4- and 12-fold increased risk for alcoholism, drug use, and suicide attempts. They also demonstrated a two- to fourfold increase in smoking and sexually transmitted infections (>50 sexual partners) and a 1.4- to 1.6-fold increase in severe obesity. These data highlight two important themes regarding child abuse prevention: (1) the profound impact that child abuse has on the entire life of the child and (2) the complex nature of the relationship between household and community dysfunction and child abuse. Additionally, child abuse, in fact, may be self-perpetuating. An adult who has been a victim of child abuse has an increased risk of themselves perpetrating violence (Fang and Corso 2007).

One obstacle to effective prevention is the lack of a single, agreed-upon definition of what constitutes child abuse (Belsky 1993; Whitaker et al. 2005). Differences in orders of magnitude for injury as well as overlap between physical abuse and neglect exist. And while there are obvious examples of the extremes of parental behavior, definitions of abuse often are subject to personal and cultural bias. Furthermore, the circumstances around trivial or minor injuries are different than those around fatal ones. Some abusive parents are also neglectful; some are not. Given the complexity of the problem, it is not surprising that a universal solution remains elusive. As the understanding of the etiology of child abuse has evolved, so have the variety of preventive programmatic responses. What has become clear is that there will be no single "solution" to end child abuse. Rather, it will require a collection of approaches, implemented in a coordinated fashion, at different times of the child's life, in various doses, with the cumulative goal of universal promotion of child well-being in society at large (Greeley 2009).

This chapter examines the current state of knowledge in the prevention of child physical abuse. The chapter begins with a discussion of the theories of why child abuse occurs, looking at the historic foundations of the etiology of maltreatment and how they have changed over the past three decades. The chapter then discusses the basics of prevention strategies and how they apply to child physical abuse. Specific models of prevention are highlighted, and the published data which supports them are presented. The chapter ends with a discussion of the future directions that the field of child abuse prevention needs to take and some of the obstacles which lay before it.

Theories on the Causation of Child Abuse

The combination of causes of phenomena is beyond the grasp of the human intellect. But the impulse to seek causes is innate in the soul of man. And the human intellect with no inkling of the immense variety and complexity of circumstances conditioning a phenomenon, any one of which may be separately conceived as the cause of it, snatches at the first and most easily understood approximation and says here is the cause (Leo Tolstoy 1899, War and Peace, Part XIII, Chap. I).

The circumstances which lead to child abuse are very complex. Factors include child, family, community, and cultural forces, as well as the interaction between them. Over the past 40–50 years, theories on the causation of child abuse have been developed, expanded, and tested. These theories attempt to distinguish conditions or forces which would increase the risk of child abuse. The ultimate goal of such study is the development of effective prevention approaches to reduce not just the incidence of abuse but the underlying factors. Theories are fit into a conceptual framework (or paradigms), which allows for testing and subsequent revision. Early theories on child abuse focused on two main paradigms: the *psychodynamic paradigm* and the *sociological paradigm* (Sidebotham 2001; Daro 1993). The *psychodynamic theory* relies upon identification and description of the psychological parameters of perpetrators as well as the psychological dynamics between the perpetrator and the victim. It takes into account the personal mindset of the individual (usually the mother) and attempts to define characteristics which might predispose a person to perpetrate child abuse. By defining these characteristics, individuals can be screened for risks and then targeted by interventions in prevention efforts. In contrast, the *sociological theory* emphasizes external forces which act upon a person (i.e., unemployment, poverty). Interventions directed toward these external forces then can be targeted in prevention efforts.

The psychodynamic and sociological theories are limiting in that they both oversimplify a very complex set of circumstances and forces which contribute to child abuse. While there may be individual characteristics that may predispose a person to committing child abuse, there are also often complex sociological forces which

compound individual weaknesses. The reverse may also be true, in that protective influences may be present as well. For example, poverty may be a significant risk factor for child abuse, but this may have less impact in one individual with protective factors, such as a close social network, than in another individual without.

A third theory, known as the e*nvironmental theory*, emphasizes the importance of the context of the child and family in the development of abusive behaviors. The theory proposes that if families had access to more and better resources, they would be less likely to engage in abusive behavior (Daro 1993). The prior three theories have been expanded in the development of a fourth, the *ecological theory* of the etiology of child abuse, as outlined separately by Uri Bronfenbrenner (1979) and Jay Belsky (1980). According to Bronfenbrenner (1979), the ecological theory of human development "involves the scientific study of the progressive, mutual accommodation between an active, growing human being and the changing properties of the immediate settings in which the developing person lives, as this process is affected by relations between these settings and by the larger contexts in which the settings are embedded." The ecological theory of the etiology of child abuse recognizes the complexity of child abuse and incorporates the individual, the family, the community, and the context into a more robust understanding of the forces involved. According to Belsky (1993), "child maltreatment is now widely recognized to be multiply determined by a variety of factors operating through transactional processes at various levels of analysis (i.e., life-course history to immediate–situational to historical–evolutionary) in the broad ecology of parent–child relations." *Individual* (or *child*) risk indicators include age (younger), gender (male), difficult temperament, and being medically fragile or complex. *Family*-level risk indicators include household violence (domestic violence, intimate partner violence), family stressors, and family size (rapid repeat pregnancies). *Community*-level risk indicators include poverty, crime, violence, and weak community infrastructure.

Belsky (1980) outlined four specific spheres, or domains, of influence on the life of a child: ontological development, microsystem, exosystem, and macrosystem.

- The ontological development domain refers to the parents' and family's personal background. Parental-level risk indicators include a parent having been raised in an abusive or neglectful family, having poor impulse control, participating in drug or alcohol use, or having psychiatric disorders (depression).
- The microsystem domain refers to the immediate household members and dynamics; any person with direct contact and interaction with the child and enlarges as the child grows to include schoolmates, friends, and neighbors.
- The exosystem includes the larger social network of the family and child. This includes parents' co-workers (if they are employed), neighborhood dynamics, and social contacts.
- The macrosystem includes cultural and societal forces. These include religious, political, and cultural beliefs, norms, and values.

Bronfenbrenner (1979) also includes the chronosystem, highlighting that each of these spheres of influence may change over time. The ecological theory can therefore be summarized as the influences affecting the individual child, his or her relationships, the community, and the larger society, with these influences changing over time. Each of these spheres of influence can potentially be leveraged in a child abuse prevention strategy. No single prevention approach is effective for all of the potential interactions. Effective child abuse prevention programs need to involve coordination of multiple approaches, influencing multiple factors. The ecological model changes the focus from individual characteristics to interactions between and among people.

Treating the neighborhood as a separate entity (with both its own risk and protective factors) reveals a new sphere of intervention. Neighborhood risk factors may include impoverishment, housing stress, childcare burden, unemployment, alcohol and drug availability, family structure, neighborhood density, social support, and immigrant concentration (Freisthler et al. 2006). The neighborhood poverty level is itself a risk factor for child abuse (Coulton 1995). How poverty places a child at risk for abuse is not completely understood; however, the correlation between poverty and child abuse was strongest with physical abuse and neglect and was independent of the individual family poverty score. There are also likely community-level factors, interfamily factors, and family-community interaction factors. Individual risk factors and community risk factors will be explored in more detail.

Individual-Level Risk Factors

How an individual person is bonded to his or her local community is often referred to as *social capital*. Although there are various definitions of social capital, the term generally refers to community resources which encourage cohesion and an individual's ability to navigate these resources (Ziersch 2005). Social capital is a way to quantify how engaged or enmeshed a person is with his or her community, i.e., how connected a person is to others. The greater a person's social capital, the lower their risk of being a neglectful parent and the lower the odds of committing domestic violence (Zolotor and Runyan 2006). Deficiency of social capital is also reflected in the lack of connectedness neglectful mothers feel with their community and how a neglectful family views its neighbors. In a study comparing neglectful mothers with their non-neglectful neighbors, differences in how neglectful mothers viewed their neighborhoods were identified. When compared with non-neglectful neighbors, neglectful mothers were more likely to describe their neighborhoods as unfriendly and their neighbors as unhelpful (Polansky et al. 1985). Additionally, neglectful mothers were more likely to describe themselves as lonelier than their non-neglectful neighbor mothers. Neglectful mothers were less likely to be affiliated with formal community organizations (e.g., churches) as well. This reflects the lack of connectedness neglectful mothers feel with their community.

Community-Level Risk Factors

Various neighborhood level factors have been identified as contributing to an increased aggregate risk of child maltreatment. These include "percentage living in poverty, percentage unemployed, percentage female-headed households, percentage living in overcrowded housing, percentage African-American, percentage Hispanic, percentage affluent (coded negatively), lower median educational attainment, and percentage resident less than 5 years" (Garbarino and Crouter 1978). In a multiple regression analysis, neighborhood child maltreatment rates involving these nine characteristics account for 79% of the variance (Garbarino and Crouter 1978) (i.e., knowing these nine variables could predict child maltreatment rates with 79% certainty). While social capital applies to a person, *community social organization* applies to the community. Community social organization refers to "patterns and functions of formal and informal networks and institutions and organizations in a locale" (Coulton 1995). This translates into a community's ability to provide protection and resources for residents in the community.

Despite neighborhood poverty being a risk factor for child maltreatment, poverty alone does not account for the risks of a neighborhood. Neighborhoods with similar socioeconomic status (SES) can have different child maltreatment rates (Garbarino and Kostelny 1992). A multiple regression model incorporating SES and demographic variables demonstrated that SES alone accounts for 48% of the variance (Garbarino and Sherman 1980). In other words, the SES accounts for only half of the factors in the relationship between neighborhood poverty and child abuse rates. This underscores the complexity of interactions that influence child maltreatment rates. Garbarino and Sherman (1980) compared two matched neighborhoods with similar SES but significantly different child maltreatment rates. The authors evaluated non-SES neighborhood factors that might account for the different child maltreatment rates between the two neighborhoods. Neighborhood "expert informants" (community and civic leaders) and random families with children were interviewed extensively. Analysis of the data revealed non-SES factors of "social impoverishment" in the neighborhood with higher rates of abuse. Among the statistically significant ($p < 0.5$) differences identified in the "low-risk" low SES neighborhood were fewer "latchkey" children, more neighborhood children as playmates, more people in the child's network (those who have an interest in the child's welfare, e.g., grandparent), more available childcare, and lower rates of self-reported stress (Garbarino and Sherman 1980). Additionally, families in the "high-risk" low SES neighborhood were statistically more likely to describe their own neighborhood as not a good place to raise a child. The authors argued that a neighborhood which is "high risk" for child maltreatment is not simply one with a low SES. A "high-risk" neighborhood has additional factors that make its child maltreatment rate higher than would be expected given the low SES. A likely component of a "high-risk" community will be resource disparity. The greater the difference between the "haves" and the "have-nots," the worse things are for children (Pickett and Wilkinson 2007). Countries with large Gini coefficients (a measure of inequality of income

distribution; a high Gini coefficient correlates to large inequalities) have higher rates of infant mortality as well as lower measures of child well-being (Collison 2007; Pickett and Wilkinson 2007). The United States has the highest Gini coefficient of all developed nations, indicating a large degree of resource disparity. The United States also has the highest level of children living in poverty among developed nations (UNICEF 2005). Analysis of national data from state CPS agency reports in the United States demonstrated that the Gini coefficient was linearly associated with child maltreatment rates (Eckenrode et al. 2014). Additionally, independent of household income or characteristics, people in states with greater income inequality have poorer reported health (Kennedy et al. 1998), including higher adjusted mortality rates for all causes (Kaplan et al. 1996).

Models of Prevention

The extent to which beliefs are based on evidence is very much less than believers suppose. Bertrand Russell, *Skeptical Essays* (1928).

The prevention of illness has been present in the medical writings since ancient times. In *A Regimen for Health*, Hippocrates wrote in 400 BCE of illness prevention through exercise and diet (Hippocrates 1983). Commonly, prevention models or interventions are divided into three, and sometimes four, categories. These categories depend on the target population and are conventionally designated as *primary*, *secondary*, and *tertiary* (and occasionally *primordial*) prevention (Coles 2008; Geeraert et al. 2004; Starfield 2001).

Primary prevention is directed toward unaffected, or pre-affected, populations (i.e., universal intervention). An example of primary prevention which is common in most developed countries is fluoridation of municipal water for the prevention of dental caries. All persons receive the same intervention (fluoride supplementation); there is no decision by the recipient to participate in the intervention.

Secondary prevention is directed toward an at-risk population; it is a targeted intervention. An example of this is the administration of daily penicillin to children with sickle cell disease for the prevention of bacterial sepsis. Only a specified cohort of at-risk children, those with sickle cell disease, receives the intervention, and there is voluntary participation in the intervention.

Tertiary prevention is directed toward those already affected. An example would be court-ordered drug treatment programs. Only a well-defined cohort of people (already exposed or victimized) receives the intervention, and there is coerced participation by those who receive the intervention. In child abuse prevention, a tertiary prevention strategy would be directed to victims or perpetrators.

Traditionally, prevention efforts have targeted a child or family, with limited attention to the neighborhood or community in which they live. As noted earlier, the neighborhood or community unit itself can be seen as "the client" for prevention efforts. A fourth category, *primordial* prevention, highlights the importance of the context in which a child, family, or community exists. Primordial prevention is

directed at changing social or public policy to reduce not only the disease but the risk factors for the disease. This is very much a *public health* approach to child abuse prevention. While not commonly employed, this strategy of prevention aligns well with the ecological model of child abuse and represents a promising future direction. It emphasizes the importance of the context in which a child, family, or community exists.

Evidence-Based Practice

As new strategies for child abuse prevention evolve, there is a growing emphasis both by state and federal funders upon the presumed or demonstrated quality of program evidence that supports a proposed intervention (Chaffin and Frederich 2004). The term evidence-based practice (EBP) has been increasingly included as a requirement for funding. Prevention programs are now often expected to have an evaluation and review process which provides a means of assessing the effectiveness of its intervention. The US Preventive Services Task Force (USPSTF) (Clinical Guidelines and Recommendations 2018)uses a grading system to stratify evidence obtained in clinical studies (US Department of Health and Human Services, US Preventative Task Force Procedure Manual 2008). The evidence levels help inform the strength of a recommendation for a particular intervention (Clinical Guidelines and Recommendations 2018). The levels of evidence and the recommendation categories are outlined in Tables 12.1 and 12.2.

The strongest level of evidence for an intervention is provided by a randomized controlled trial (RCT). Randomized controlled trials are robust, complex processes by which an intervention is compared to a control in a blinded fashion. Randomized controlled trials are complicated and expensive to execute well, and the results are often not available for years. Despite that, well-done RCTs that demonstrate effectiveness are nearly unassailable as strong evidence. There exist other study designs to demonstrate effectiveness that do not involve RCTs, but these methods

Table 12.1 US preventive services task force levels of evidence

Evidence level	Minimum source of evidence	
I	At least one randomized controlled study	
II	II-1	Well-designed controlled trials without randomization
	II-2	Well-designed cohort or case-control analytic studies
	II-3	Multiple time series with or without the intervention
III	From respected authorities, based on clinical experience, descriptive studies, or reports of expert committees	

Adapted from US Department of Health and Human Services. Agency for Healthcare Research and Quality. US Preventive Services Task Force http://www.ahrq.gov/clinic/uspstf/gradespre.htm#irec

Table 12.2 US preventive services task force recommendation grade

Grade	Definition
A	The USPSTF recommends the service. There is high certainty that the net benefit is substantial
B	The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial
C	The USPSTF recommends against routinely providing the service. There may be considerations that support providing the service in an individual patient. There is at least moderate certainty that the net benefit is small
D	The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits
I	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined

US Department of Health and Human Services. Agency for Healthcare and Research Quality. US Preventive Services Task Force http://ahrq.gov/clinic/pocketge08/gcp08app.htm

(case-control trial, pre-posttesting) are viewed as providing a weaker level of evidence, subject to bias and criticism.

The increasing emphasis on EBP highlights the lack of national standards in the implementation and quality assurance in prevention practices. This has resulted in states and communities implementing fragmented strategies of variable quality (Chaffin 2004). The quality and quantity of evidence behind a child abuse prevention program is often weaker than that which would be expected of most conventional medical interventions. Many programs and interventions are developed with good intentions and sound theories but have little reliable data demonstrating a significant decrease in child physical abuse rates. Such programs can be described as "promising" or "evidence-informed" (Chaffin and Frederich 2004) to highlight the missing strength of evidence.

Obstacles to Evidence

As noted earlier, a common obstacle for prevention studies is the defined endpoint. As there is no universal definitive diagnostic test for physical abuse in all cases, there exists much county-to-county, or jurisdiction-to-jurisdiction, variability in the substantiation of a child as a victim of physical abuse. Programs may not be able to generate convincing data as they are unable to compare "apples to apples." Often, prevention strategies use proxy measures (i.e., "parenting skills," "school readiness") instead of the endpoint (i.e., "child abuse"). While these measures may make it easier to demonstrate success, caution must be used. As noted above, child abuse represents a symptom of a complex family and community disease; it is unlikely that a single intervention, given in a uniform manner, would be effective in preventing all cases of child abuse. Similarly, different interventions are implemented by different people (home visitors, teachers, healthcare providers), and it is easy to see

that the same curriculum or particular model approach may be presented with subtle differences or variations in fidelity to the model. While it is important to rigorously scrutinize all supporting evidence for a program before endorsing it as a successful prevention strategy, care must be taken not to reject promising strategies prematurely simply because they may lack stronger evidence.

Cost Considerations

Increasingly, communities and policymakers examine cost as part of the decision to support prevention programs. Often budgetary constraints are a significant barrier to bringing to scale a program with limited effectiveness data. Many strategies may demonstrate a peak impact only years or decades later, and cost savings of initial outlay of resources may only be truly documentable in the life of the child as an adult. The initial outlays of resources may only result in cost savings 20 years later. Despite the potential for substantial benefit, funders may not give priority of dollars to a program which lacks immediate demonstrable fiscal benefit. If a successful intervention results in lower rates of vandalism or petty crime in 10–15 years, it may be difficult to correlate the absence of that negative directly to the specific program.

An example of the disconnect between financial support and a program with delayed benefits is home visitation. Early evaluation of home visitation as a child abuse prevention approach showed it to be cost-effective in various studies (Barnett 1993). Later evaluations likewise showed that home visitation remained a cost-effective intervention. This was substantiated in a report by the Washington State Institute for Public Policy (WSIPP) titled "Evidence-based Programs to Prevent Children from Entering and Remaining in the Child Welfare System: Benefits and Costs for Washington" (Lee et al. 2008). This report compared different evidence-based programs (from data published in the peer-reviewed literature) and how they impacted "likelihood of children entering and remaining in the child welfare system." Of the prevention programs included in the analysis, home visitation, specifically Nurse-Family Partnership (NFP), was shown to be cost beneficial with US$3.02 of benefit for every US$1 of cost. The cost analysis in the WSIPP report indicated that NFP cost US$8931 per participant, a cost which may dissuade a funder from supporting this model. The total benefit (a net benefit minus cost of US$18,054 per participant) may not be reaped for many years as manifested as lower expenditures by the community at large.

Another cost metric for the community is the *willing to pay* amount. This represents the amount a citizen would be willing to pay in additional taxes for a measurable decrease of a condition, such as a reduction of child abuse by 50% in the community. Another cost metric used is the *cost-effectiveness* of a program. This describes the outcomes in a way which can be compared to other interventions. If, for every US$100 spent on Prevention A, child maltreatment rates were lowered by 52%, but for every US$100 spent on Prevention B, child abuse rates were lowered

by 76%, then Prevention B would be more cost-effective. Alternatively, cost-effectiveness can be expressed in costs per episode of child abuse prevented.

Specific Models

We will now look at specific models and approaches to child physical abuse prevention. We will look at the theoretical foundation and the published evidence behind the each strategy. The goal is not to compare each approach to each other, but to highlight their strengths and weaknesses.

Home Visitation

One of the best-studied prevention interventions is in-home visitation. Visitation of a child and family by a professional in the family's home environment has been part of the medical and community infrastructure for generations. Many developed countries have free home visitation for all infants as part of the national health infrastructure. In Denmark, home visitation has been mandated by law since the late 1930s as a way to lower infant mortality. Home visitation continues to enjoy strong support, and indeed there has accumulated much evidence of its benefit in improvement of maternal and neonatal outcomes (Baqui et al. 2008). Home visitation as a specific child abuse prevention strategy was highlighted by C. Henry Kempe in the 1970s (Gray et al. 1966; Kempe 1976, 1978). It has since been endorsed by the American Academy of Pediatrics (1998). In 1977, the first issue of the seminal journal *Child Abuse and Neglect* contained the first RCT of home visitation for the prevention and identification of child abuse and neglect (Gray et al. 1977). In the United States, although home visitation by nurses has been shown to improve infant outcomes, it is often seen as too costly despite the WSIPP findings (Lee et al. 2008) and support by the Brookings Institute (Issacs 2008) and the RAND Corporation (Promising Practice Network 2008).

That first RCT of home visitation involved 100 mothers who were randomized to either an "intervene" group or a control group (Gray et al. 1977). The intervention was "comprehensive pediatric follow-up with a single physician, a lay health visitor, and/or a public health nurse in the home." After 2 years, five children in the control group were hospitalized for injuries "thought to be secondary to abnormal parenting practices," while none of the intervention group were admitted to the hospital. The authors sagely concluded that "the concept of early preventive pediatric and community intervention will, it is hoped, lead to progress in prevention of the harmful effects of child abuse and neglect."

Despite home visitation now having been recognized for three decades as preventing child abuse, little is known about precisely *why* it is successful. There are various models of home visitation, many with common themes. In most, the visits

occur in the child's home; the visits are initiated early in the child's life, ideally prenatally; and the visits need to occur with sufficient frequency and duration to make an impact.

Nurse–Family Partnership is a rigorous curriculum of nurse engagement with first-time pregnant mothers. The NFP curriculum, described as being both "theory-driven" and "research based" (Olds 2002), involves home visitation by trained nurses. The underlying hypotheses for NFP include the human ecology and the self-efficacy approaches, proposed by Bronfenbrenner, and Bandura and Bowlby's human attachment theory. The research base involves multiple published RCTs involving 2270 mother/baby dyads in three different locations. The NFP nurse visits the pregnant woman before the end of the second trimester and approximately every 2 weeks while she is pregnant. The nurse then visits the mother and child during the first 2 years of the infant's life, averaging over 20 postnatal visits. The NFP nurse curriculum emphasizes three domains: parental education on infant and child development, engaging the mother's social community in the care of the infant, and linking the family to community resources and services (Olds et al. 1986). In an RCT in 1986, in Elmira, New York, the NFP was shown to decrease the rates of child abuse in the target population (Olds et al. 1986). Although the rates did not reach conventional statistical significance ($p = 0.07$), there was compelling impact on the home-visited families. Additionally, visited families had fewer visits to the emergency department ($p = 0.04$) as well as longer inter-pregnancy intervals than those who were not visited. When the initial Elmira children were followed until adolescence (15 years), they were found to smoke less, drink less alcohol, have fewer lifetime sexual partners, have less drug use, and have fewer arrests (Olds 2000). Additionally, mothers of these children had longer inter-pregnancy intervals, less drug and alcohol use, fewer arrests, and, importantly, a lower rate of child abuse substantiation ($p < 0.001$) than those who were not visited (Olds et al. 1997). It was at this 15-year evaluation that the real child abuse prevention effects became apparent, supporting the argument that one has to view prevention in the long term. When evaluated 15 years after receiving NFP services, participant mothers were identified perpetrators of child abuse at a rate of 0.29, while control mothers had a rate of 0.54 ($p < 0.001$) (Olds et al. 1997). This meets USPSTF level of evidence I.

The NFP model was replicated in Memphis, Tennessee (Kitzman et al. 1997, 2000). The demographics of Memphis were very different from those of Elmira, and notably, the impact of the intervention was less. In the Memphis replication, of the common outcomes being reviewed across sites, benefits to the mother included increased inter-pregnancy intervals and lower poverty levels as measured by fewer on food stamps and more fathers employed. Child abuse rates are not reported. The NFP intervention was also implemented in Denver, Colorado, with similar results (Olds et al. 2004). The Denver replication project again showed longer inter-pregnancy intervals as well as improved home environments, but the impact on child abuse reduction was not reported. In addition to nurses, the Denver replication included a paraprofessional intervention arm. A paraprofessional was defined as "to have a high school education, no college preparation in the helping professions, and strong people skills." The results of the paraprofessional home visits were compa-

rable to the nurse home visits although the two groups were not explicitly compared. The major criticisms of the NFP model are the dependence upon BSN-level nurse visitors and the high costs associated, and the restriction of visitation to first-time mothers. However, these may also account for some of its success.

The first RCT of NFP outside of the United States was conducted in the Netherlands in 2007. A study of 460 first-time pregnant, low-resource women demonstrated a statistically significant decrease in CPS reports (19% vs. 11%, P = 0.04) by 3 years of age (Mejdoubi et al. 2015). In addition, at 24 months of age, children in the intervention group demonstrated a significant improvement in externalizing behaviors, without any improvement in internalizing behaviors.

A common debate regarding home visitation is whether strategies should be universal or targeted. While NFP has a well-defined target population and has been shown to be quite successful, there are data which favor a more universal approach (Guterman 1999).

Healthy Families America (HFA) is another home visitation intervention that has great acceptance in the United States but is not limited to first-time mothers (Daro and Harding 1999). Healthy Families America began in the early 1990s as an expansion of Hawaii's Healthy Start Program. Health Families America has a less rigorous curriculum than NFP and is based on 12 critical programmatic elements (Healthy Families America 2008). Healthy Families America uses social worker (paraprofessional) home visitors as contrasted with the nurses used in NFP. While there are promising supporting data regarding family functioning and parenting behaviors, there are limited data with regard to child abuse prevention (Duggan et al. 2007; DuMont 2008). The availability of HFA to families with multiple children, along with the variability in implementation of the intervention, may contribute to the modest success in prevention of child abuse. This is supported by data showing a protective effect of HFA on child abuse when the selected population matched those visited in the NFP model (DuMont 2008).

While there are differences between the NFP and HFA home visitation models, they have common themes: both endorse a high "dosage" of interventions (frequent and meaningful); both endorse the importance of the rapport between the visitor and the parent as crucial to the therapeutic effect; both endorse the importance of connecting the family to their community; and both endorse curricula with a foundation in effective parenting. Each home visitation model has identified the presence of domestic violence (intimate partner violence) in the household as an obstacle to its successes (Duggan et al. 2004; Eckenrode et al. 2000). Additionally, reports on both NFP and HFA highlight family attrition as a profound problem with a home visitation strategy (Gomby 2007; Olds et al. 1986). An additional obstacle to implementation of HFA in particular has been fidelity to the original model. Variable model fidelity has contributed to limited published evidence of HFA's decreasing child abuse rates (Duggan et al. 2004, 2007). Healthy Families America meets USPSTF level of evidence II-1.

Another home visitation program that shows promising results is the Early Start (ES) program from New Zealand (Fergusson 2005). The ES program is a research-based home-visitation service whose critical elements include "(1) assessment of

family needs, issues, challenges, strengths, and resources; (2) development of a positive partnership between the family support worker and client; (3) collaborative problem solving to devise solutions to family challenges; (4) the provision of support, mentoring, and advice to assist client families to mobilize their strengths and resources; and (5) involvement with the family throughout the child's preschool years" (Fergusson 2005). Each enrolled family receives 36 months of home visitation delivered by either nurses or social workers. Results from an RCT (n = 443 families) showed decreases in parental abusive behaviors (improved Conflict Tactic Scale scores) in visited families. Additionally, children who were visited had greater contact with their medical homes and fewer emergency department visits and remained in preschool longer. No difference in child protection agency contacts between the two groups was demonstrated (Fergusson 2005). This meets USPSFT level of evidence III. The authors highlighted the similarities between the ES and NFP models but did note differences; all delivering families are screened for risks by a nurse within 3 months of birth, enrollment was not restricted to first-time mothers, and services are delivered by both nurses and paraprofessionals.

While most prevention strategies emphasize primary (universal) or secondary (targeted) strategies, tertiary prevention programs (recidivism prevention) present novel challenges. The targets of these interventions have demonstrated a propensity to abuse and are thus likely to have behaviors that would be a challenge to impact. One intervention that has very promising results in child abuse recidivism prevention is Project SafeCare (Gershater-Molko et al. 2002). Project SafeCare is an intensive, 24-week, in-home parent training program that focuses on three major domains: (1) basic child health, (2) positive parent–child interaction, and (3) home safety. A comparison trial involving 82 families (41 in Project SafeCare and 41 receiving Family Preservation Services) with substantiated abuse resulted in, at 36 months, the Project SafeCare families having a 15% recidivism rate while Family Preservation Services (routine CPS response to substantiated abuse) had a recidivism rate of 46% ($p < 0.001$) (Gershater-Molko et al. 2002). This meets USPSTF level of evidence II-1.

Child–Parent Centers

While home visitation as an intervention has a strong body of supporting literature, there are non-home visitation interventions which also bear consideration. Closely tied with child abuse prevention is school preparedness and educational support. Conditions which hinder development and education are similar to those which are risks for child abuse. The Chicago Longitudinal Study (CLS) (2008) is a federally funded, cohort study, tracking 1500 low-income children in Chicago. The CLS afforded the opportunity to evaluate the Chicago Child–Parent Centers (CPCs) for their impact on child abuse rates. The CPCs are community center-based interventions which tie school preparedness with family strengthening and health monitoring services. Child–Parent Centers provide an environment for parents, mostly

single and unemployed, to bring their children for education while they receive support and resources. The program begins at age 3 and continues throughout preschool up to grade 3. The CPC model has been shown to decrease substantiated reports of child abuse for participant families by 52% (Reynolds et al. 2003). This meets USPSTF level of evidence II-2.

Additionally, children in participant families had improved scholastic readiness, higher rates of completing high school, and lower rates of juvenile delinquency and arrests, all statistically significant differences from a control matched cohort group. The CPC model has also been shown to be cost saving for the community (Lee et al. 2008; Reynolds et al. 2003). The initial costs of US$6692 per child for 18 months of school resulted in US$47,759 of return per child to society by age 21 years. This translates to a US$7.14 return for each US$1 invested in the CPC.

In-Hospital Parental Education

Another prevention strategy, in-hospital education, has gained support, particularly after a report published by Dias, Backstrom, Falk, and Li (2005). The report was of a regional parental education program administered to all eight hospitals with maternity services in western New York State. The parents of all newborns were provided information on the dangers of violent infant shaking and alternatives to soothing a crying infant and were asked to sign a "commitment statement" after completion. The authors indicated that over 5.5 years, 69% (65,205 of 94,409) of all births in the region had signed commitment statements. They reported a 47% decrease in the incidence of abusive head injury in the catchment area. In the 6 years prior to the intervention, the case rate in the region was 41.5 cases per 100,000 births. In the 5 years after the intervention, the case rate was 22.2 per 100,000 births. While this was not an RCT, the authors reported that in the same time interval, the case rate in Pennsylvania, which is geographically proximate, remained unchanged. Such dramatic results are striking, but the intervention has not been duplicated as of yet. This meets USPSTF level of evidence II-3.

Community-Based Initiatives

Often missing from many child abuse prevention initiatives is a community engagement component. DePanfilis and Dubowitz (2005) described a community-based intervention called Family Connections (FC) implemented in Baltimore to combat child neglect. Family Connections "is a multifaceted, community-based service program that works with families in their homes and in the context of their neighborhoods to help them meet the basic needs of their children and reduce the risk of child neglect" (DePanfilis and Dubowitz 2005). Families referred to FC were offered four core components: emergency assistance, home-based family

intervention, referral services coordination, and supportive recreational activities. Emergency assistance addressed immediate food, shelter, and safety needs. Home-based family intervention consisted of in-home assessments and tailored service plans. Service coordination provided integration of various social services involved with a family to maximize benefit. Multifamily supportive recreational activities were free-of-charge quarterly outings (e.g., museums, boat rides) for families. Despite poor compliance in the program by enrolled families, a 3-month intervention resulted in improved protective factors and diminished risk factors for participant families. Although substantiated child abuse rates were unchanged in the participant families, FC remains a promising adjunct intervention (California Evidence-Based Clearing House for Child Welfare 2008). This meets USPSTF level of evidence III.

Another promising community-based intervention is the Positive Parenting Program ("The Triple P") (Sanders et al. 2003). The Triple P is a tiered, population-based intervention with the goals of enhancing parenting skills, promoting healthy environments for children to grow up in, and promoting children's development through positive parenting practices. This is done through a tiered approach based upon the specific family strengths and risks (Prinz et al. 2009). The first tier (level 1), *Universal Triple P*, is a media campaign involving radio, television, direct mailings, and Internet sources. The information pertains to positive parenting strategies in an attempt to destigmatize seeking assistance for parenting challenges. The second tier (level 2), *Selected Triple P*, consists of individual parental consultations and group parenting seminars. The content is general parental education and anticipatory guidance. The third tier (level 3), *Primary Care Triple P*, consists of enhanced parental consultations around specific behavioral management difficulties. The fourth tier (level 4), *Standard and Group Triple P*, consists of delivery of specific skills training to parents, either in individual or group settings. The fifth tier (level 5), *Enhanced Triple P*, consists of intensive individualized child–parent intervention and can include other interpersonal management domains (stress, partner communication). The Triple P has shown positive child behavioral and family functioning data (California Evidence-Based Clearing House for Child Welfare and University of Queensland) demonstrating improved parenting practices to recipients. The Triple P does not have data showing participant families having lower child abuse rates than nonparticipant families, but in a novel approach, Prinz et al. (2009) randomized matched counties to receive either The Triple P or routine care. The authors found that in their RCT, counties that received Triple P had lower rates of substantiated child maltreatment, lower rates of child out-of-home placements, and fewer hospitalizations or emergency department visits for child abuse injuries. In treating the county as the target for their intervention, the authors could not show specific families having a lower risk of child abuse, but in aggregate, communities as a whole had a lower risk. The Triple P meets USPSTF level of evidence I.

Other promising community-based interventions are the Sure Start local programmes (SSLPs) (Melhuish et al. 2008). Sure Start local programmes (or "Sure Start") (2009) are regional programs in the United Kingdom which are "area based" and target the lowest 20% of the most deprived regions in England. The services

offered at local centers include early education and childcare, parenting support, child and family health and medical services, and job training for parents. Over 2500 centers in the United Kingdom were offering services to 2.3 million children and families (Sure Start 2009). Melhuish's study of SSLPs, which compared similarly deprived regions without an SSLP, revealed modest improvements in parenting behaviors, improved home learning environment, and improved social development in the children (Melhuish et al. 2008). While not directly a child abuse prevention initiative, the Sure Start model is an example of broad-ranging services which are imbedded in communities, with a stated goal to increase "the availability of childcare for all children," to improve "health and emotional development for young children," and to support "parents as parents and in their aspirations toward employment" (Sure Start 2009).

Other Strategies

While the pediatrician's office would seem to be a natural site for prevention services, financial and time constraints have made office-based strategies impractical. The Safe Environment for Every Kid (SEEK) model of in-office parent support and abuse prevention (Dubowitz et al. 2009) has generated some promising preliminary data. The SEEK model involves specific physician training, dedicated parental resources, a screening questionnaire, and a dedicated SEEK social worker. In a cluster RCT in a pediatric resident continuity clinic, SEEK resulted in fewer CPS reports involving participant families ($p = 0.03$) (Dubowitz et al. 2009). The USPSTF noted the SEEK model as the only strategy which is promising if deployed in the primary care setting (Selph et al. 2013).

As noted earlier, infant crying is a commonly reported trigger for caregiver assault on a young child. A commonly explored strategy is to attempt to normalize the crying of infant colic and to provide education for parents on how to decrease their stress response to it. One of the most highly visible programs is The Period of PURPLE Crying (PURPLE). Developed by the National Center on Shaken Baby Syndrome, PURPLE is a parental educational booklet and a 10-min DVD intended to increase parental knowledge of infant crying (Runayn et al. 2009). Two RCTs demonstrated that parental education increased significantly as a result of receiving the PURPLE program (Barr et al. 2009a, b). While these results are promising, two large-scale, statewide implementation studies failed to demonstrate any improvement in rates of AHT (Dias et al. 2017; Zolotor et al. 2015). While these large studies did not have a comparison group, given the complexity of the root causes of child physical abuse, it is unlikely an educational strategy alone will meaningfully impact population rates.

Another commonly utilized prevention strategy is group-based intervention. This model is common in medical practice as new parent classes or support groups for people with a specific condition or disease. Such interventions are typically offered to prospective or current parents as a prevention strategy to ensure parents

have the skills to care for their children. Group-based interventions include parenting classes focusing on discipline techniques and anger management classes. These are often court mandated or part of a constellation of services offered to at-risk parents. There are limited data on the efficacy of group-based child abuse prevention strategies. While they may be part of a larger strategy, their effectiveness as a unique intervention is only speculative.

Often, prevention strategies include a public awareness component. There is little evidence that public awareness initiatives prevent abuse in and of themselves (Daro and McCurdy 2007), but they can be quite effective as part of a larger community or regional effort (as shown in The Triple P above). Internet, radio, and television commercials emphasizing "Don't Shake Your Baby" may be ineffective, but when tied to a larger educational initiative including medical, educational, and civic threads could provide a platform for discussions in neighborhoods, supermarkets, schools, community centers, and medical provider offices. A large parental education program (n = 15,708) which disseminated educational materials to new mothers in a maternity ward on the dangers of shaking infants had a 21% (3293) response rate (Showers 1992). Forty-nine percent of respondents indicated that they were less likely to shake their babies after reviewing the materials. While this shows that large-scale, population education is feasible, whether this alone translates into sustained, altered parental behavior is unknown.

Expanding the Current Models and Theories

Child abuse prevention now has over four decades of study and practice and as past theories and strategies have undergone evolution, our current theories and practices will undoubtedly look different in another four decades. This section will discuss how the current models and theories will likely be expanded beyond child physical abuse, into a more including child well-being approach.

Most child abuse prevention efforts are "program centered." This term highlights the fact that a specific program, curriculum, or intervention is used toward a specific target, usually a child or family. While primary, secondary, and tertiary structure is a simple means to communicate about the target(s) of a specific program, the models of the etiology of child abuse have evolved and so have the prevention strategies. Efforts in prevention traditionally have been limited in scope (i.e., a specific age range or time of life), are either universal or targeted (e.g., first-time mothers), and are focused on changing a specific person's behaviors or attitudes (i.e., regarding spanking). The evolution of prevention has seen the movement away from site-specific programs toward expansion of community-based collaborations. The designations of primary, secondary, and tertiary can now seem artificial in practice. A child abuse prevention strategy can touch more than one domain or may be primary or secondary depending upon the target or the time in their life. To move beyond the current "*primary*, *secondary*, *tertiary*" convention is to make the theory or models of prevention more fluid. An alternative paradigm for child abuse prevention would

be to place an intervention along the continuum of timing of abuse. In this way, interventions can be seen as either "proactive" or "reactive" to child abuse. This horizontal intervention axis can be vertically expanded by incorporating the target, starting at the individual level and expanding to encompass an entire community. Prevention can then be thought of along a continuum of individual to community and proactive to reactive (Prilleltensky 2005). Figure 12.1 gives one example of how an alternative paradigm of prevention could be represented.

Complexity in the causes of child abuse necessitates flexibility in approaches to prevention. A comprehensive prevention effort needs to include components addressing the child, the family, the community, and society at large, in various ways, at various stages of the child's life, and for various durations. Simply "buying" a program (no matter how effective) to roll out in a uniform manner may show short-term gains, but substantial and sustained improvements in child well-being will likely be lacking. For example, implementing an effective home visitation program may touch the lives of those visited children and families, but it is likely to leave the community as a whole unaffected. Similarly, global early-education and pre-kindergarten support impacts those who attend, but those who don't remain untouched. Implementing prevention requires integrating programs into "strategies" or "approaches." Taking a more expansive view of child abuse prevention allows for inclusion of interventions or strategies which impact child abuse rates but are not conventionally viewed as child abuse prevention. This is best expressed with some of the concepts and language of *community psychology*.

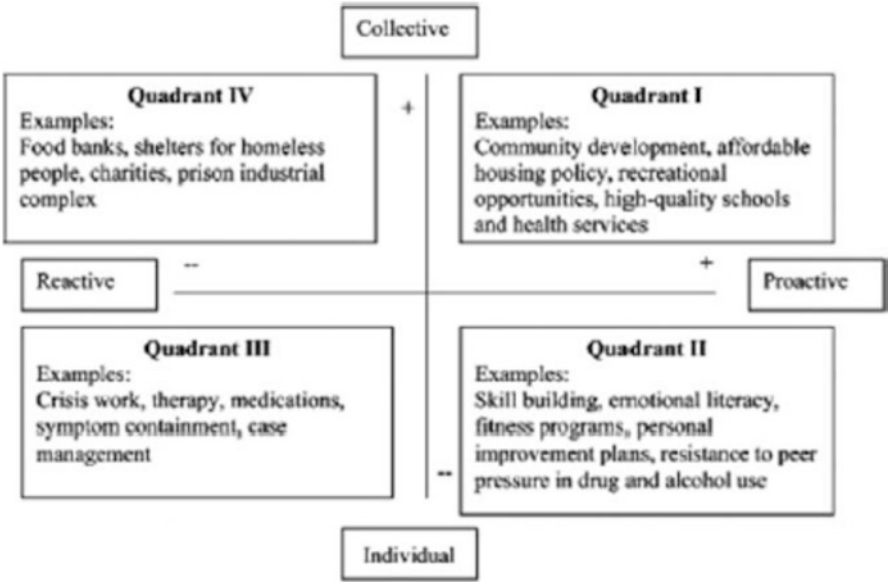

Fig. 12.1 Representation of alternative prevention paradigm. (Printed with permission from Prilleltensky 2005)

Understanding the ecology of a neighborhood is often integral to understanding an individual child's risk for maltreatment. A "sick" neighborhood is a risk to a child and family and manifests its "illness" in a variety of ways. An example is the *broken window theory*. Initially described by Wilson and Kelling (1982), the broken window theory describes the manifestation of social disorder or dysfunction. Broken windows are included in a list of other manifestations of social strife, gangs, loitering, street violence, and petty crime. Social dysfunction is manifest in the physical structure of a community in the form of potholes in the roads, broken-down cars, litter, and broken windows. A regression study of 177 census tracts for Cleveland, Ohio, identified three independent variables which explained 78% of the variance in child maltreatment rates (Coulton 1995). These three factors were *impoverishment* (poverty rate, unemployment rate, vacant housing rate, and population loss), *childcare burden* (ratio of children to adults, ratio of males to females, and percent population that is elderly), and *instability* (proportion of residents who have changed houses within 5 years, proportion of households who have lived in their current home over 10 years, and percent of households who have lived in their current household less than 1 year). The *impoverishment* variable had the greatest effect (coefficient = 11.52, $p = 0.00$), followed by *childcare burden* (4.21, $p = 0.00$) and *instability* (2.76, $p = 0.03$).

Reconceptualizing Child Maltreatment and Community Intervention

Reconceptualizing child maltreatment as a manifestation of community despair requires thinking of it not as a disease in itself but as a symptom. To cure the illness requires focus on the underlying disease and not the symptoms alone. In this way, for example, a strategy to improve access to affordable childcare could easily be incorporated into a child abuse prevention initiative. Sustainable child abuse prevention requires engagement with a community or neighborhood to create a new social norm to change "how things are done."

Community intervention can be seen as either *ameliorative* or as *transformative*. Ameliorative interventions aim to promote immediate well-being, while transformative interventions strive to fundamentally change the power structures in a community (to "change the culture") (Nelson and Prilleltensky 2005; Prilleltensky, August 2008, personal communication; Prilleltensky and Prilleltensky 2006). Ameliorative interventions address technical and operational processes. They address practical immediate needs. The emphasis is on enhancing protective, strengths-based factors in a community. Transformative interventions address power dynamics and inequalities. The emphasis is on reduction of risk factors in a community ("treat the disease") (Nelson and Prilleltensky 2005). Both ameliorative and transformative community interventions are often necessary. For example, in addressing the problem of homelessness in a community, it is vital to house and clothe those who live on the street, but it is also important to combat the forces that resulted in their homelessness. In response to child abuse, ameliorative interven-

tions would, for example, provide parenting classes or psychosocial counseling and support with the goal of improved parenting competence and enhanced psychological stability. Transformative prevention interventions, on the other hand, might address parental poverty and social connectedness with the goal of reduction in resource disparity and social isolation. An example of the blending of ameliorative and transformative prevention themes into a combined approach is the Strong Communities for Children initiative, based in Greenville, South Carolina (Clemson University 2008; Kimbrough-Melton and Campbell 2008). This effort is directed by the US Advisory Board on Child Abuse and Neglect and engages churches, businesses, volunteer groups, and community and civic organizations, bringing together 4500 volunteers to provide universal assistance to all families of young children in their community (Clemson University 2008). The services provided range from simple neighborly check-ins to parenting classes and financial counseling. The goal of these ameliorative activities is to effect a larger transformative community change in how children are valued. The Strong Communities for Children initiative required a substantial initial outlay of resources, with yearly support by the Duke Endowment of US$1.65 million per year, with the ultimate goal of integration into a permanent change in the day-to-day life in the community. While theory-based, and likely improving child well-being, there are no published data on the Strong Communities for Children initiative's impact on child abuse rates specifically.

Modifications of the physical environment are another way for a community to participate in child abuse prevention (Mair and Mair 2003). One of the best examples of the impact of environmental modifications on public health is the case of Dr. John Snow and the London cholera epidemic of 1854 (McLeod 2000). Dr. Snow, a physician in the Soho District of London, noted a proximal relationship between the Broad Street water pump and clustering of infected patients during a cholera outbreak. Even prior to the recognition of *Vibrio cholerae* as the causative agent, the pump handle was removed and the cases of cholera plummeted. Thus, a modification to the environment, removal of a tainted water source, resulted in a cessation of disease. In this way, an intervention can reduce the opportunity for child abuse without directly affecting the motivation.

The *crime pattern theory* describes how routine activities can expose opportunity for crimes. Changing that pattern of activity could result in lower crime due to fewer passive crimes. An example of this is designing subway stations with high-arched ceilings, few support columns, and no public restrooms in order to limit loitering and places to hide. This is called *situational crime prevention* (Clarke 1997). An analogous example is the relationship between neighborhood alcohol outlets and child abuse. Neighborhood data show that the rates of both reported and substantiated CPS referrals in a neighborhood are correlated to the number of alcohol outlets in the zip code (Freisthler 2007). By targeting alcohol outlets, specifically off-premise outlets (i.e., liquor stores), the prevention strategy affects the physical environment as a way to prevent child abuse. While this could be viewed as being primary prevention, it is more appropriate to see this as changing the context in which the child and family lives (or *proactive/collective*, Fig. 12.1). *Situational crime prevention* and *broken window theory* both address the same underlying cause, a cycle of community disengagement by the residents. People who live in a

community in chaos are less likely to engage in the daily life of the community (sit outside in the summer, go for a walk around the block); the absence of community eyes allows passive vandalism to occur and worsen (broken windows, graffiti); crime and dysfunction increases (gangs, muggings); and increasing crime keeps people inside their houses. Community environmental interventions can include redirected traffic flow, improved street lights, increased personal home ownership, streets that blend housing and businesses to increase foot traffic, and redesigned public transportation facilities (Mair and Mair 2003).

Critical for the success of any comprehensive prevention strategy is its direct integration into existing community and public policy structures. All babies born in a hospital have contact with a medical provider. This provides a tremendous opportunity to either intervene or aid a family which may have needs in caring for the newborn baby. Teachers represent the most common reporter of child abuse in the United States (US Department of Health and Human Services 2008). With the advent of mandated education in 1903, nearly all children in the United States have a teacher in their lives. Doctors and teachers are two of the many people who have an interest in the child's well-being; both can be a critical protective factor (Garbarino and Sherman 1980). A larger community-wide prevention strategy should involve a variety of approaches (primary, secondary, tertiary; proactive, reactive, individual, universal) with various levels of evidence for their success.

The ACE study (www.acestudy.org) noted earlier supports the notion that the context in which a child lives has a long-lasting impact on society. Children exposed to violence (either as victims or witnesses) have a greater risk of negative health behaviors as an adult, including an increased risk of alcoholism, drug use, early teen pregnancy, suicide attempts, and sexually transmitted infections (Middlebrooks and Audage 2008). The notion of child abuse prevention as a single intervention or program constrains the need for substantive, meaningful improvement in childhood well-being. What is viewed as child abuse prevention should be expanded to include the basics of a healthy childhood. This includes access to healthcare, mental health services (for both the child and the family), education, job training, and financial services, to name a few. The Institute of Medicine (IOM) report *Children's Health a Nation's Wealth* defines children's health broadly as including not just health conditions but child functioning and the health potential as well (National Research Council and Institute of Medicine 2004). The report highlights the importance of impacting the trajectory of a child's life by cultivating multiple difference domains: policy, services, social environment, biology, behavior, and physical environment.

Emphasis on the long view is imperative. While policymakers, pundits, and apologists may focus on programs and interventions, the long view is to seek and accomplish progress and evolution. And, while programs and interventions may contribute to a greater evolution of our communities and society, we have to be prepared as a society to accept that they may often lack immediate payoff. The effects of various programs and interventions, when taken as a whole, may bear fruit in decades in the demonstrable with improvement in the lives of children. This is best seen with the NFP 15-year review of the Elmira trial (Olds et al. 1997). While the initial, 2-year evaluation was promising, after 15 years the results were quite striking. If decisions

to embrace NFP were made solely after the 2-year results, the model may not have been as strongly endorsed.

Future Directions

> … it is difficult to imagine that major strides can be made in the battle to prevent, much less remediate, child maltreatment so long as impoverished women, particularly those who are young, are rearing multiple and closely spaced offspring on their own, without sufficient social supports, or both. This observation suggests that fertility planning, education, employment, and economic assistance will be required if serious progress is to be made in the battle to prevent child maltreatment. (Belsky 1993)

The future of child abuse prevention efforts will depend on development of crucial infrastructure throughout all levels of human interface. This will include better data collection and management, more rigorous evaluation of interventions, improved collaboration between governmental agencies as well as between governmental and community agencies, and better understanding of how a person or family functions in a community.

The public health model of prevention (universal, prior to "outbreak") has demonstrated enormous improvements in population health (e.g., sanitation, vaccination). That same model of prevention—getting at the root cause—is likely to result in the most sustainable advances for child abuse prevention as well (O'Donnell et al. 2008). As noted earlier, a major obstacle in child abuse prevention research has been the differing definitions of child abuse which researchers and agencies use (Whitaker et al. 2005). An additional obstacle is the limited regional or national communication infrastructure for prevention activities. Currently, the National Child Abuse and Neglect Data System (NCANDS) collects data from states' Children Protective Services. These data are used mainly for tracking purposes. There exists no similar national tracking system for prevention efforts. An important step toward understanding the complexity of child abuse prevention is an increase in regional and national collection coordination. To compliment a more rigorous data collection effort, a systematic distribution process needs to be created. The current dissemination system involves data publication in peer-reviewed journals. While our matrix of prevention efforts expands to include other well-being indicators, other local data (pollution, crime, sanitation, food security, and poverty) should likewise be tracked. Prevention initiatives, when brought to scale, are going to be confronted with the complex nature of the forces in a child's life. These initiatives are going to have to be tailored to the child or community. If communities are seen as organisms themselves, tailored interventions can be prescribed to address specific needs. As the community's health improves, then the lives of all its constituents, and thus those of children, will improve.

One example of the impact of broadly applied public health strategies on child maltreatment is the impact of changes to the paid family leave (PFL) policies on hospitalizations or abusive head trauma (AHT). Abusive head trauma, a form of child

physical abuse formerly known as shaken baby syndrome, is when a caregiver violently handles, shakes, or slams a young infant or child. The violent treatment is usually associated with caregiver stress or distress. Klevens and colleagues reported on the impact of California's 2004 change to the PFL policies on hospitalizations for AHT (Klevens et al. 2016). They reported that after the change in the state policy there was an associated decrease in hospitalizations for AHT for children under 2 years of age, as compared with similar states that did not change their PFL policies.

Despite great enthusiasm for home visitation, NFP in particular, caution should precede wholesale endorsement. There is still much unknown about home visitation. What is the optimal dose? What is the optimal curriculum? Who are the optimal targets? Most important, why does it work? Home visitation is not a silver bullet for child abuse, is not simply "the" answer, and therefore is best part of a larger strategy. Unrestrained support for home visitation has resulted in variable success. This unchecked implementation was seen in the 1990s with the dissemination of HFA programs in the United States. Currently, while HFA is a very valuable prevention program, with programs in over 35 states (Healthy Families America 2008), there is no central infrastructure for data collection or dissemination. Much could have been learned about HFA and home visitation in general, if a national strategy for implementation had been in place at the outset.

How individual or family risk factors interface with community strengths and weaknesses remains mostly unknown. As seen in the NFP replication in Memphis, the population chosen was fairly similar (young, mostly single, first-time mothers), but the impact of NFP was much different in this population. The reason behind this is unclear. Rigorous study of the process of home visitation will contribute to a better understanding of the dynamics between children, families, and their communities.

Another future goal is the improvement in understanding how to move theory into practice and to translate effective pilot programs into effective community interventions. There is a large gap in the understanding of how to interface effectively with communities (Ohmer and Korr 2006). Future initiatives may have to look very different than they currently do. Likely, the future will include dynamic collaborations between academia, state or local governments, and community and not-for-profit stakeholders. An example of how this could be constructed is the Saskatchewan Population Health and Evaluation Research Unit (SPHERU) (Mahajarine et al. 2006). The SPHERU framework blends public policy and research to evaluate interventions and policies which affect the child's well-being. There are two central concepts: (1) interactions of people in communities can produce measurable health outcomes; and (2) these outcomes are affected by overlapping hierarchies of global, state, neighborhood, family, and individual forces. The framework for the SPHERU model includes research that (1) is based on various study models and data sources and (2) is nested in and engages the community.

Lastly, child abuse prevention services are often located in a single governmental department. The complexity of the causes of child abuse no longer can be constrained to the purview of a single departmental domain. For future success, governmental agencies will require greater coordination to effectively address child abuse. This was highlighted in the United Kingdom with the publication of the

Every Child Matters Green Paper (Every Child Matters 2003a). One of the cornerstones of the *Every Child Matters Green Paper* was "child protection cannot be separated from policies to improve children's lives as a whole. We need to focus both on the universal services which every child uses, and on more targeted services for those with additional needs" (Every Child Matters 2003b). The *Every Child Matters Green Paper* was commissioned by then Prime Minister Tony Blair and published in response to the abuse and murder of 8-year-old Victoria Climbié (Wikipedia 2008). The public and political discussion resulted in the Children Act 2004. This act required local authorities to develop integrated multiagency Children's Trusts which function under the "duty to cooperate." The "duty to cooperate" provided the legal support for overcoming any interagency barriers.

Summary

As the understanding of the etiology of child abuse improves, its complexity increases as well. No longer is it simply bad, sick, or evil people beating their children. Now there is a complex web of influences which protect a child from, or place them at risk of, abuse. These influences range from the child, through the family, into the community, and reach society at large. Each of these spheres of influence changes over the life of the child. The changing understanding of why child abuse occurs has been mirrored in a change in approaches to its prevention.

Child abuse prevention began as the identification of "bad" parents and simply watching them more closely. The current themes in child abuse prevention involve mental health, community psychology, social marketing, and public policy. As the "targets" of child abuse prevention are now varied (infants, parents, neighborhoods, policies), there is an increasing emphasis on cohesive, broad strategies as opposed to monolithic program implementation. One of the cornerstones to successful child abuse prevention strategies is the reliance of methodologically sound evidence for support. Many programs may "sound" like they should work, but without rigorous programmatic and process evaluation, they may in fact be dangerous by inhibiting true progress. We cannot spend our time tilting at windmills. There are real giants to joust.

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Chapter 13
Child Maltreatment and Sports Activities

Angelo P. Giardino

Introduction

> Sport is …a social or cultural institution…and, thus, falls under the terms of institutional child abuse and protection … it is similar to other social institutions, such as religion (with its churches or mosques, for example) or education (with schools and colleges)… just as organised religion and education have had to implement child protection, sport has also had to come to terms with abuse and abusers in its ranks and with ways of preventing and responding to such problems. (Brackenridge and Rhind 2014, p. 327)

As the quote above indicates, there is a risk for child maltreatment and victimization to occur in sports and athletic activities. Increasingly, professionals and the public are recognizing the very real risk for child maltreatment and other forms of victimization such as peer abuse (i.e., bullying) to occur in a range of youth-serving agencies which include sports teams, churches, and schools (LaBotz et al. 2018; Shattuck et al. 2016). As testament to this increased awareness, especially as it relates to sexual victimization, the US Centers for Disease Control and Prevention (CDC) in 2007 issued an authoritative guide titled "Preventing Child Sexual Abuse Within Youth-serving Organizations: Getting Started on Policies and Procedures" (Saul and Audage 2007). The release of this CDC report provided guidance to professionals working on how best to implement systematic practices directed at preventing one type of maltreatment: sexual abuse. However, many of the policies and procedures are applicable to other forms of maltreatment and victimization as well:

> Youth-serving organizations strive to create a safe environment for youth, employees, and volunteers so that youth can grow, learn, and have fun. Part of creating a safe environment is making sure that youth are not harmed in any way while participating in organization-sponsored activities. (p. 1)

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On the international front, also in 2007, the United Nations International Children's Emergency Fund (UNICEF), recognizing the gap in calls for safety in organized sport, developed a strategy and proposed protective measures for enhancing child safety in sport, which included (Brackenridge and Rhind 2014, pp. 330–331):

- Strengthening child protection systems around and within sport organizations.
- Increasing awareness and strengthening the protective role of parents, teachers, coaches and other caregivers, as well as the media.
- Developing and implementing standards for the protection and Well-being of child athletes.
- Implementing sport for development and other international programs and initiatives.
- Improving data collection and research to develop an evidence base.

The ever-increasing recognition of the risk for maltreatment and victimization in sports has led to calls for identification of the risk, response to actual maltreatment and victimization, and, importantly, urgently needed prevention efforts that establish safe environments for children and adolescents who participate in sporting activities. Daniels (2017), whose unique role as an independent investigator in the US context will be described later in this chapter, frames the risk for maltreatment and victimization in youth-serving organizations as follows (primarily around sexual abuse but, as with the CDC resource above, largely applicable to other forms of abuse):

> Organizations that serve children have long been aware that, while most adults who wish to work in their environment are well-meaning and have only the best interests of the children at heart, there is a danger of child sexual predators gaining access to children through employment or volunteer service with such an organization. For that reason, myriad entities, from schools to recreational clubs to scouting organizations, perform criminal background checks on the people they consider for paid and volunteer positions. Many states, in fact, require criminal background checks in relation to certain areas of work for precisely this reason. However, only a very small percentage of predators has been convicted of a crime or listed on a sex offender registry, so while the background check is essential, it is not a failsafe. Thus, employers do their best to check references as well; and they are well aware of the need for vigilance in both their hiring and management processes. (p. 10)

This chapter will address the emerging professional literature related to the risk of child maltreatment and peer abuse in organized sporting activities, defined by Alexander et al. (2011, p. 5) as being "…sport that is voluntary, takes place outside of school hours and includes an element of training or instruction by an adult." While the risk and reality of sexual abuse command a great deal of lay and professional attention, and rightly so, there is an increasing recognition of other forms of abuse and victimization in organized sports. This chapter will discuss the risk of sexual victimization and will also explore the risk of physical abuse and peer victimization in organized sporting activities as well.

International Context and Background

Conceptual

Attention is increasing on the safety and well-being of children involved in organized sporting activities in the international community (Mountjoy et al. 2016; David 2005; Brackenridge 2001). In general, organized sporting activities are viewed as having many potential positive effects for children who participate. Drawing upon the work of Brackenridge and Rhind (2014), many organizations, recognizing the potential positive effects from organized sporting activities, have adopted sports-related programs as a component of their outreach to children and adolescents. Sports are seen as a potentially useful activity to focus on the health and well-being of the child athlete, and in the realm of international development agencies, sports can be part of such diverse efforts as peace building and disaster recovery in addition to general outreach (Brackenridge and Rhind 2014). These efforts tend to focus more on the human development aspect of sport and typically focus less intently on the performance during the sport. This broad approach is referred to as the "sport for development" movement, or S4D (Brackenridge and Rhind 2014, p. 331):

> An S4D project is defined as any initiative, project, programme, multi-stakeholder initiative, campaign or other activity that uses sport as a tool to reach development or humanitarian objectives… By definition, therefore, the humanitarian objectives of S4D programmes trump the sport development ones.

Figure 13.1 captures the conceptual map that reflects three mission domains of action when sporting activities are used in the S4D framework: international development, sport development, and child protection/human rights.

These mission domains have both shared interests as demonstrated by the overlap in the circles and separate and distinct functions shown by the non-overlapping areas. While some political tension among organizations may arise from an overemphasis on one domain over another from time to time, the overall focus remains the creation and delivery of a safe and nurturing environment in which children and adolescents can experience all of the positive aspects that come from involvement in sports and thus avoid the risk and potential negative aspects such as maltreatment and peer victimization.

The international approach to children and sports has taken on a decidedly human rights perspective regarding the participation of children and adolescents in sporting activity (David 2005; Brackenridge 2001). It began with the 1990 United Nations Convention on the Rights of the Child, which, although not explicitly mentioning sports, contained several elements that related to the safety and well-being of children who may participate in sports. According to Paulo David (2005) (former Secretary of the Committee on the Rights of the Child, Office of the United Nations High Commissioner for Human Rights), of the 42 key provisions in the document, 37 have relevance to the children and adolescents participating in organized sports. Among the most relevant provisions to this discussion are:

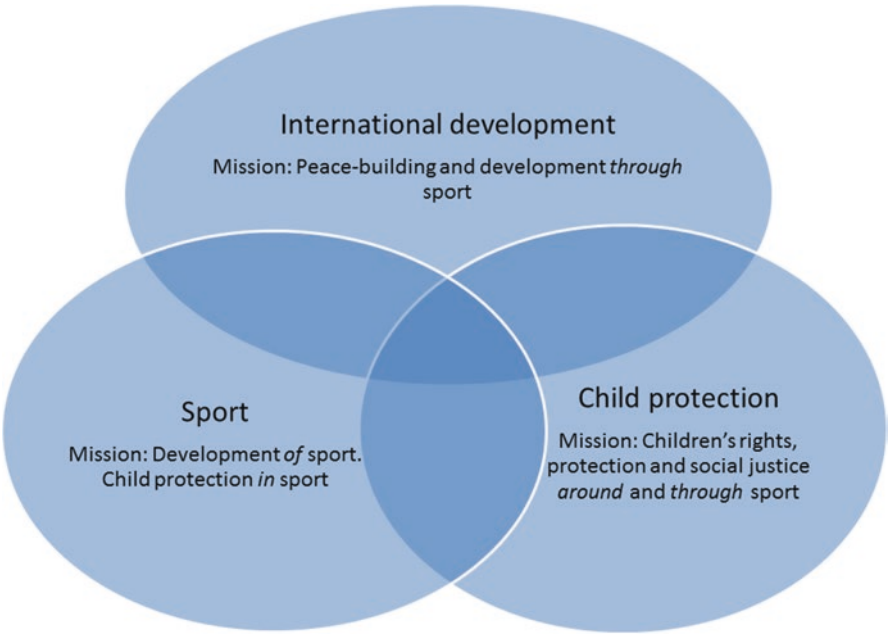

Fig. 13.1 Conceptual map of sports for development framework. (Brackenridge and Rhind 2014, p. 332. Used with permission via open access)

- Protection from abuse and neglect and other forms of violence
- The right to health; the right to rest, leisure, recreation, and cultural activities
- The right to be protected from economic exploitation, sexual exploitation, trafficking, and other forms of exploitation (David 2005)

The United Nations Office on Sport for Development and Peace has an International Working Group on Sport and Child Youth Development. It identified the most common forms of abuse in sport, which may vary in their frequency and intensity, as the following:

- Child trafficking and child labor
- Physical abuse
- Excessive intensive training
- Peer violence
- Physical violence by adults, including corporal punishment
- Violence due to participating in competitions
- Sexual abuse including harassment on the basis of sexual orientation (United Nations 2011, p. 1)

The working group explored reasons for human rights violations of children in organized sport and identified: (1) the developmental dependency needs of children and adolescents, (2) the reality of children and adolescents "training to please" coaches and parents during sporting activities, (3) the regretful lack of qualified

athletic trainers who understand health, wellness, and developmental needs of children and adolescents, and (4) the lack of international standards (UN 2016). Moving forward, the working group suggested several steps to avoid human rights violations of children in organized sport: (1) educating children about what they can and should expect in the sporting context; (2) raising awareness of the potential risks to children among parents and caregivers; (3) directed, targeted efforts to raise the knowledge and skills of coaches around the range of issues necessary to keep children safe and healthy; and (4) the development, implementation, and ongoing monitoring of policies directed at creating and maintaining a safe environment for children and adolescents participating in organized sporting activities (United Nations 2016). Toward that end of establishing appropriate polices to protect children, the working group advised organizations to develop policies with specific provisions and implementation plans to prevent the exploitation and abuse of children and youth in sports context.

In addition, the working group recommended that sports programs appropriately screen prospective coaches, help coaches develop the teaching and coaching skills necessary to be positive and effective role models, and work with communities to make sure children and adolescents have physical play environments that are safe, accessible, and oriented to their safety and well-being.

Finally, David (2005), speaking from his international human rights perspective, proposed ten fundamental principles to guide the creation and maintenance of a child-centered sport system that puts the rights, safety, and well-being of children front and center using such descriptive terms as equity, fairness, informed participation, mutual respect, transparency, and accountability.

Academic Focus

Professional scholarly attention to the risk of child maltreatment and victimization is found in early literature primarily from the UK in large part led by Professor Cecilia Brackenridge, whose quote began this chapter. Brackenridge and Rhind (2014) outlined eight different potential frameworks for policy on sexual exploitation in sport (Table 13.1).

Brackenridge and other colleagues via academic inquiry have generated evidence on the sexual maltreatment of children and adolescents in the organized sporting context. For example, work published in 2008 found that between 2% and 22% of children and adolescents were sexually abused in sports-related activities, and virtually all of the identified cases of sexual abuse (98%) were perpetrated by coaches, teachers, and instructors, who were likely male and anywhere from 16 to 63 years of age (Brackenridge et al. 2011). However, beyond sexual abuse are other forms of maltreatment and victimization that occur even more frequently than sexual maltreatment, including physical abuse, peer victimization, and emotional abuse. For example, Stafford et al. (2015) found that up to 75% of young athletes in organized sports in the UK experienced some type of psychological/emotional

Table 13.1 Frameworks for policy on sexual exploitation in sport (Brackenridge and Rhind 2014. Used with permission via open access)

Policy approach	Description
Child protection	Narrowly focussed on prevention and recognition of types of child abuse (sexual, physical, emotional and neglect) and on referral
Duty of care	Focussed on children and emphasising legal duties in loco parentis
Child welfare	Focussed on children but emphasising broader concerns, including social, environmental, and educational opportunities, peer group relations and ensuring that the child thrives overall
Anti-harassment	Focussed on athlete protection from sexual harassment and bullying, with particular controls on authority figures
Athlete welfare	Wider concerns for the overall health and well-being of athletes that encompass freedom from exploitation and the development of athlete autonomy
Equity, equal opportunities	Focussed on compliance with national equal opportunity law and employment standards. Often underpins liberal aspirations for equal/fair treatment
Quality assurance	Risk management systems that embed sexual safety within the overall operation of the organisation: regularly monitored and evaluated
Ethics/human rights	Broadly focussed on moral standards and guidelines within the context of international law

abuse during their time as a student athlete. Additionally, the International Olympic Committee (IOC), in its 2016 consensus on harassment and abuse in sports (Mountjoy et al. 2016), recognized psychological/emotional abuse as the "gateway" to other forms of maltreatment and victimization. Not unexpectedly, the IOC also found that vulnerable groups seen in the general population may be at increased risk for maltreatment and victimization in sports-related activities; lesbian, gay, bisexual, transgender, and questioning athletes are at markedly higher risk for abuse as are athletes participating at higher levels of competition. This growing body of evidence can be used to inform safe environment practices based on sound policies and procedures focused on athlete health and wellness (Brackenridge and Rhind 2014).

Brackenridge (2001) authored a book-length exploration of problems of sexual abuse and victimization in organized sports titled *Spoilsports: Understanding and Preventing Sexual Exploitation in Sport* in which she lays out contextual aspects of the problem as well as the need for rigorous policies and procedures to reduce and eliminate the risk. In a keynote address, Brackenridge, reflecting on 20 years of scholarly work in the area of child safety in sporting activities, offered a list of myths that she and her colleagues have confronted in their work to explore child safety in sports in a systematic and objective manner (Table 13.2).

Brackenridge and Rhind (2014) summed up the confluence of models and frameworks and advocated for a combined human rights and child protection perspective to ensure that children and adolescents are provided a safe environment in which to pursue the positive aspects of sporting activities:

> It is tempting to argue that we might be reaching a kind of tipping point in sport where athlete welfare and personal development are becoming central concerns for sport

Table 13.2 Cecilia Brackenridge's myth typology for child sexual abuse in sport

Myth	Focusing question	Comment
"Sport is a safe space for young people"	*Is sport better or worse than other sectors when it comes to child abuse?*	Sport is just one part of our social system, suffering all the good, bad, and ugly features of other sectors, including child abuse
"It doesn't happen in our sport"	*Are some sports immune from the need for safeguarding?*	Abuse happens in all sports…we have access to so few well-archived and detailed cases
"Child protection is just for kids"	*Is safeguarding really necessary at the elite level?*	…the higher an athlete progresses up the sporting talent ladder, the greater the risks of being exploited sexually…he same applies to emotional abuse of young athletes… So, far from needing less safeguarding at top level, we actually need just as much there as lower down the talent ladder
"Scanty clothes lead to more abuse"	*Does less clothing cover lead to more sexual exploitation?*	No…more harassment of female athletes in sports with greater clothing cover… scanty clothing is associated with early specialization sports…peaking age is the important mediator rather than clothing…
"We can't touch athletes anymore"	*Is abuse more likely in sports where there is a lot of close interpersonal touching/manual support?*	…no proven connection between handling or manual support and the likelihood of sexual exploitation…However, just as it happens in physiotherapy or nursing, there are commonsense protocols that should be observed by any coach or trainer who has to touch an athlete…helps to secure consent and alerts the athlete and anyone watching about what to expect and why it is being done
"Ours is a team sport so we don't need to worry"	*Are athletes in individual sports more likely to experience abuse than those in team sports?*	Individual performers are often involved in squad training; team athletes often train alone. The competitive structure of a sport tells us nothing about the type or frequency of safeguarding problems that it may encounter…
"Coaches are the main problem"	*Are coaches the majority perpetrators of abuse?*	…athletes perpetrate more sexual harassment on their peers than do coaches…Athlete-athlete bullying is also widespread but we have no systematic data on this
"All our coaches are licensed so we don't have to worry"	*Are perpetrators of sexual abuse in sport drawn mainly from those without proper qualifications?*	…coach perpetrators are often very highly qualified and very highly respected which acts as a mask for their misdemeanors … we know very little about people working in the unregulated sector…we now have better vetting…as coaching becomes fully professionalized, more people will experience safeguarding training and adopt best practice

(continued)

Table 13.2 (continued)

Myth	Focusing question	Comment
"We work in a male-only environment so we don't need to worry"	*Is abuse perpetrated only by males on females?*	…since most coaches and athletes are male, there is a statistical probability that most perpetrators of abuse in sport will therefore be male…Both men and women, boys and girls, may be victims of any type of abuse
"Safeguarding is just for softies … a bit of rough and tumble never did me any harm as a kid"	*Is safeguarding an extension of the "nanny state" and political correctness? After all, one person's abuse is another's way of toughening up the athlete*	This kind of attitude reflects institutional tolerance for maltreating athletes and overlooks the longer-term harm that can result from "tough" training and coaching regimes
"Only the strong survive." "No pain, no gain"	*Does success demand that athletes should suffer emotionally?*	Performance success is linked to support and nurturing as much as it is to mental toughness. There are no gains (but many losses) to be had from athlete abuse…
"We must all be on the lookout for signs of grooming in sport"	*Is sexual abuse the most common safeguarding issue in sport?*	… emotional abuse and bullying are probably far more prevalent than sexual abuse in sport… It is likely that rates of the different forms of abuse vary from sport to sport, but we do not have clear sport-specific data about this yet
"Our advanced standards will protect us from scandal"	*Do standards guarantee that children are safe in sport?*	… there is often a policy vacuum between national and local or club level, and policy impacts fade unless safeguarding work is constantly refreshed…
"Kids have nothing useful to say about this subject"	*Are children in sport able to offer sensible ideas about their own sport experiences and safeguarding issues?*	…too often we exclude athletes – of all ages – from expressing their own views and or being listened to… That said, we should never forget that adults should always be held responsible for their own actions

Myths and evidence – learning from our journey
Brackenridge, C. (2010). Keynote address: "How safe is your sport?" Excel Sports Centre, Coventry, February 25, 2010, hosted by the Coventry Sports Foundation and the NSPCC Child Protection in Sport Unit

administrators, coaches and other stakeholders. If so, then our obsession with "humans doing" is at last being matched by concern for "human beings"… Then, there could be an equalisation of authority relations in sport that, in itself, reduces the opportunities for non-accidental harms to athletes. This humanitarian shift in sport may remain elusive unless it can be proven to advance the core mission of sport. If that happens, there might be a realisation that welfare enhances, rather than inhibits, performance success. For now, the dominant discourse in sport is still performance success and, to that extent, if change is to be achieved, human rights advocates will need to find a performance rationale for their cause. (p. 334)

A landmark study in the academic effort to develop an evidence base from which to further understand the negative aspects of sport participation owing to the risk of abuse and victimization was conducted by Alexander et al. (2011) at the University of Edinburgh's Child Protection Research Center. In short, the study consisted of results from an online survey of students who were 18–22 years old during the 3-year period between 2007 and 2010 and who were asked to reflect back on their experiences prior to age 16 years. The quantitative analysis was done on the 6060 respondents who had negative experiences during their sports participation. In addition, 89 interviews were conducted to collect qualitative information as well. Emotional harm consisted of criticism of performance, embarrassment, humiliation, or bullying. Sexual harm was described as verbal, nonverbal, or physical, intentional, or non-intentional, in a sexual manner that was considered unwanted. And physical harm referred to a range of behaviors including excessive intense training, having to compete or train while injured or being exhausted, being returned to training or competition too soon after injury, and experiencing aggression/violence at the hands of either coaches or team members.

The most common form of harm was emotional harm, being reported in three-quarters of the sample (75%), followed by sexual harassment in nearly a third of the participants (29%), physical harm in nearly one out of four participants (24%), self-harm in 10%, and sexual harm in 3% of the sample. Minimal gender differences were found with the exception of sexually harassing behavior, which occurred at double the rate in young women versus young men.

The study by Alexander et al. (2011) provided an opportunity to move beyond Brackenridge's focus on sexual harm and provided valuable data on emotional and physical harm as well as peer abuse. In examining physical harm, nearly a fourth of the sample reported some form of such harm with the most common forms of physical harm, being excessively trained and being exposed to aggressive or violent behavior. In the words of the authors, we read:

> A quarter of young people responding to the survey (*n*=1480) had experienced one of the physically harmful behaviours explored in the questionnaire in either their main or second sport. The most common of these experiences was being forced to train on while injured or exhausted, reported by 54% (*n*=763) of those reporting physical harm in their main sport. In most cases this was something that happened only once or twice but there were circumstances where it was a regular occurrence. (Alexander et al. 2011, p. 93)

In reflecting on these observations, Alexander and colleagues concluded with the following summary and made note that the majority of aggressive and violent events were not at the hands of coaches but instead from fellow athletes and peers:

> In interview, young people described how they came to accept a culture of training through injury and exhaustion – 'the sport ethic'….Fifty-five per cent of young people who reported physical harm experienced some aggressive treatment (n=779) and 17% (n=234) had experienced violent treatment in their main sport. Sometimes this was seen as part of the sport but in their interviews, respondents described how the inherent physicality of a sport could be used to mask deliberate aggression or violence. Aggression and violence from coaches was reported by a few interviewees but the most frequent reported source was peers, sometimes as part of a pattern of bullying that encompassed areas of life other than sport. (p. 93)

US Context

Organized sporting activities are an important and common experience for children and families in the USA. The American Academy of Child and Adolescent Psychiatry (2013), in a parent guide, explicitly highlighted the potential positives for children participating in athletics: "Sports help children develop physical skills, get exercise, make friends, have fun, learn to play as a member of a team, learn to play fair, and improve self-esteem" (p. 1). Estimating the numbers of children and adolescents is challenging from a methodologic perspective for a variety of reasons, including definitions of participation and various venues for sports including school-related, local clubs, and more formal leagues. But with those challenges in mind, the sports media giant ESPN (2013) estimated that in 2011 there were a total of 39.82 million children and adolescents between the ages of 8 and 17 in the USA, and of those, approximately 28.7 million (72%) were regular/frequent participants in organized sporting activities. Of course, the numbers are higher since children may become involved with organized sporting activities prior to age 8. The Aspen Institute's Project Play website provides a robust data set examining participation rates for a variety of individual and team-based child and adolescent sporting activities (The Aspen Institute 2017). Clearly, participation in sporting activities is relatively common for children and adolescents in the USA, and the Aspen Institute makes this point clear by quoting a national sports leader and states that in the USA, sport is considered akin to a birthright (Lee 2015).

With the positive potential in organized sporting for child and adolescent development come some potential negatives as well. Benefiting from the international conceptual and academic background, US academicians and advocates have focused increasing attention on the safety and well-being of children within youth-serving organizations including organized sporting activities. Casting a broad gaze on youth-serving organizations in general, Shattuck et al. (2016) asked, "How many children and youths are abused by staff associated with youth-serving organizations such as schools and religious/recreational groups?" (Shattuck et al. 2016, p. 2). To answer that question, data was aggregated across three nationally representative samples of US children contained in the 2008, 2011, and 2014 National Surveys of Children's Exposure to Violence (NSCEV).

The three NSCEVs were telephone surveys addressing exposure to abuse, crime, and violence of children aged 1 month to 17 years with those children between 10 and 17 years of age being directly interviewed. The three combined samples allowed for the construction of a single sample, totaling 13,052 children and adolescents. The findings showed that the rate of abuse by persons in youth-serving organizations was 0.4% for the past year and 0.8% over the lifetime of the child. Most of the maltreatment (63.2%) was verbal abuse, physical abuse was reported by 34.6% of those who were maltreated, and 6.4% reported any form of sexual violence or

assault. The authors made clear that the rate of abuse in youth-serving organizations is relatively small compared to the large percentage of abuse that occurs by a family adult, determined to be 5.9% in the past year and 11.4% over the lifetime. However, the authors also cautioned not to over interpret the relatively low rate of sexual abuse in youth-serving organizations compared to family settings, making the point: "The rate found in this analysis could translate to a population estimate of 36,000 …cases among the population of children and youths younger than 18 years, certainly worthy of additional prevention efforts" (Shattuck et al. 2016, p. 2). Finally, the authors also made the point that the most common form of maltreatment uncovered in youth-serving agencies is in fact emotional abuse, so this form of maltreatment should get attention as well as potential physical abuse and sexual abuse. The survey described above did not specially address abuse and victimization in sporting activities, and this paucity of specific organized sporting data has been identified as an ongoing need to advise policymakers and child health advocates as well.

As seen with the sexual abuse crisis that came to light in the early 2000s in the US Catholic Church, investigative reporting led to significant public awareness and outrage at the harm to which children were exposed (The Boston Globe 2004). The US Olympic Committee has taken a lead role in focusing attention on the potential risk for abuse and victimization during organized sporting activities in the USA:

> Sport plays a significant role in the lives of children, and as the national steward for sport in the United States, the United States Olympic Committee [USOC] has an important responsibility to create positive, safe, and secure environments for American athletes. To further advance the safety and well-being of all U.S. athletes – regardless of age, gender, or sport – the USOC has invested in programs to shape the foundation of the safe sport movement nationally. (Team USA 2018. https://www.teamusa.org/about-the-usoc/safe-sport)

Taking a decidedly child protection approach, the USOC in 2010 convened a Working Group for Safe Training Environments and tasked it with developing a set of recommendations oriented to keeping athletes free from abuse and victimization in the training and competition environment. Misconduct was defined as including child sexual abuse, emotional abuse, physical abuse, bullying, hazing, and harassment (Team USA 2018). Acting on the recommendations of the 2010 Working Group, in 2012 the USOC launched its SafeSport initiative and encouraged the related 47 national governing boards (NGBs) and 34 multisport organizations to develop and tailor SafeSport principles and practices to prevent abuse and victimization. SafeSport was defined at that time as efforts designed to address misconduct in sport and those that seek to create a healthy, supportive environment for all participants by providing information, training, and resources (Team USA 2018). The USOC reaffirmed its commitment to SafeSport in June 2014 and approved the creation of the US Center for SafeSport, an independent, nonprofit organization designed to respond and to investigate misconduct claims in sports that are managed by USOC's sanctioned NGBs as well as to provide education programs around SafeSport principles and practices. Specifically:

> The USOC's Safe Sport Policy applies to USOC employees, coaches, contracted staff, volunteers, board members, committee and task force members, and other individuals working with athletes or other sport participants while at a U.S. Olympic Training Center, or a USOC-sponsored or delegation event; athletes training and/or residing at an OTC or a delegation event; individuals the USOC formally authorizes, approves or appoints (a) to position of authority over or (b) in frequent contact with athletes. It prohibits all forms of misconduct, including sexual, emotional, physical, bullying, harassment and hazing as set out in the SafeSport Code for the U.S. Olympic and Paralympic Movement as adopted by the U.S. Center for SafeSport. (Team USA 2018)

March 2017 saw the launch of the new, independent US Center for SafeSport, which investigates allegations, issues sanctions dealing with participation in organized sporting activities, and provides education and training around the prevention of abuse and other forms of victimization (US Center for SafeSport 2017a). At the time of the writing of this chapter, the US Center for SafeSport was entering its second year of operation. In the coming years, evaluation data for its response and education programs will be invaluable in further understanding the risk and harm experienced by children and adolescents involved in sporting activities. Toward that end, the US Center for SafeSport has developed and published a "SafeSport Code," which is available online at https://safesport.org/files/index/tag/policies-procedures. It provides a useful set of standard definitions for various forms of misconduct beyond the well-recognized forms of misconduct implied by the terms sexual abuse and exploitation and includes misconduct implied by physical abuse, emotional abuse, peer abuse (or bullying behavior), harassment, and hazing (Table 13.3).

In the first decade of the 2000s, after abuse allegations came to light via investigative reporting involving swimming and gymnastics, two independent reports were commissioned by the NGBs of each sport, respectively, to determine what lessons could be learned from the facts in these situations and how best to use this information to further protect the children and adolescents participating in these organized sporting activities.

Case 1: Swimming

In 2013, USA Swimming contracted with former prosecutor Victor Vieth (2014) and the professional team at the Gundersen National Child Protection Training Center to conduct an independent assessment of the USA Swimming's Safe Sport program. In addition to documentary review of existing materials related to the Safe Sport program, 57 interviews of stakeholders and subject matter experts were conducted, and a set of recommendations were developed. Owing to existing evaluation data, the reviewers were able to analyze data before and after the implementation of the USA Swimming Safe Sport program in 2010. Toward that end, Fig. 13.2 is a diagram detailing how an allegation of potential maltreatment is handled, and

Table 13.3 Definitions of misconduct in SafeSport code (US Center for Safe Sport 2017b)

Misconduct	Definition	
Physical	Any contact or noncontact conduct that causes or reasonably threatens to cause physical harm to another person *Contact violations*: Punching, beating, biting, striking, choking, or slapping another; intentionally hitting another with objects, such as sporting equipment; encouraging or knowingly permitting an athlete to return to play prematurely following a serious injury (e.g., a concussion) and without the clearance of a medical professional *Noncontact violations*: Isolating a person in a confined space, such as locking an athlete in a small space; forcing an athlete to assume a painful stance or position for no athletic purpose (e.g., requiring an athlete to kneel on a harmful surface); withholding, recommending against, or denying adequate hydration, nutrition, medical attention, or sleep; providing alcohol to a person under the US legal drinking age; providing illegal drugs or non-prescribed medications to another. (p. 6)	
Emotional	Repeated and/or severe noncontact behavior involving verbal acts, physical acts, and/or acts that deny attention or support. Emotional misconduct is determined by the objective behaviors, not whether harm is intended or results from the behavior *Verbal*: Verbal assault that repeatedly attacks someone personally (e.g., calling a person worthless, fat, or disgusting; taunting a person for being too effeminate); repeatedly and excessively yelling at a particular athlete or other participant in a manner that serves no productive training or motivational purpose *Physical*: Physically aggressive behaviors, such as throwing sport equipment, water bottles, or chairs at or in the presence of others; punching walls, windows, or other objects *Acts that deny attention or support*: Ignoring or isolating a person for extended periods of time, including routinely or arbitrarily excluding a participant from practice. (p. 3)	
Sexual	*Sexual conduct* (or attempts to commit the same), without consent *Sexual conduct* (or attempts to commit the same), where there is a power imbalance, regardless of purported consent *Sexual harassment* *An intimate relationship* involving a person in a position of power where a power imbalance exists	Sexual misconduct involving minors regardless of any purported consent, a sexual misconduct offense involving a minor includes *Sexual conduct* (or attempt to commit the same) between a covered adult and a minor where the age difference is three or more years *Sexual conduct* (or attempt to commit the same) between a covered adult and a minor where the age difference is less than 3 years, but a power imbalance exists *An intimate relationship* (or attempt to establish the same) between a covered adult and a minor where the age difference is 3 or more years and a power imbalance exists *Sexual conduct between a covered minor and another minor if* (1) the age difference is 3 or more years or (2) there is a power imbalance based on the totality of the circumstances

(continued)

Table 13.3 (continued)

Misconduct	Definition
Bullying behavior	Repeated and/or severe (a) aggressive behavior (b) among minors (c) that is intended or likely to hurt, control, or diminish another person emotionally, physically, or sexually *Physical*: Hitting, pushing, punching, beating, biting, striking, kicking, choking, spitting, or slapping; throwing objects such as sporting equipment at another person *Verbal*: Teasing, ridiculing, taunting, name-calling, or intimidating or threatening to cause someone harm *Social, including cyberbullying*: Using rumors or false statements about someone to diminish that person's reputation; using electronic communications, social media, or other technology to harass, frighten, intimidate, or humiliate someone; socially excluding someone and asking others to do the same *Sexual teasing*: Ridiculing or taunting based on gender or sexual orientation (real or implied), gender traits, or behavior (e.g., taunting someone for being too effeminate), or teasing someone about their looks or behavior as it relates to sexual attractiveness (pp. 1–2)
Harassment	Repeated and/or severe conduct that (a) causes fear, humiliation, or annoyance; (b) offends or degrades; (c) creates a hostile environment; (d) reflects discriminatory bias in an attempt to establish dominance, superiority, or power over an individual athlete or group based on age, gender, sexual orientation, gender expression, gender identity, race, ethnicity, culture, religion, national origin, or mental or physical disability; or (e) any act or conduct described as harassment under federal or state law. Whether conduct is harassing depends on the totality of the circumstances, including the nature, frequency, intensity, location, context, and duration of the behavior (p. 4)
Hazing	Any conduct that subjects another person, whether physically, mentally, emotionally, or psychologically, to anything that may endanger, abuse, humiliate, degrade, or intimidate the person as a condition of joining or being socially accepted by a group, team, or organization. Purported consent by the person subject to hazing is not a defense, regardless of the person's perceived willingness to cooperate or participate examples of hazing include: *Contact*: Tying, taping, or otherwise physically restraining another person; beating, paddling, or other forms of physical assault *Noncontact*: Requiring or forcing the consumption of alcohol, illegal drugs, or other substances in an effort to elicit a negative physiological response, including participation in binge drinking and drinking games; personal servitude; requiring social actions (e.g., wearing inappropriate or provocative clothing) or public displays (e.g., public nudity) that are illegal or meant to draw ridicule; excessive training requirements demanded of only particular individuals on a team that serve no reasonable or productive training purpose; sleep deprivation; otherwise unnecessary schedule disruptions; withholding of water and/or food; restrictions on personal hygiene *Sexualized*: Actual or simulated sexual conduct of any nature (p. 5)

Safesport code for the US Olympic and Paralympic movement https://77media.blob.core.windows.net/uscss/1488581091937.2017-03-03%2D%2D-safesport-code%2D%2D-final.pdf

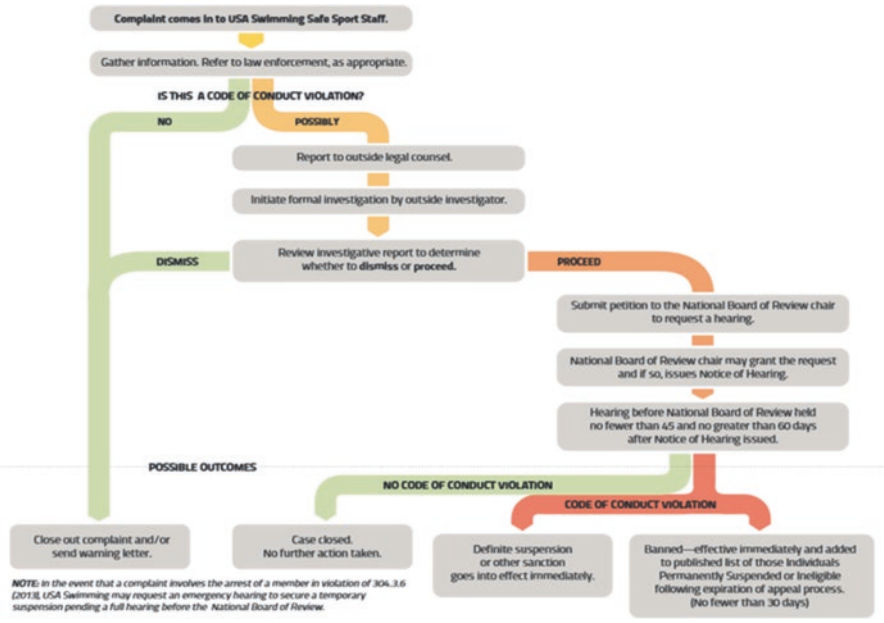

Fig. 13.2 Diagram outlining the process in cases of sexual abuse. (Vieth et al. 2014, p. 53. Used with permission)

Table 13.4 contains several years of evaluation data related to the handling of maltreatment allegations by USA Swimming (see Fig. 13.2 and Table 13.4).

In the text of the report, Vieth (2014) interprets the data contained in Table 13.4 as representing marked improvement in the case response and resolution process. Of note, the average time of resolution is 2.5 months, and in those cases expected to take longer which received full National Board of Review (NBOR), the average time to close the case is within 4.7 months after 2010.

The general recommendations are offered in the following targeted areas that were agreed upon at the outset of the review, including:

- Policies and guidelines
- Screening and selection
- Education and training
- Monitoring and supervision
- Recognizing, reporting, and responding
- Grassroots engagement and feedback

Each targeted general recommendation then is tagged to a set of specific recommendations in order to operationalize that effort. Table 13.5 contains the listing of specific recommendations.

Vieth et al. (2014) concluded with meaningful observation about both the positive and negative potential experiences that young athletes might have in organized

Table 13.4 USA Swimming's handling of sexual misconduct or other forms of child maltreatment (Vieth et al. 2014, pp. 54–55. Used with permission)

Cases opened by year

	Cases opened	Pending cases	Closed through informal resolution process	Closed after investigation	Closed after NBOR	Closed after NBOR and appeal	Suspended by NBOR	Banned by NBOR
2010	25	0	6	10	6	3	1	8
2011	36	0	12	9	14	1	4	11
2012	40	0	14	6	17	3	4	16
2013	78	16	45	1	15	1	3	12
Total	179	16	77	26	52	8	12	47

Cases closed by year

	Cases closed	Closed through informal resolution process	Closed after Investigation	Closed after NBOR	Closed after NBOR and appeal	Average time open to close - all	Average time open to close - investigation and NBOR cases
2010	3	2	1	0	0	1.3	3.1
2011	32	14	10	8	0	4.1	5.3
2012	34	8	9	15	2	8.7	10.8
2013	94	53	6	29	6	5.8	10.5
Total	163	77	26	52	8		

Outcomes – cases opened by year

	No violation found	Informal resolution	Non-compliant victim	Suspension	Ban	Other	Total
2010	7	5	2	1	8	2	25
2011	9	5	4	4	11	3	36
2012	4	11	3	4	16	2	40
2013	10	32	3	3	12	2	62
Total	30	53	12	12	47	9	

NBOR National Board of Review; Non-Compliant Victim: cases where there is credible suspicion or credible evidence but the victim is unwilling to testify before the NBOR or is uncooperative with the investigation

sporting activities, and they called for action to decrease and eventually eliminate the risk for maltreatment and victimization:

> Athletes interviewed as part of this assessment spoke of the majesty of the sport of swimming and how, even years later, the smell, sounds, colors and sights of the sport are indelibly linked to the best of memories and friends. This is how it should be. The survivors we spoke to, the survivors whose histories unfold in the files of banned coaches, may have similar memories of the sport—but they are clouded through the pain of childhoods interrupted or even lost. One survivor told us that her first kiss was to the man who abused her—and that you never get that sort of thing out of your head. Although the past cannot be changed, the future is free to shape. The recommendations offered in this report will not end the risk of abuse within the sport or within the homes of the children standing on the decks, speeding through the pools, or traveling to meets. It will, though, give more of them a fighting chance. (p. 83)

Case 2: Gymnastics

In 2016, USA Gymnastics engaged former federal prosecutor, Deborah J. Daniels, to conduct an independent review of the organization's bylaws, policies, procedures, and practices related to its handling of sexual abuse matters and to conclude

Table 13.5 Specific recommendations to create a culture of safety for children in swimming

General	Specific recommendations
Policies and guidelines	1. Provide equal layers of protection for all abused children within the sport 2. Develop a workable definition and response to cases of psychological abuse
Screening and selection	1. Recommend to clubs additional pre-employment screening tools of a written application, personal interview, and written acknowledgment of the code of conduct pertaining to child protection 2. Develop materials to assist clubs in this process 3. The safe sport training program for parents should include information on asking questions about pre-employment screening 4. USA Swimming should maintain its current background check program but explore the feasibility, perhaps in collaboration with other youth-serving organizations, of 1 day moving to a fingerprint-based check
Education and training	1. Require children who are athlete members 12–18 to take the safe sport training 2. Develop personal safety materials for younger children—and require parents to review them with younger athletes 3. Require parents to take safe sport training 4. Develop a version of safe sport accessible to children or parents with a disability 5. Strengthen the physical abuse section of the safe sport training 6. Incorporate adverse childhood experience (ACE) research into safe sport training 7. Develop training and written materials pertaining to juvenile sexual behaviors and offenses 8. Incorporate resilience research into safe sport training 9. Constantly reevaluate training as research expands
Monitoring and supervision	1. Continually reinforce the rationale behind and importance of the monitoring and supervision rules 2. Continue to develop options for “two-deep leadership” on all team travel 3. Develop checks and balances or quality control measures for the informal resolution process

(continued)

Table 13.5 (continued)

General	Specific recommendations
Recognizing, reporting, and responding	1. Extend whistleblower protection to coaches or others who make a good faith report of physical abuse or psychological abuse/bullying 2. Extend whistleblower protection to coaches or others who make a good faith report to the authorities or to USA Swimming of any act of child abuse committed by any person inside or outside of USA Swimming 3. Create a "rebuttable presumption" clause that further protects coaches or other reporters from retaliation 4. If a report concerns recent abuse such that most witnesses are in one location, consider the possibility of the investigator traveling to the community and conducting in-person interviews 5. If the crime scene is available and accessible to the investigator, have it photographed 6. Develop a pool of medical, mental health, and sex offender treatment experts who can be consulted in cases of physical abuse, psychological abuse, and juvenile sex offenses 7. Disband or limit the coaches' panel to evaluating whether or not a coaches' conduct is acceptable within the sport of swimming 8. USA Swimming should develop materials that may assist an abused athlete and his or her family in cooperating with an investigation or NBOR hearing 9. Research the effects of testifying before the NBOR, and utilize this research in responding to cases in which a victim or family is uncooperative 10. Establish "reliable hearsay" standards that may allow the organization to ban coaches USA Swimming believes has abused a child or otherwise violated the code of conduct 11. Develop standards for evaluating underlying law enforcement and child protection investigations
Grassroots engagement and feedback	1. Set a goal of a Safe Sport coordinator in every club—and strive to meet this goal within 5 years 2. Facilitate connections between local clubs and community child protection organizations that may assist in evaluating risks unique to a particular club 3. Make a concerted effort to engage survivors in every major safe sport initiative 4. Conduct a baseline study to assist in determining the extent of child abuse within swimming, the manner in which offenses may be carried out, and the effectiveness, or lack of effectiveness of various responses 5. Evaluate the level of victimization of boys 6. Allow researchers access to USA Swimming's current data and files 7. Establish and maintain a victim assistance fund 8. A taskforce regarding greater access to files and NBOR decisions, as well as sharing information about banned, suspended, or flagged members with other youth-serving organizations 9. A taskforce to assess the limits of USA swimming jurisdiction over offenders 10. An independent entity to oversee the investigation, adjudication and imposition of sanctions in cases of abuse

Vieth et al. (2014). Used with permission

with a set of recommendations directed at improving the protection afforded those young athletes who participate in gymnastics. The review occurred over a 6-month period, concluding in May 2017. Daniels contracted with an organization well versed in managing sexual misconduct matters, praesidium, and conducted over 160 interviews of a broad range of stakeholders and subject matter experts. In addition, over 25 site visits occurred along with thorough documentary review. Daniels (2017) observed at the outset the unique risk that children and adolescents face in the current organized sporting activity environment.

> This risk of sexual abuse and harassment, as well as the risk of other types of abuse, such as the physical and emotional abuse of young people, is clearly present in the high-pressure environment of Olympic sports. The athletes and their coaches are driven to achieve the level of excellence required to be deemed the best in the world. The athletes who reach the elite (highest) level of competition are singularly focused on achieving this level of excellence, and generally are willing to sacrifice the kind of lives other young people enjoy – school, social life, normal childhood recreation – in favor of home schooling, many hours of practice every day, and a limited circle of acquaintances based around the gym, the pool or the ice rink. This all-encompassing training regimen can isolate an athlete from the rest of society, and limit his or her exposure to and comprehension of the normal boundaries of adult and child interaction; so it can be hard for a young athlete to recognize what constitutes acceptable conduct and what does not. (p. 10)

In the final report, Daniels (2017) recommended an overarching cultural shift with general areas of focus to create an environment of safety and well-being for the child athlete, including:

- Clear standards of care and behavior
- Provision of sufficient resources to assist in maintaining standards
- Accountability

In order to carry through on this culture change, a voluminous list of specific recommendations was made around 9 general themes (Table 13.6).

Daniels (2017) concluded her report with a sober assessment of the hard work ahead but also with a statement of optimism that, with focused action around the recommendations, the culture of safety is indeed possible:

> The reviewers have done their best to develop recommendations that, while ambitious, are capable of accomplishment by USA Gymnastics in the interest of protecting children. The road ahead is not an easy one: there are a significant number of recommendations in this report that will require a great deal of time and collaborative effort to execute effectively. However, the reviewers feel strongly not only that the recommended actions are capable of achievement, but also that they are essential to the ability of the many dedicated adults involved in a beloved sport to protect the young lives they hold so dear. (p. 3)

On January 30, 2018, the US Senate passed the *Protecting Young Victims from Sexual Abuse and Safe Sport Authorization Act* (https://www.congress.gov/bill/115th-congress/senate-bill/534/text?format=txt) (U.S. Congress 2018), which was drafted by Senator Dianne Feinstein (D-CA) to require amateur athletics governing bodies like USA Gymnastics and other amateur sports organizations to report sex-abuse allegations to local or federal law enforcement, or a child-welfare agency designated by the Justice Department, within 24 h. According to Senator Feinstein on behalf of her 29 cosponsors, the bill represented a major step forward aimed at

Table 13.6 Specific recommendations to create a culture of safety for the child in gymnastics

General	Specific recommendations
Board structure and duties	Amend bylaws to clarify priority of athlete well-being Ensure that term limitations are consistently enforced Reduce or eliminate conflicts of interest Provide abuse training for the board of directors Create, maintain, and regularly update board handbook Create accountability for protection of children, driven by board Increase the number of in-person board meetings Ensure that each board meeting includes a robust discussion Hold an executive session at the conclusion of each board meeting of safe sport matters Conduct an annual enterprise risk review that routinely includes safe sport issues
Administrative management	Develop position descriptions for all positions; include child protection requirements Seek individuals with expertise in child protection for leadership team Seek administrators with fresh perspective Exclude president from safe sport disciplinary control Ensure greater accountability of president to board Change culture of entire staff to athlete safety first Require greater accountability of child protection function to board Require strategic plan from newly appointed director of safe sport and provide for direct reporting to board Create general counsel role and centralize legal functions
Member requirements and enforcement	Require that owners of member clubs also be members of USA gymnastics Require that every person working or volunteering with youth in any member club also be a member of USA gymnastics Strengthen current code of ethical conduct and participant welfare policy, and require adoption in full by member clubs Develop a disciplinary process for violations of the revised code of ethical conduct and other member club requirements Ensure that members suspended or deemed permanently ineligible are banned from all clubs Develop and require training for all member clubs on membership requirements
Screening and selection of coaches, volunteers, and other adults with access to athletes	Expand the universe of those subjected to background checks Consider requiring certification for coaches prior to hiring Provide member clubs with a detailed hiring toolkit Provide club owners and hiring personnel with training on how to use the screening and selection toolkit Review and reconsider method of overriding red light finding Create database of persons dismissed from member clubs

(continued)

Table 13.6 (continued)

General	Specific recommendations
Process for filing reports of misconduct	Err on the side of protecting the athlete in all situations Create a clear protocol for response to allegations made outside the formal grievance process Remove president from controlling role in determining disposition of allegations Provide for board oversight of the process Relax due process requirements in cases of alleged grooming or abuse of a minor Clarify in bylaws the use of preponderance of the evidence standard Ensure that all persons involved in response to reports are properly trained Remove or extend time bar for allegations relating to abuse and other violations of the code of ethical conduct
Education, training, and athlete support	Implement a strategic, comprehensive abuse prevention training plan for members, parents, and athletes Create stand-alone course in "preventing child abuse in gymnastics" Revise and expand the current "preventing child abuse in gymnastics" course Ensure that USA gymnastics consistently reinforces the revised training content through annual training requirements Create a required, annual safe sport training for all members regarding USA gymnastics' revised abuse prevention policies, procedures, and reporting mechanisms Include mandatory plenary sessions for all national congress attendees on safe sport requirements and abuse prevention information Require all member clubs to host annual training for coaches, athletes, and parents (all together) regarding the revised code of ethical conduct and revised safe sport policy Consider creating a safe sport certification for clubs. Provide parents with information about USA gymnastics abuse prevention policies and procedures and how to protect their children from abuse on an annual basis Provide athletes with age-appropriate abuse prevention education on an annual basis Provide a stronger support system to athletes Consider creating an "athlete bill of rights"
Encouraging reporting of suspected violations	Permit third-party reporting of policy violations and abuse to USA gymnastics by third parties Require reporting of abuse and reporting of policy violations Enforce serious consequences for failure to report abuse Expand reporting methods to encourage and facilitate reporting Accept and investigate reports relating to misconduct by a member in which the victim is a nonmember Provide training to all members and staff regarding reporting requirements

(continued)

Table 13.6 (continued)

General	Specific recommendations
National team training center	Create a policy handbook and code of conduct for all coaches bringing athletes to the training center Develop a transportation policy for national team training center and include this information in the new handbook Formalize the athlete and coach orientation meetings at each specific camp Create a formal monitoring plan for all athlete lodging Provide athletes with a reliable and accessible way to call home/parents Formalize the role of the athlete representative, and ensure this individual does not continue to sit on the selection committee Formalize safety procedures for the Talent Opportunity Program (TOPs) camp Require all national team coaches and staff to complete an intensive in-person training on abuse prevention and athlete safety Discontinue use of the athlete recovery center in the Beijing motel and consider moving to a more central and open location Improve physical safety and emergency communications
National team selection process	Many competing concerns regarding the general selection process The athlete representative … under no circumstances be included in the team selection process

Daniels (2017). Used with permission

ensuring a safe environment for children participating in organized sports and a necessary part of the creation of a culture of safety and well-being for child and adolescent athletes:

> Today is the culmination of months of hard work in the Senate and House, and by the many gymnasts and other athletes who championed this bill and advocated passionately for its passage. Every adult involved in amateur and collegiate athletics must now know that they have a responsibility to protect the young athletes in their care … The days of turning a blind eye to abuse are over. This vital reform was only possible because of the incredibly courageous women who decided to come forward, share their pain and do all they could to make sure this dark chapter is never repeated. They all deserve our thanks.

The bill ensures that child and adolescent athletes can report allegations of abuse to an independent entity, the US Center for Safe Sport, to make sure that all national governing bodies such as USA Swimming and USA Gymnastics continue to follow the strictest standards for child abuse prevention, detection, and investigation (Feinstein 2018).

In 2018, as part of the Omnibus reconciliation process, representatives Ted Poe (R-TX) and Annie Kuster (D-NH) introduced the bipartisan *Keep Young Athletes Safe Act of 2018*, to provide a funding mechanism to help protect child and adolescent athletes under the jurisdiction of the USOC from physical, emotional, and sexual abuse. The bill authorizes the Department of Justice to provide funds for

nonprofit, nongovernmental entities to support oversight and anti-abuse education at the USOC, its national governing body, and each Paralympic sports organization. According to representative Poe: "The Keep Young Athletes Safe Act is critical in protecting our young athletes from sexual abuse" (Kuster 2018; Poe 2018).

Toward the Future

With regard to potentially unsafe environments in organized sporting activities, the dilemma for the athletes is made clear by Daniels in her report on the situation in USA Gymnastics:

> Everything about this environment, while understandable in the context of a highly competitive Olympic sport, tends to suppress reporting of inappropriate activity. The athlete and her parents are not certain what behavior is inappropriate; the athlete is expected to bear pain and emotional stress without complaint; the young female athlete in particular is highly desirous of gaining the approval of adult authority figures; and the athlete's opportunity for success in competition hinges on pleasing her coach. Even fellow athletes are in competition with each other, further suppressing the desire to report inappropriate activity by adults, even to peers. Elite gymnastics is not truly a team environment; while some friendships form, each individual is in competition with every other individual gymnast. In this environment, it is highly unlikely that the athletes themselves will report abusive activity to others. In addition, we have learned that some athletes who did report abuse were ostracized by coaches, fellow athletes, and even those athletes' parents, who either did not believe the reports or simply did not want a popular and purportedly effective coach sidelined. (Daniels 2017, p. 12)

The IOC recognizes the needs for attention to the safety of the sporting environment and calls for more research to develop a robust evidence base for ongoing and future efforts to keep children and adolescents safe while participating in organized sporting activities. But the IOC makes clear that efforts in organized sports directed at projecting the health and well-being of child and adolescent athletes should not wait while the research is being conducted:

> Much more research is needed to protect athletes of all ages and impairments… Such research should include prevalence of all forms of non-accidental violence in countries for which there are currently no data; the gendered nature of violence; mechanisms of disclosures and responses to violence; violence prevention methods; safe sport advocacy and effectiveness (what works, from team selection to postgames review); and athlete consultation methods. However, action to ensure safe sport need not wait for these studies. Everyone involved in sport, not least the athletes themselves, will benefit from 'safe sport'. It is incumbent on all stakeholders in sport to adopt general principles for safe sport …as well as to implement the following recommendations without delay in a culturally respectful and sensitive manner. (Daniels 2017, p. 1025)

As the research continues to emerge about the factors related to the risk for maltreatment and victimization to children and adolescents in organized sporting activities, there continues to be ever more concerted efforts to recognize the human right that these young people have to grow through and enjoy the benefits of participation in sporting activities in a safe and nurturing environment that has their health and well-being at its very core.

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Chapter 14
Corporal Punishment

Paige Culotta and Taylor McLain

Terminology

Corporal punishment has been used by caregivers as a way of correcting a child's behavior from the beginning of documented history (Gershoff 2013; Zolotor 2014). While not new to society, its use in children has become a more pressing issue as adverse childhood experiences are more intensely studied. Corporal punishment is a broader term that encompasses various methods including spanking, but is more specifically defined as a form of punishment intended to cause physical pain, often used with children as a form of discipline for undesirable behavior (Ferguson 2013; Zolotor 2014). The American Professional Society on the Abuse of Children (APSAC 2016) defines corporal punishment as "the use of physical force with the intention of causing a child to experience pain, but not injury, for the purpose of correcting or controlling the child's behavior."

This physical form of discipline covers many different terms including whipping, smacking, paddling, hitting, or slapping. The specific interpretation of each term typically varies by its user. Spanking is generally thought of as the strike of an open hand against the skin, though in a similar act the individual inflicting the punishment may also use an object such as a belt or cord (Mackenzie et al. 2015). The expression also does not necessarily indicate which part of the body is receiving the pain and whether the hand or object strikes against clothing or bare skin. Each of these forms of discipline associates an unwanted behavior with a negative stimulus with the idea of eliminating the occurrence of that behavior (Altschul et al. 2006).

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Though significant injury may not be the intent, corporal punishment has many inadvertent consequences. While there is often a fine line between corporal punishment and abuse, the former is considered legal in the United States if no significant injury results (Zolotor 2014).

History

Corporal punishment is considered a normal response in some cultures, including the American South and African Americans, and is thought to be more common in families with low socioeconomic status, though information on this subject is limited to parental and child report as its use is often restrained in public settings (Lansford and Dodge 2008). Use in these settings may relate to certain cultures placing more of an emphasis on obedience and respect as well as the support of religious beliefs or scripture passages for these actions (Friedson 2016; Taylor et al. 2011). Socioeconomic status is inversely related to value on obedience (Friedson 2016). African American families are more supportive of an authoritarian parenting style, having high expectations for children while offering minimal clear feedback on behavior or nurturing (Friedson 2016). This style of parenting sets children up to maintain a similar socioeconomic status to their parents', as the enforcement of compliance without questioning prepares children for employment with similar restrictions (Friedson 2016).

Attitudes toward physical punishment appear to remain consistent with that of the caregiver's upbringing even when their socioeconomic status has changed (Friedson 2016; Taylor et al. 2011). Thus, spanking is more likely to occur in homes of caregivers who have received physical discipline themselves as a child, often using the explanation "I turned out okay" as defense or even support of these actions (Taylor et al. 2011). Similarly, differences in discipline styles are also related to a parent's country of origin. For example, a study by Lee et al. (2013) found that US-born Hispanic parents were more likely to spank their children compared with their foreign-born counterparts, even when controls for income, education, and environment were in place. These and other studies consistently demonstrate the strong cultural influence on child-rearing behaviors including those that include physical discipline.

Prevalence

Data on corporal punishment is difficult to ascertain since numbers have been generally based on self-reporting, as randomized trials would be clearly unethical and the action is less likely to be performed in a setting that has observers. This report by a parent or child may be influenced by memory or even embarrassment. Even still, physical punishment is thought to be widespread in the United States (Zolotor

2014). Recent studies have shown a decline in spanking by 18% between 1975 and 2002 in children ages 3–11 from a previously reported 76% (Zolotor 2014). It is difficult to know if this is a true decline or only that of the social acceptability of physical discipline as this study used self-reporting by caregiver (Zolotor 2014). Despite this reported decline, studies continue to show an extremely high number of children receiving physical punishment as a major source of discipline. The United Nations Children's Fund (UNICEF) reported that half of children in a 33-country survey had been physically disciplined by their parents, a number that appears to be even greater in the United States with 65% of 19- to 35-month-olds (Regaldo et al. 2004; UNICEF 2010).

Studies show that American parents believe corporal punishment to be a socially acceptable, normal part of child-rearing, thus contributing to its widespread nature (Chiocca 2017). Spanking is most prevalent in preschool and school-aged children but does occur even in the first year of life (Mackenzie et al. 2011; Wissow 2001). APSAC (2016) has identified that nearly 50% of children have been spanked by 18 months of age. While a risk at any age, the likelihood of physical punishment increases as a child ages (Altschul et al. 2006). A study by Taylor et al. (2009) found that over 70% of US parents approved of the use of corporal punishment. Even staff in medical facilities were unlikely to identify spanking as harmful, and those who did suspected that their co-workers did not agree with these thoughts (Gershoff et al. 2016). Favorable attitude toward corporal punishment is a consistent predictor of its use as a preferred method of discipline (Taylor et al. 2009). Furthermore, attitudes of perceived disagreement by peers discourage onlookers from responding to public displays.

Supporters have cited reasons for their beliefs to include personal experience, belief that the action improved behavior, and the opinion that other forms of discipline were not as effective. Many caregivers believe spanking to be an effective form of punishment that will result in changing a particular behavior, with alternate options being less effective (Altschul et al. 2006; Zolotor 2014; Taylor et al. 2009). Several were also of the opinion that this use of physical discipline was not considered abuse and caused no harm to the child (Taylor et al. 2009).

Physical punishment of children being a social norm has been cited as one of the main risk factors for child abuse, with its use increasing the odds of physical abuse by 3–9 times (Klevens and Whitaker 2007; Straus 2010; Zolotor et al. 2008). Corporal punishment is often used in times of frustration and anger, responding immediately to an inappropriate behavior, decreasing parental control in the situation, and increasing the risk of intended or unintended injury to the child. Though spanking or other forms of physical discipline may produce an immediate response, over time force and frequency of the punishment must increase to produce the same desired response, especially as the size of the child increases. This contributes to frustration as well as increased likelihood of significant injury. Additionally, corporal punishment is thought to increase other forms of abuse including psychological aggression and neglect, putting children at even further risk of maltreatment (Taylor et al. 2009).

The United States does not currently have clear standards of unacceptable forms of punishment by parents, while Sweden has led the way of the more than 50 countries outlawing all physical punishment of children, including within the home (Klevens and Whitaker 2007; Durrant 1999; Global Initiative to End All Corporal Punishment of Children 2017). In most societies, it is illegal to use physical force against an adult as it is seen as a violation of the human rights of that individual. In this sense, one must ask, are a child's rights to be relinquished or should there be more specialized rights assigned to childhood for their protection (Zolotor 2014). In 1998, the American Academy of Pediatrics (AAP) issued their position on corporal punishment. In it they describe that "physical discipline is of limited effectiveness and has potentially deleterious side effects" (American Academy of Pediatrics, Committee on Psychosocial Aspects of Child and Family Health 1998). The AAP also notes that parents should practice alternative forms of discipline. Evidence behind the AAP recommendations has demonstrated that spanking is ineffective and harmful and leads to negative outcomes in children.

Ineffective

Contrary to the belief that spanking will produce desired results, research shows that it is actually not effective for reducing unacceptable behavior or developing positive patterns of behavior in the short or long term (Altschul et al. 2006). There are no studies in the literature to demonstrate positive outcomes associated with violent forms of punishment (American Professional Society on the Abuse of Children 2016). While spanking and other forms of physical discipline may abolish an undesired behavior in the immediate setting, there is no evidence of desirable long-term results. In addition to ineffectiveness in the long term, parents are forced into a cycle of escalating harm. With a bad behavior a spank is delivered, but each subsequent spank must be of greater force or frequency to effectively illustrate their disapproval. This becomes even more difficult as the child becomes larger.

In fact, the use of physical discipline, such as spanking, is in direct conflict with a child's ability to learn, as children do not readily interpret or internalize their parent's disciplinary messages when they are sad or afraid (Dobbs et al. 2006; Gershoff 2013; Grusec and Goodnow 1994). At the time of a spanking, the child feels scared, threatened, and confused. They have been taught not to hit, yet this is what is happening to them by the person they look to for love and guidance. Physical punishment goes against what children have been taught and differs from other forms of punishment in that it involves violence (Gershoff 2013). It demonstrates that physical aggression is normal and acceptable in loving relationships and an appropriate means by which someone can obtain a desired object or outcome (Eron et al. 1971). This further perpetuates the use of violence within families.

Spanking, compared to alternate forms of punishment, has also not been found to increase compliance in the long term. As stated previously, caregivers use spanking in an effort to eliminate a behavior, not only in the acute instance in which it is

occurring but permanently. This process requires a child's learning, understanding, and internalizing the goal of the parent. Multiple studies have evaluated the effectiveness of spanking in promoting development of a child's ability to operationalize obedience to commands and establish a resistance to the temptation and have found that spanking does not accomplish this and actually results in less compliance in the long term (Gershoff 2002; Gershoff and Grogan-Kaylor 2016).

A child has an exceptionally complex pattern of learning, which is not fully addressed by physical punishment and thus does not allow the child to infer the lesson that is intended from a spanking. Spanking alone does not educate a child on why their behavior was wrong or offer appropriate alternatives but rather teaches them to fear a physical punishment (Hoffman 1983). When the threat is removed, they have no incentive to continue to behave properly (Hoffman 1983). Caregivers should be encouraged to approach a punishment in a way that identifies the inappropriate action and teaches a child how to change the behavior to one that is acceptable (Gershoff 2013). Children must internalize a caregiver's reasoning for appropriate, acceptable behavior to successfully learn socialization (Grusec and Goodnow 1994).

Harmful

The majority of parents who utilize spanking as a form of discipline love their children and are attempting to be good parents. Frequently, they are modeling behavior that was demonstrated to them when they were children. Very simply put, however, spanking is violence against the child. Many groups at the national and international level have spoken out against the practice of spanking, citing it as a type of violence (Gershoff 2013). When considering the most serious of consequences, spanking places children at significantly increased risk of abuse (American Professional Society on the Abuse of Children 2016).

Some reports have shown that the favor and use of corporal punishment have been decreasing over the last several decades. However, one study noted that 74% of parents reported hitting their children and 47% of them reported hitting very young children in spite of the known negative consequences (Klevens and Whitaker 2007). Overall, the use and favor of physical punishment, specifically among US adults, are high with 76% of men and 65% of women citing it as a requisite part of child-rearing (Taylor et al. 2009). Unfortunately, this is likely because spanking and the use of corporal punishment remain deeply ingrained in American culture and are considered a social norm. Because physical abuse typically arises from parental intention to discipline, the cultural acceptance of spanking and other forms of corporal punishment must change before we can successfully prevent physical child abuse (Klevens and Whitaker 2007).

Numerous reports of child abuse have stemmed from an initial incident of spanking (Thompson et al. 2017). A major study performed in Canada found that nearly three quarters of "substantiated physical abuse" evolved from an incident that

started with physical discipline (American Professional Society on the Abuse of Children 2016). This demonstrates the ease with which spanking can evolve into a more violent act. There is also evidence showing a positive correlation between the increasing use of physical punishment and the escalation of severity of physical and psychological aggression (Taylor et al. 2009). One study demonstrates a threefold increase in child physical abuse with the use of spanking and a ninefold increase in physical child abuse when an instrument, such as a belt or paddle, is utilized (Taylor et al. 2008). In addition to the frequency and severity of corporal punishment, the age at which a child experiences spanking is also a strong determinant of future risk of abuse. Children younger than 9 months of age whose parents engage in corporal punishment have significant risk of near fatal or fatal abuse as compared to older children (Thompson et al. 2017).

As referenced above, it is likely that social norms surrounding corporal punishment are one of the greatest risk factors for child abuse in the United States. Spanking and other types of corporal punishment have a strong positive correlation with other forms of family and intimate partner violence (Taylor et al. 2009). Domestic and intimate partner violence, in turn, exposes children to greater risk of maltreatment. Thus, infants and children in homes where spanking and corporal punishment are utilized are at a significantly higher risk for other further acts of violence, physical and psychological aggression, and neglect by their parents and caretakers (Taylor et al. 2009). In addition, it has been shown that children who are spanked or receive other forms of corporal punishment have an increased risk of later CPS involvement (American Professional Society on the Abuse of Children 2016). A majority of authors of longitudinal studies have concluded that spanking and other forms of corporal punishment have long-term effects of negative outcome in childhood and early adulthood (Ferguson 2013).

Negative Outcomes

Not only has spanking been cited as ineffective and harmful; it has little to no positive effects in the short or long term. Spanking and physical discipline use pain and fear to elicit a positive and productive response from children and teach them that violence is an acceptable way to resolve conflict or express disapproval (Gershoff 2013). For example, if a parent spanks a child for hitting a sibling, the parent is, ironically, demonstrating that conflict and disapproval can be communicated through violence. Parents spanking to punish a child's own aggression is hugely confusing for the child, though defended as a "do as I say, not as I do" form of parenting. These children then have a higher likelihood of utilizing aggression and physical contact as a way to resolve conflicts between siblings or peers (Taylor et al. 2009).

Spanking a child is not simply discipline in the acute setting (Mackenzie et al. 2011). A growing body of evidence shows that children of all backgrounds respond negatively in the years after spanking or physical discipline occurs. Spanking and

physical punishment have been associated with increased aggression and violence and poor mental health in both the long term and short term (Altschul et al. 2006). In the Fragile Families and Child Wellbeing Study, findings showed that spanking in the early developing years was directly correlated with increased externalizing behaviors later in life, including physical aggression, verbal bullying, relational aggression, defiance, theft, and vandalism (Mackenzie et al. 2011). This study demonstrated the direct relationship between corporal punishment and externalizing and aggressive behaviors that reach well into adolescence (Mackenzie et al. 2011). In another large, multicenter study, children aged 2–49 months who were spanked as discipline were nearly 3 times more likely to exhibit aggressive behaviors such as hitting, kicking, and throwing. Researchers also noted that for this same population, the risk of aggression was not related to the child's psychosocial status (Thompson et al. 2017). The literature also demonstrates that the more frequently a child experiences physical discipline, the higher the rate of aggression in the child. This includes higher rates of delinquency and criminality (Lansford and Dodge 2008).

Spanking at an early age was also an indicator of reciprocal spanking in adulthood (Mackenzie et al. 2011). This alludes to the vicious cycle of violence that perpetuates throughout generations. A child endures physical discipline such as spanking, demonstrates externalizing behavior and aggression throughout childhood, and goes on to utilize spanking as a form of physical discipline with their own children as they have not learned alternate forms of regulating a child's behavior (Mackenzie et al. 2011). One study demonstrated an increase in aggression of children years 3–5 who were spanked between the ages of 1 and 3 (Thompson et al. 2017). This same study showed that increased aggression at age 3 was related to a significant increase in maternal spanking at this same age, demonstrating an unbroken cycle of violence and aggression (Thompson et al. 2017).

It is postulated that pathways involved in the link between child maltreatment and physical health are likely similar to those that are responsible for poor health outcomes (Taylor et al. 2008). Growing research involving both animal and human studies suggests there is a dysregulation at the hypothalamic-pituitary-adrenal axis with resulting increases in cortisol. This biological stress response affects physical health over time. Neuroimaging has also shown alteration of cerebral anatomy and function in those who have experienced corporal punishment. Additionally, it is possible that pain perception and threshold can be altered by similar pathways through alterations in sleep and subsequent changes in physical symptoms (Taylor et al. 2008).

It is well demonstrated that infants and young children who endure chronic physical discipline demonstrate high hormonal reactivity to stress (Taylor et al. 2008). Many studies have consistently demonstrated the connection between corporal punishment and an increased risk of mental health changes such as mood, anxiety, substance, and personality disorders (Taylor et al. 2008). Pain inflicted on the child, whether by physical punishment or physical abuse, causes stress that is perceived similarly by the child (Taylor et al. 2008). In the absence of child maltreatment and abuse, adults with a history of corporal punishment are at a higher risk of poor

health outcomes, namely, diabetes, arthritis, cardiovascular disease, and obesity (Taylor et al. 2008).

Spanking and corporal punishment also have an indirect correlation with cognitive performance and abilities (Ferguson 2013). Ferguson showed that physical discipline was more often related to decreased or poor cognitive abilities in comparison to other negative outcomes. This is most likely related to the interruption of the nurturing environment that is caused by physical discipline (Ferguson 2013).

Not only is corporal punishment detrimental to the children who experience it; Lansford and Dodge (2008) have found that increased rates of physical discipline and corporal punishment within a society lead to higher rates of adult acceptance and application of violence at a societal level. Violence experienced in childhood allows adults to more readily normalize violence on a grander scale. This includes children viewing physical discipline as an acceptable form of conflict resolution, leading to the use of physical force in order to solve problems. Specific cultural groups such as African Americans, low socioeconomic families, and families from the American South are more at risk for this increase in the use of generalized physical force leading to higher rates of societal violence (Lansford and Dodge 2008).

Better Options

Corporal punishment, as discussed above, is a poor option for discipline both in the short and long term. Spanking and other forms of physical discipline utilize the behaviorism technique of positive punishment. A punishment is employed in an effort to remove an undesired behavior. While this may work with a nonviolent behavior (e.g., detention), abundant evidence has shown that this is not the case with corporal punishment. Instead of violence, it is recommended that parents practice positive parenting through positive discipline. Positive discipline is a parenting technique that focuses on directing and molding a child's behavior in a nonviolent manner. Positive discipline allows parents to respect their child's developmental process while correcting behavior through communication, empathy, and modeling. This discipline model teaches and reinforces good behavior through creating intrinsic motivation, redirecting negative behaviors, and acknowledging an unmet need rather than a bad behavior. Through this positive interaction, parents create long-term improvements in behaviors, and children develop lasting social and problem-solving skills (Parker and Stimpson 2000).

Timeout is another alternative discipline technique instead of spanking or corporal punishment. Timeout is defined as "the withdrawal of the opportunity to earn positive reinforcement or the loss of positive reinforcers for a specified time, contingent upon the occurrence of a behavior; the effect to reduce the future probability of that behavior" (Kostewicz 2010). Timeout, when used immediately after an undesired behavior and in the appropriate environment, can be extremely effective discipline (Kostewicz 2010). It is important to utilize timeout in an age-appropriate manner: 1 minute for every year in age up to 5 minutes. After administering an

appropriate timeout, a period of positive reinforcement and praise for good behavior immediately following helps to underscore its effectiveness (Kostewicz 2010).

Parents should identify and highlight good behaviors as frequently as possible with praise. This helps to take the focus away from children constantly hearing the word "no," and they learn that desired attention comes from good behavior rather than acting out. When developmentally feasible, communicating to a child what actions are appreciated reinforces good behavior through positive reinforcement.

What Should Pediatricians Advise?

Currently, there is no strict standard of belief when discussing spanking and corporal punishment among health-care providers (Taylor et al. 2009). However, when evaluating health-care professionals' attitudes toward spanking, the vast majority report a negative opinion toward this and other forms of corporal punishment. To more thoroughly investigate this notion, APSAC sent a national survey to its members in an effort to measure their beliefs on physical discipline and spanking. In this study, the overarching position was similar among providers, with 82% of members agreeing that spanking is a poor disciplinary technique and 74% of members describing spanking as harmful (Taylor et al. 2009). The next step then becomes translating this information from provider opinion into family education. Pediatricians are the medium with which this education can successfully occur and often the source that parents look to for sound advice. Pediatricians should be viewed as trusted professionals who have many occasions to address discipline strategies with parents and to encourage the health and well-being of their patients.

The literature shows that pediatricians should bring up discipline techniques at well-child visits early and often, even before the 9-month well visit (Olson et al. 2004). This allows for early setting of expectations through each developmental milestone as well as creating rapport with the families. During these encounters, pediatricians can also revisit parent questions and continue to promote nonviolent parenting techniques. Unfortunately, appropriate discipline strategies and advice are notably lacking during the present-day well-child visit. According to one study, child guidance and discipline were the least-talked-about topic at the last well-child visit. Discipline techniques in this study were not addressed at 43% of the visits for their 10- to 18-month-olds, according to polled parents. Additionally, parents reported that not only were discipline techniques not addressed and they would have found this information beneficial (Olson et al. 2004). This discrepancy of parental education could help explain the prevalence of spanking that has persisted in American culture.

It is beneficial for pediatricians to review parental expectations at every developmental stage. At each well-child visit, the provider should discuss age-specific developmental milestones with parents in an attempt to then define appropriate discipline strategies. Often parental frustration, and thus spanking, results from inappropriate expectations of their child. For example, a parent may be easily frustrated

or quick tempered with a colicy 2-month-old and spank them in an attempt to abolish the act of crying. In these situations, providing parents with the expectations of normal 2-month-old behavior not only helps set expectations for proper parenting but also protects the child from inappropriate parental reactions. Not only should pediatricians discuss with parents these developmental expectations; they should also address developmental phases that may cause stress for parents, including normal exploratory behavior, normal negativism, and normal poor appetite.

Additionally, behaviors such as colic, nighttime awakening, separation anxiety, and toilet training resistance are a handful of transitional phases found to be particularly difficult for parents to manage (Schmitt 1987). Crying, specifically, is a behavior that should be discussed frequently with parents. Pediatricians should regularly gauge parents' perception of their infant's or child's crying and techniques they use to cope. Cases in which parents are poorly managing their child's crying should be addressed on an individual basis, and alternative discipline or coping strategies (e.g., placing the crying child in their crib or room and shutting the door) should be provided. Persistent and open dialogue between parents and providers helps to maintain safety throughout each developmental stage. This normalizes a child's behavior while also assisting parents in understanding that the action is not their fault or evidence of failure.

Optimally, pediatricians should tailor opportunities for education to their target audience as it is very likely that parents who utilize spanking, and other forms of physical discipline, were spanked as children themselves. Parents are more likely to perpetuate this cycle of violence and aggressive behavior to the next generation if they are not properly and frequently educated (Afifi et al. 2013). Commonly, parents believe that physical discipline has had favorable outcomes within their own culture, adding a layer of complexity to the underlying behavior (Lansford and Dodge 2008). This highlights the fact that pediatricians should be aware of the views and beliefs of discipline held by their community. A pediatrician with high cultural literacy has the potential to advance evidence-based practice of reducing the use of corporal punishment as well as change parents' understanding of corporal punishment within specific cultures (Afifi et al. 2013). Perhaps in some groups, the cultural normativity of physical discipline and spanking is so strong that education alone is ineffective. It is likely, in these situations, that cultural shifts and policy change may be the only effective way to help reduce both family- and society-level violence, thereby reducing externalizing behavior of the individual children involved (Lansford and Dodge 2008).

Awareness of the rapidly growing number of families experiencing stress will benefit pediatricians in learning to recognize situations that interfere with successful child-rearing and address them appropriately. Early identification of stressors like maternal depression, domestic and intimate partner violence, separation/divorce, or substance abuse allows for early intervention and increases positive outcomes for the children involved. At each visit, care providers should consider family strengths and weaknesses and work to identify, develop, and participate in community-based family support programs (American Academy of Pediatrics, Committee on Psychosocial Aspects of Child and Family Health 1998). It is the pediatrician's duty

to encourage the growth and development of healthy children by supporting the development of healthy families.

If a child is spanked for any reason, parents, when calm, should return to the child to calmly explain why they hit the child and the specific behavior that provoked them and apologize to the child for their loss of control. This helps the child understand the spanking, and it models how to apologize for a mistake. This also fosters a calm, safe environment where a child feels less threatened, allowing them to process and internalize the teaching provided in that moment. In the future, every effort should be made by the parent to refrain from this discipline technique.

There is seldom a time where the line between corporal punishment and child physical abuse is clear and distinct. Pediatricians should caution parents of the ambiguity between physical discipline and child abuse. What's more, evidence supports the view that cases of physical abuse often begin as a parent utilizing physical discipline. It is important for physicians and other providers to be mindful of their impact on their patients as evidence demonstrates a decreased rate of perceived or reported child abuse when a provider condones the use of corporal punishment (Taylor et al. 2009). Overall, spanking should not be condoned by any pediatrician at any age (Afifi et al. 2013). If pediatricians readily discourage corporal punishment and focus on frequent and repetitious education, parents are more likely to adopt similar behaviors in the home (Taylor et al. 2009). This also includes tailoring educational efforts to the cultural needs of their patient population. In summary, pediatricians should advise that corporal punishment of all definitions (e.g., spanking, hitting, slapping) should be seen as violence toward a child.

Summary

Spanking does not appropriately convey disapproval of a child's action or offer a means with which to correct their behavior. As with all types of physical discipline, it is impulsive and aggressive at best and is much more likely to result in negative consequences for the child. Corporal punishment leads to negative outcomes for all children regardless of race, ethnicity, or socioeconomic background. Cultural acceptance of the practice does not spare a child the harmful consequences. Worldwide, human rights groups and academic societies strongly disavow the use of spanking and physical discipline, and many countries have already banned or are working toward completely outlawing corporal punishment. It is recommended that pediatricians and other providers discourage and ardently educate against spanking and other acts of physical discipline. The literature shows that spanking and other forms of corporal punishment are ineffective and potentially harmful and subject a child to a host of negative outcomes.

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Part IV
Teamwork

Chapter 15
Multidisciplinary Teams

Maria D. McColgan, Dominick A. Siconolfi, and Allan DeJong

Children allegedly killed by mother were previously in DHS custody

V. Odom, ABC News, 6-10-2016

A 10-year-old's wholly preventable death

M. Newall, Philly.com, 7-17-2017

Introduction

The goal of the investigation of suspected child maltreatment is to help create a safe environment that fosters the child's health and development while simultaneously holding accountable the person or persons who put the child in harm's way. A thorough, effective investigation of child abuse and neglect can have a tremendous effect on the outcome of a case and the well-being of the child. However, the high volume of child abuse and neglect cases often strains the capacity of the agencies involved. Child abuse cases are multifaceted, as cases of child abuse involve social, medical, legal, psychological, and other issues. These complexities are beyond the scope of what any one professional can tackle.

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Cases of child abuse that reach the media are often cases in which child protective service (CPS) systems are being blamed for allowing children to die in their care. An Internet search of child fatalities reveals thousands of headlines of recent deaths of children who were under CPS agency supervision. These stories highlight the breakdowns of the investigations and tend to place blame on those involved. While it is horrifying that cases under investigation can result in such dismal outcomes, the reality is that child maltreatment investigations are complex and difficult.

By evaluating high-profile cases in which there was a breakdown in the processes that were designed to protect children, we can develop a community response to improve systems. Political and legal action may occur in response to these situations, establishing multidisciplinary oversight in the form of task forces or commissions to identify the failures in the system and lack of appropriate function that led to the poor outcome. For example, failures by social, law enforcement, and medical agencies to recognize ongoing episodes of abuse eventually led to the death of a 4-year-old boy in Delaware from a fatal alcohol overdose at the hands of his father's girlfriend. His death prompted the state of Delaware to create the Child Protection Accountability Commission.

These cases underscore the need for multidisciplinary cooperation and the development of ad hoc task forces. Therefore, multidisciplinary teams (MDT) were created to foster communication and collaboration between the professionals involved in investigations of child abuse to improve the outcome of the investigation and plan for the ultimate well-being of the child, as well as to avoid bad outcomes as in the cases above. In some states attention to these cases has led to improved statewide funding, increased development of MDTs, and the development of consistency in statewide and regional protocols.

The goals of this chapter are to define an MDT, address the role of an MDT, and discuss the settings in which an MDT can be used to improve the investigation and therefore the medical, legal, and social outcome in cases of child abuse and neglect.

What Is an MDT?

The US Department of Justice defines an MDT as "a group of professionals who work together in a coordinated and collaborative manner to ensure an effective response to reports of child abuse and neglect" (US Department of Justice 2015). Originally enacted in 1974, and most recently amended in 2010, the Child Abuse Prevention and Treatment and Act (CAPTA) (Child Abuse Prevention and Treatment and Act 2010) further defines the professional unit as having representatives from health, social service, law enforcement, and legal service agencies to coordinate the assistance needed to handle cases of child abuse. It further states that a multidisciplinary child abuse team shall be used when it is feasible and that "the court and the attorney for the Government shall consult with the multidisciplinary child abuse

team as appropriate." Services that should be provided for a child by the MDT include:

(A) Medical diagnoses and evaluation services, including provision or interpretation of radiographs, laboratory tests, and related services, as needed, and documentation of findings.
(B) Telephone consultation services in emergencies and in other situations.
(C) Medical evaluations related to abuse or neglect.
(D) Psychological and psychiatric diagnoses and evaluation services for the child, parent or parents, guardian or guardians, or other caregivers or any other individual involved in a child victim or child witness case.
(E) Expert medical, psychological, and related professional testimony.
(F) Case service coordination and assistance, including the location of services available from public and private agencies in the community.
(G) Training services for judges, litigators, court officers, and others that are involved in child victim and child witness cases, in handling child victims and child witnesses (Child Abuse Prevention and Treatment and Adoption Reform 2006).

The first known MDTs were created in the 1950s in Pittsburgh, Los Angeles, and Denver in the hospital setting (Lashley 2005; Kolbo and Strong 1997). Community-based MDTs emerged shortly thereafter. In 1985, the nation's first Children's Advocacy Center opened in Huntsville, Alabama (National Children's Alliance 2017b). Federal funds to develop multidisciplinary task forces became available in 1986. There are now thousands of MDTs with most states having legislative mandates for ongoing MDTs. MDT investigations are recommended by many organizations including the American Academy of Pediatrics, National District Attorney's Association (NDAA), National Children's Alliance, National Children's Advocacy Center, National Association of Children's Hospitals, and related institutions (NACHRI) (Kellogg 2007; NACHRI 2005a, b; National Children's Alliance Standards for Accredited Members 2017c).

Teams can vary based on settings, function, composition, sponsorship, and other characteristics (National Children's Alliance 2017b). An MDT may focus on investigations; policy issues; treatment of victims, their families, and perpetrators; or a combination of these functions (Ells 2000; National Children's Alliance 2017b). An MDT can take the form of a formal team that meets at regularly scheduled intervals, a team that works together on a daily basis, or an informal team that communicates on an as-needed basis.

The goal of forming an MDT is to provide communication and checks and balances. The benefits of an MDT have been well-established and include benefits to the patients and their family, agency staff, investigators, and the community.

There are many benefits to the MDT approach (Ells 2000; Dinsmore 1993; Giardino and Ludwig 2002; Kolbo and Strong 1997; National Children's Alliance 2017b), including:

- Reduction in the number of interviews from the child.
- Decreased trauma to children and families from the investigation.
- Improved communication, coordination, and collaboration between agencies.
- Better quality assessments, including more accurate investigations and more appropriate interventions.
- A broader range of viewpoints.
- Reduction in the number of people involved in cases.
- Reduction in duplication of services and thereby more efficient use of agency resources.
- Otherwise unknown resources identified.
- Enhanced evidence quality for both criminal and civil proceedings.
- Decreased conflicts between various agencies involved.
- Better-trained, more-capable professionals.
- More cases reviewed and fewer cases missed.
- More respect in the community and less burnout among child abuse professionals.

MDTs are not without challenges, however. Some reported challenges include difficulty collaborating, with some participants being hesitant or resisting participation, confusion about leadership roles, unclear ownership of the case, and perceived scrutiny of individual's work. Some participants felt, at least at first, that interdisciplinary decision-making was more time-consuming than traditional approaches. However, in the National Children's Alliance 2016 survey of 12,685 multidisciplinary team members, 98% believed clients benefit from the collaborative approach of the MDT (National Children's Alliance 2016).

Despite benefits, MDTs also face financial challenges, with many unable to be self-supporting, as low reimbursement payments do not cover all expenses for the team (Kolbo and Strong 1997; Lalayants and Epstein 2005). Potential funding sources can be found on the Child Welfare Information Gateway at https://www.childwelfare.gov/topics/management/funding/program-areas/prevention/ (Child Welfare Information Gateway 2017).

Settings and Types of Teams

While formal MDTs are often used in state and county investigative teams, the MDT model can be applied in a variety of settings. The focus of an MDT may be investigative; treatment of the victims, the family, or the perpetrator; or a combination of these functions (Ells 2000). An MDT may be formed by government agencies, law enforcement, child protective services, medical care organizations, and community advocacy centers. This approach can be used by any agency that deals with or investigates cases of child abuse or treats victims and their families.

Legal and CPS Investigative Teams

States requesting funding through the CAPTA Reauthorization Act of 2010 are required to establish and maintain a "State multidisciplinary task force on children's justice composed of professionals with knowledge and experience relating to the criminal justice system and issues of child physical abuse, child neglect, child sexual abuse and exploitation, and child maltreatment related fatalities." The bill states that the State task force shall include:

(A) Individuals representing the law enforcement community.
(B) Judges and attorneys involved in both civil and criminal court proceedings related to child abuse and neglect (including individuals involved with the defense as well as the prosecution of such cases).
(C) Child advocates, including both attorneys for children and, where such programs are in operation, court-appointed special advocates.
(D) Health and mental health professionals.
(E) Individuals representing CPS agencies.
(F) Individuals experienced in working with children with disabilities.
(G) Parents.
(H) Representatives of parents' groups.
(I) Adult former victims of child abuse and/or neglect.
(J) Individuals experienced in working with homeless children and youths (as defined in sect. 725 of the McKinney-Vento Homeless Assistance Act (42 U.S.C. 11434a)) (CAPTA Reauthorization Act of 2010, 2011).

A summary of each state's legislation mandating MDTs can be found at http://www.ndaajustice.org/pdf/MDT%20draft%20for%20MAB_%2001052015-last.pdf.

The National District Attorney's Association (NDAA) recommends an MDT consisting of the prosecutor, police, and social services for the investigation and prosecution of cases where a child is alleged to be a victim or witness to abuse in order to reduce the number of times that a child is called upon to recite the events involved in the case as well as to create a feeling of trust and confidence in the child. They further recommend that members of the team receive specialized training in the investigation and prosecution of cases involving child abuse and that the same prosecutor should be assigned to handle all aspects of a case. In 2000, the Office of Juvenile Justice and Delinquency Prevention (OJJDP) established a national training program on Child Death Investigation that includes modules on child fatality review teams. The NDAA also recommends a team approach in cases where children are witnesses to domestic violence and that domestic violence advocates should participate in child abuse MDTs (Turkel and Shaw 2003).

In 1993, CAPTA required states to establish child death review teams. As of 2012, all states report having state and/or local child death review teams. The purpose of a death review team is to review all cases of child fatalities to deter-

mine the cause of death, which deaths were preventable in cases of accidental trauma, and which are identifiable as inflicted trauma and to prevent future child deaths and improve the health and safety of the community. As a result of the determination, cases can be handled in an appropriate manner in regard to legal investigation. In addition, the social investigation can investigate the welfare of other children in the home to prevent both accidental and inflicted injury.

Child death review is very time-consuming, as most jurisdictions have many cases per month and each case is multifaceted. In addition, in the case of child fatality in a child under CPS supervision, a more specific case review must occur. This review is more in-depth than a typical review and not only evaluates the cause and preventability of the individual child's death but also investigates the failure of the system to protect the child in its care. The National Center for Fatality Review and Prevention, formerly the National Maternal and Child Health Center for Child Death Review, states that the purpose of a child death review team is to "conduct a comprehensive, multidisciplinary review of child deaths, to better understand how and why children die, and use the findings to take action that can prevent other deaths and improve the health and safety of children." They provide guidance and tools for local child death review teams on their Website at https://www.ncfrp.org/. Additional information on each state's team can be found at https://www.ncfrp.org/cdr-programs/u-s-cdr-programs/.

State commissions or task forces may be appointed by the governor to complete an overview of child protection issues. A task force may be charged with evaluating systematic issues throughout the state that involve the investigation, treatment, and prevention of child abuse and neglect and look to creating legislation to change laws related to protection. How state task forces or commissions function varies widely and depends on the purpose of the commission. Some task forces will have a limited specific task to discuss and solve a particular problem and present a solution. Others will be a standing commission that will continue to assess all components of the child protection system, support legislation and policies, and provide quality assurance. The role of such commissions is not only to determine if current legislation is appropriate and effective but, through continuous assessment of the function of the child protection system, to suggest changes in policy to promote improvement in the functioning of the system. The task force or commission is typically comprised of a group of professionals appointed by the governor. For example, in the state of Delaware, the Child Protection Accountability Commission is an appointed state commission composed of personnel from 19 different disciplines such as lawyers, medical mental health, CPS, foster work, independent social work agencies, and law enforcement. This commission's task is to evaluate all issues involved in child protection and to provide oversight for child protection issues in the state of Delaware. This task force has now incorporated child death review processes. This commission does not review particular cases to determine specifics such as whether or not to prosecute the case. Rather, it is meant to involve all aspects of the month-to-month functioning of the child protection system including but not limited to legislation, policy, oversight, and accountability and to make suggestions to improve the function of child protection in the state.

Global MDTs or medicolegal advisory boards are assembled in some states. This is typically a team of physicians, CPS personnel, prosecutors, mental health professionals, and law enforcement that helps prosecution teams around the state decide if a case should be prosecuted or how to proceed in cases where prosecution is being planned. Advisory boards, such as that created in Pennsylvania, are often assembled though the attorney general's office. For example, in 2012, the Pennsylvania General Assembly created the Pennsylvania Task Force on Child Protection. The goal of the task force was to review the state's laws and procedures governing child protection and reporting of child abuse. The task force members included prosecutors, child abuse pediatricians, educators, child protection caseworkers, advocacy group leaders, and a judge. The task force was instructed to hold public hearings and review written comments from individuals and organizations to formulate and submit recommendations to improve the reporting of child abuse and implement any necessary changes in state laws and practices, policies, and procedures relating to child abuse. The report, submitted November 2012, led to the creation of over 20 new laws, such as redefining and expanding mandated reporters and requiring mandated reporters to complete 2–3 h of training every licensing period. These teams may not be as formal as governor-appointed teams and may not have the same oversight that statewide commissions might have. However, the team may also discuss legislation that affects crime against children and may have input into legal issues that affect the child protection system in the state.

In some states, task forces are convened to solve a particular issue. The goals of a task force are to look at the issue, identify the pitfalls, and present solutions to the problem. This type of MDT is typically disbanded after generating a report presenting the solutions. This type of team does not necessarily carry out the proposed changes and may not have the responsibility for the actual oversight.

The Child Advocacy Center

In response to the fragmented approach to child abuse investigations and evaluation, the first Children's Advocacy Center (CAC) was formed by then District Attorney Bud Cramer in 1985 (National Children's Alliance 2017b). As of 2017, there are 822 CACs in the USA, 687 of which are accredited by the National Children's Alliance, gaining 31 total members in 2016 (National Children's Alliance Annual Report 2016, 2017a). Each state has at least one CAC to help children who have been abused. In 2016, CACs provided help to over 320,000 abused children and provided child abuse education to over 1.8 million people (National Children's Alliance Annual Report 2016, 2017a).

The National Children's Alliance states that a functioning and effective MDT is the foundation of a CAC (National Children's Alliance Standards for Accredited Members 2017c). Their vision statement is as follows:

> Children's Advocacy Centers are community partnerships dedicated to a coordinated team approach by professionals pursuing the truth in child abuse investigations. By bringing together professionals from law enforcement, criminal justice, child protective services, victim advocacy agencies and the medical and mental health communities, CACs provide comprehensive services for child victims and their families. (Children's Advocacy Center Definitions 2017)

The National Children's Alliance defines minimal requirements for certification as an accredited advocacy center. Minimal components of an MDT responding to allegations of child abuse must include representation from law enforcement, child protective services, prosecution, mental health professionals, medical professionals, victim advocacy, and child advocacy center personnel. The goals of the CAC model are to improve interagency coordination and cooperation and to provide a child-friendly atmosphere to reduce the trauma of the investigation on victims and their families. The child forensic interview is a central component of the CAC model. Therefore, trained forensic interviewers are usually employed to conduct interviews of children.

As of 2015, the CACs joined in alliance with the FBI to make sure that children in federal abuse cases are provided with the resources to get the help needed for recovery. As of the end of 2016, there are 565 CACs partnered with the FBI (National Children's Alliance Annual Report 2016, 2017a).

While the concept of a CAC investigation intuitively makes sense, initially there was a paucity of research proving the benefits of this model. A study published in 2007 examined four CACs and compared cases evaluated at the CACs with those evaluated in communities without CACs. While centers varied in their approach to coordination efforts, CAC cases were more likely to have police involvement in CPS cases, MDT interviews, case reviews, joint police/CPS investigations, and video/audio taping of interviews. In CAC investigations, 85% of child interviews took place in child-friendly CAC facilities, while interviews in comparison cases took place in less child-friendly locations such as CPS offices, police facilities, the child's home, or school (Cross et al. 2007). In another 2007 study, CAC and child protection team (CPT) investigations were associated with improved substantiation rates and investigation efficiency as compared with traditional child protective investigations (Wolfteich and Brittany 2007). Additionally, a cost analysis of CAC cases found that traditional investigations were 36% more expensive than the CAC investigation (Shadoin et al. 2006). The decreased number of child interviews has also been shown to be a benefit, thereby possibly reducing the trauma to the child and improving the outcome of the investigation by providing a sound child interview (Cross et al. 2007).

Medical/Hospital

The first hospital MDTs, developed in Pittsburgh and Los Angeles in the late 1950s, were a concept that quickly caught on. Discussion of hospital MDTs first surfaced in the medical literature in the 1970s. In 1973, pediatrician Ray Helfer recommended that any hospital seeing 25 or more cases of child abuse or neglect (CAN)

per year should have a well-defined MDT (Helfer 1973; National Center on Child Abuse and Neglect 1978).

The MDT approach has been used in the hospital setting in a variety of ways. Functions performed by CPTs included consulting on cases of CAN, functioning as a liaison with CPS, tracking cases of abuse or neglect, providing quality assurance on CAN cases, and filing reports with CPS. Twenty-four-hour consultative coverage was provided by most CPTs, with 94% providing phone consultation and 81% providing in-person consultation when necessary (Tien et al. 2002). Medical institutions for children with a CPT have been found to provide more comprehensive documentation for CAN and follow-up of children with suspected child abuse, including referral to law enforcement and a CAN clinic for follow-up.

Another benefit of a hospital MDT approach is a decrease in misdiagnosis of child abuse. For example, a study by Wallace looked at 99 children under 12 months with fracture who were referred to the hospital-based MDT for the concern for physical abuse. Seven percent of the referrals were not reported to CPS based on the findings of the MDT. They concluded that hospital-based MDT evaluation can prevent unnecessary referrals to CPS (Wallace et al. 2007).

In the ideal situation, all children who are suspected victims of child abuse would be evaluated in a children's hospital with a CPT. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) guidelines require hospitals to have practices in place to identify child abuse and domestic violence. This requirement is not unique to children's hospitals and must be in place in all health-care settings. Therefore, all hospitals must have a multidisciplinary response for situations where the concern for child abuse and/or domestic violence becomes evident.

In 2005, NACHRI, now the Children's Hospital Association, sponsored a survey of children's hospitals to identify the availability of child abuse services (NACHRI 2005a). From the 2005 survey, NACHRI defined a team as having a minimum of a physician, a social worker, and an administrative coordinator. The survey found that 4% of hospitals had no services and that 38% had child abuse services but did not have a formal team or program. Seventeen percent had a child abuse team, and 37% had a child abuse program. In the association's 2012 survey, 5 (3.6%) of 139 acute care children's hospitals still reported no child abuse services (Children's Hospital Association 2012).

The surveys highlight the complexity of the cases seen by these teams and note that when a child is admitted with concerns for maltreatment, the admission has doubled the length of stay, diagnoses, and cost of other pediatric admissions. Therefore, the association recommends that all children's institutions develop a program that fits the needs of the institution and the children they serve. They outline best practices in child maltreatment evaluations using a three-tiered standard for child maltreatment teams: basic, advanced, and a center of excellence. At the bare minimum, a basic team has an administrator and a physician, with access to social work support. The team's responsibilities are to consult on all child abuse cases, help to guide hospital policies on child maltreatment, facilitate timely reporting to CPS, and foster communication with agencies involved. An advanced program has the features of a basic program plus has 24/7 consultation, utilizes a multidisci-

plinary approach, and participates in community MDT meetings. A center of excellence has a larger MDT, including mental health and social workers. The team members are involved in local, regional, and national leadership activities related to child maltreatment and conduct research and educational efforts. They further define each tier as to services provided in each of seven categories: clinical services, policies, advocacy, prevention, community collaboration, education and training, and research.

In their guidelines, the association provides recommendations that all acute childcare hospitals (NACHRI 2011):

- At a minimum, meet the requirements for a basic team.
- That all child protection teams at advanced- or center-of-excellence-level hospitals be led by medical personnel and, in the majority of cases, child abuse pediatricians.
- If any of the following criteria are met, an institution should have a CPT led by medical personnel at the status of either advanced or center of excellence:
  - Have a trauma center designated by the state and/or verified by the American College of Surgeons as a Level I or II adult or pediatric trauma center.
  - House an intensive care unit.
  - Have an academic residency.
  - House a burn unit.

A basic team can be formed with a physician and a social worker that are dedicated to improving the system of care. This "team" then can bring in other professionals to help with individual cases even though they may not be parts of the permanent team. For example, they may interact with the investigative team and work with law enforcement and CPS to foster communication and thereby contribute to a more successful evaluation. In addition, it is important for practitioners who work with children to know what teams and other resources exist in the area where they practice. In most outpatient office settings, there is no on-site social worker. These offices must be knowledgeable about where to refer victims of abuse. In addition, team members on local and state MDTs should be sure that community physicians are aware of the team and know when and how to refer a child to the team for further evaluation.

As of 2012, child abuse pediatricians were leading child protection teams at 90% of self-assessed center-of-excellence-level hospitals, 85% of advanced-level hospitals, and 46% of basic-level hospitals (Children's Hospital Association 2012).

Hospital teams provide a variety of clinical services with 97% providing medical exams, 95% inpatient care, 86% psychosocial assessments, and 85% second-opinion consultations. Nonclinical services provided by teams included court testimony (88%) and training and education (90%). A NACHRI report highlights types of evaluations a hospital team might provide in a particular case (NACHRI 2003).

Evaluation	Goal
Medical/forensic evaluation	Offer a medical diagnosis based on the history and exam as to whether abuse may be occurring and make recommendations for further evaluation and treatment
Psychosocial/ evidentiary interview	Provide more in-depth interviews of children, completed by specially trained, master's level professionals and designed to draw out specific information about abuse concerns
Psychological evaluation	Assess the psychological impact of abuse and offer treatment recommendations
Multidisciplinary team evaluations	Provide a comprehensive assessment of the child and family
Treatment services	Help children cope with the emotional and behavioral effects of abuse including sexual behavior problems
Emergency evaluations	Provide immediate evaluation in emergency cases

Hospitals' CPTs are facing an increased caseload, up approximately 9% from 2008 to 2012. The increase may, in part, be due to increased recognition of the need for subspecialty expertise and specialized services. While there has been a reported increase in full-time employees in hospitals for these cases, comparisons of 2008 and 2012 data do not support these accounts (Children's Hospital Association 2012).

Funding a child maltreatment team presents difficult challenges. As many of the services provided by teams are not reimbursable, the majority of children's hospitals with a CPT subsidize the program, underwriting an average of $246,000 annually (NACHRI 2005b). Due to low reimbursement for CPTs, many programs are not financially self-sustaining. Hospitals cover 47% of the cost, with only 62% of hospitals receiving resources to cover these expenses. The cost of managing the increasing caseload of child abuse has risen 10% from 2008 to 2012 (Children's Hospital Association 2012).

Function of an MDT

How a team functions will depend on the goal of the team and the role that the team intends to fill. CACs should meet regularly, keep documentation of the meetings, and communicate with all of the members of the MDT. Members should follow up with recommendations and provide follow-up information back to a designated coordinator who will disseminate the information to the rest of the team.

MDTs in the hospital setting can be extremely variable. They may meet whenever a case dictates the need for MDT involvement vs. periodic, set meetings, or a combination of case-specific meetings and periodic case reviews. In well-developed programs, MDTs may only discuss specific details of the more difficult cases with the full team, allowing the team to function more efficiently. See Table 15.1 for an outline of team members' roles and functions.

Table 15.1 Team members and their roles

Discipline	Main role	Comments
Physician/ medical care provider	Identification and reporting of suspected abuse or neglect Completion of accurate medical evaluation, including history, physical examination, and appropriate laboratory/radiologic evaluation Medical treatment and mental health referral for child and family Follow-up for high-risk clinical situations that do not meet the level of reporting Preventing the misdiagnosis of abuse through a thorough differential diagnosis and ruling out mimics of abuse Interpretation of findings and expert testimony regarding diagnosis Providing community efforts to prevent child abuse Training of medical and nonmedical professionals on the medical aspects of child abuse and neglect	Appropriate training, knowledge, and experience are essential to adequately manage the medical aspects of child abuse and neglect
Health-care social worker	Role is variable but often involves some level of team coordination Careful assessment of family strengths and weakness Facilitation of connections with community services and supports Liaison to CPS and law enforcement Support to other team members	Knowledge of child development, abuse dynamics, and legal process are essential Skills at interviewing, doing initial information gathering, and working with all disciplines are necessary
Child protective services (CPS) worker	Gathering of reports Initial assessment Liaison to other disciplines in investigation Provision of protection of child and safety plan Development of individual service plan Delivery and coordination of services being provided Provision of updates to court, if involved Community activities around awareness and prevention	Knowledge of regulatory and legal issues essential Collaboration skills are necessary
Police officer/ law enforcement	Initial assessment Possible immediate intervention and protection of child Criminal investigation and evidence collection	Professional training in child abuse investigations is essential Awareness of other disciplines' contributions is necessary to overall investigation

(continued)

Table 15.1 (continued)

Discipline	Main role	Comments
Prosecutor	Management of the court proceedings if the case goes to trial Preparation of the child for court Facilitation of victim advocacy services Collaboration with other disciplines around community-based efforts dealing with child abuse	Experience with criminal and juvenile court proceedings is essential Decision to file charges and proceed to court rests on the severity of case and ability to prove the case
Child advocate	Protection of needs and interest of the child in court proceedings Independent investigation Determinations of child's treatment needs	May or may not be an attorney, depending on the jurisdiction
Mental health provider	Identification and reporting of suspected child abuse Mental health assessment Provision of treatment Interpretation of findings and provision of expert testimony Possible assessment of caregivers' degree of risk for further abuse; baseline mental health status and treatability	May include principals, teachers, school counselors, and other school-related personnel

Adapted from Medical Evaluation of Child Sexual Abuse (Giardino and Ludwig 2002) and printed with permission

Forming an MDT

The establishment of an MDT involves several steps: identifying and recruiting members, developing a mission statement, defining goals, drafting policies and protocols, establishing and maintaining good working relationships among team members, and evaluating the team function (Ells 2000).

The benefits of developing written procedures and policies include formalizing the team, thereby allowing for continued coordination and collaboration beyond the participation of individual team members (Ells 2000). The US DOJ Portable Guide provides an in-depth overview on forming an MDT, and questions to consider when developing an MDT can be found in Table 15.2.

In Georgia, an assessment of MDTs was done by surveying 15 MDTs throughout the state [4]. In this analysis, 16 general qualities were found to indicate success:

1. Accountability for the team—assures that the team meets local, regional, and national standards and assures that the team is functioning within their purpose and meeting its goals.
2. Accountability for team members—individual members maintain their responsibility to the team, including attending meetings, being prepared, and following team policies and procedures.
3. Efforts to prevent team member burnout—team members can provide support to one another to deal with the stress of handling child abuse cases.

Table 15.2 Questions for developing an MDT protocol from US DOJ Portable File

Questions to help you create a protocol
The following points should be addressed in any MDT protocol
What is the purpose of the team? This may be the team's mission statement, but it can be more concrete, such as "to investigate all child abuse reports in Box Butte County"
Who are the members of the team?
What kinds of cases will the team investigate? All child abuse? Only child sexual exploitation? Only felony physical abuse? Neglect and abandonment?
How will investigations be conducted? Who will do what?
Who will interview victims and who will interrogate suspects? Who will remove children from their home? Who will collect physical evidence? Who will refer victims for physical examinations?
When will team members perform certain tasks? Within a specified time from receipt of report? After consultation with other team members? In a particular sequence?
Where will particular events occur? Will interviews be conducted at a certain location? Interrogations at a different location? Will specific locations be prohibited unless there are unusual circumstances?
How will team members carry out assignments? Jointly?
Who must be present? How long will others wait? Will child interviews be recorded? On video? Audio? Other? Will non-team personnel be present? Parents or person in loco parentis?
What information can be shared under what circumstances?
How will decisions be made? By whom and at what stage?
When and where will the team meet?
How will meetings be conducted?
When (or how frequently) will the protocol and team function be evaluated? How and by whom?

Ells, US Department of Justice (2000)

4. Celebration of accomplishments—this can be crucial to continued success of the team and preventing burnout.
5. Establishing a clear definition of purpose—as an MDTs' purpose may vary from team to team, the purpose of a team must be clearly defined and understood by all members.
6. Having consistent, regular representation of all agencies—in order to work well, team members must know each other and work together regularly. Each agency must be represented to assure all pertinent information is shared.
7. Regular evaluation plans—honest evaluation from members allows the team to assure that the team is meeting its purpose and allows future planning and improvement.
8. Extended MDT concept—teams are more effective when they work together on a daily basis outside the formal team meetings.
9. Identification of a meeting leader—ensures that meetings run smoothly and effectively.
10. Knowing other team members' roles—this helps each member understand the decisions made by members of the team and prevents conflicts.
11. Orientation for new members—to understand the purpose and process of the team.
12. Development of written protocols—to clarify each agency's role, address confidentiality issues, and serve as an interagency agreement.

13. Development of procedures for resolving conflict—allows the team to focus on the issues at hand rather than placing blame.
14. Supervisor support—to promote improved interagency communication and relationships.
15. Trust, respect, and commitment—critical to the success of a team.
16. Recognition of weaknesses and mistakes—allows the team to compensate for or correct problems.

These qualities can be generalized to any type of team and should be considered while developing a strong, effective team.

Why Does It Work?

MDTs are effective for many reasons. Every discipline has something to contribute, both on an individual level and a program/institutional level.

In 1998, New York City's child welfare agency, the Administration for Children's Services (ACS), launched the Instant Response Team (IRT) program. The IRT aims to have child protective workers, police, and, when appropriate, prosecutors respond to reports of severe child abuse or neglect within 2 h and to conduct joint interviews of victims in child-friendly settings. This program has had many successes, such as reduced numbers of child interviews, better information sharing, stronger working relationships, and more effective and efficient case processing (Ross et al. 2004).

In a survey of MDTs, the majority of respondents felt that participation in the team helped them do their job better and more efficiently (Lashley 2005). MDT members can improve the performance of other members because they can add information or experience that the other person does not have. Both individuals can apply that information to the current case and then be able to use that knowledge and information in future cases to provide continuous learning. The continuous cross-discipline learning is a true benefit that can develop into a continuous learning cycle, which will benefit the investigation in future cases. Individual investigators need to know a certain amount of information from the other disciplines involved to make an association between one's domain and the information from another discipline. For example, an investigator may need to understand basic tenets of the radiographic appearance of healing rib fractures to pinpoint a perpetrator. In addition, this basic knowledge can help investigators know when to ask for additional help and which questions to ask. There is also improved decision-making capability since as a team you are using the experience from multiple disciplines. The continuing education of the team members should improve each individual member's processing of child maltreatment cases and therefore improve the outcome of the investigation. While it may be time-consuming to form a team, ultimately efficiency is a benefit of the MDT approach, as there is quicker interdisciplinary sharing of information which improves the performance of the individual members. This approach is both time- and cost-effective, as delineation of each member's role can be outlined, thereby reducing the potential for duplication of services. These benefits help MDT members promote better protection to children. An example of how an MDT evaluation can improve investigations is outlined in Table 15.3.

Table 15.3 True case presentation highlighting the potential benefits of early MDT evaluation

	Case without MDT evaluation	Possible case with early MDT evaluation
Case: 7-week-old, ex-35-week preemie twin A presents to emergency department (ED). Fell off bed while in dad's care, looked pale to mom when she returned home. Noted to have bruising on cheek. Head CT done, which showed subdural hemorrhage (SDH)	Police and CPS are notified, who present to ED and ask if the injury could possibly be accidental. The physician reports that this could possibly be accident, but unlikely, so no further investigation is done. Twin sibling not evaluated 2 months later twin B presents to the neurologist for increasing head circumference and seizures. On workup is noted to have acute and chronic SDH and multiple healing fractures Twin is evaluated as a result and is found to have increasing head circumference, chronic SDH, and healing fractures	MDT evaluation is done Hospital social worker sees family and reports that mom is 20 years old. Dad has a history of prior drug use. Dad was a victim of child abuse in the past. SW communicated this to CPS CPS notes that dad is 21, is not currently working, and has a history of placement in a youth detention center Police are informed of this and retrieve his list of multiple arrests for violent crimes Twin sibling is brought to ED for evaluation and is noted to have healing posterior rib fractures and subacute SDH
Outcome	A state investigation ensues due to the children's injuries despite previous report to CPS. The team determined there was: Inadequate police investigation due to misunderstanding of meaning of "possible but unlikely" mechanisms of injury Lack of supervision of new CPS worker, who did not have adequate knowledge of known risk factors and risk assessment tools and did not contact the medical providers No evaluation of twin at the initial presentation, because a worker had contacted the pediatrician, who noted that the child was "fine" at the last visit 3 weeks ago	Children are placed in kinship care and services to family are provided Three months later, children are doing well, and growth parameters are within normal limits. Parents are receiving services, including parenting classes. They have regularly scheduled visits with the children, and the goal is for reunification

Where to Find Help

Many resources are available to help with the formation of an MDT, training for MDT members, and maintenance of a healthy functioning MDT. See Table 15.4 for further information.

Table 15.4 Resources

Organizations
American Professional Society on the Abuse of Children (APSAC) 1706 E. Broad St. Columbus, OH 43203 Phone: 614-827-1321 Toll free: 1-877-402-7722 Fax: 614-251-6005 Internet: www.apsac.org APSAC is the nation's only interdisciplinary society for professionals working in the field of child abuse and neglect. It supports research, education, and advocacy that enhance efforts to respond to abused children, those who abuse them, and the conditions associated with their abuse. APSAC's major goal is to promote effective interdisciplinary coordination among professionals who respond to child maltreatment
Missing and Exploited Children's Training and Technical Assistance Program Fox Valley Technical College Criminal Justice Department 2614 Chapel Lake Dr., Suite A Gambrills, MD 21054 Phone: 202-347-5610 Fax: 202-347-4306 Email: mecptraining@fvtc.edu Internet: http://mecptraining.org/ The Missing and Exploited Children's Training and Technical Assistance Program, sponsored by the Office of Juvenile Justice and Delinquency Prevention (OJJDP) and Fox Valley Technical College, offers a variety of courses on investigating child abuse, including an intensive special training for local investigative teams. Teams must include representatives from law enforcement, prosecution, social services, and (optionally) the medical field. Participants take part in hands-on team activity involving: Development of interagency processes and protocols for enhanced enforcement, prevention, and intervention in child abuse cases Case preparation and prosecution Development of the team's own interagency implementation plan for improved investigation of child abuse
Child Welfare Information Gateway US Department of Health and Human Services Children's Bureau/ACYF330 C St., SW Washington, DC 20201 1-800-4-A-Child https://www.childwelfare.gov/
National Center for Prosecution of Child Abuse American Prosecutors Research Institute (APRI) National District Attorneys Association 1400 Crystal Drive, Suite 330 Arlington, VA 22202 703-549-9222 Fax: 703-836-3195 Internet: www.ndaa.org The National Center for Prosecution of Child Abuse is a nonprofit and technical assistance affiliate of APRI. In addition to research and technical assistance, the center provides extensive training on the investigation and prosecution of child abuse and child deaths. The national trainings include timely information presented by a variety of professionals experienced in the medical, legal, and investigative aspects of child abuse

(continued)

Table 15.4 (continued)

Organizations
National Clearinghouse on Child Abuse and Neglect Information (NCCAN) 330 C Street NW. Washington, DC 20447 800-FYI-3366 703-385-7565 703-385-3206 (fax) Internet: http://www.calib.com/nccanch NCCAN provides access to the most extensive, up-to-date collection of information on child abuse and neglect in the world. The clearinghouse will provide, on request, annotated bibliographies on specific topics or a copy of its database on CD–ROM. NCCAN also publishes the User Manual Series, which includes several titles related to MDTs: *A Coordinated Response to Child Abuse and Neglect: A Basic Manual* (1992), *The Role of Law Enforcement in the Response to Child Abuse and Neglect* (1992), and *Joint Investigations of Child Abuse: Report of a Symposium* (1993). These publications are available from NCCAN
National Children's Alliance 516 C Street NE Washington, DC 20002 202-548-0090 Internet: http://www.nationalchildrensalliance.org/ Regional Children's Advocacy Centers (CACs): Midwest Regional Children's Advocacy Center, St. Paul, MN, 888–422–2955, 651–220–6750. www.nca-online.org/mrcac Northeast Regional Children's Advocacy Center, Philadelphia, PA, 215–387–9500. www.nca-online.org/nrcac Southern Regional Children's Advocacy Center, Rainbow City, AL, 256–413–3158. www.nca-online.org/srcac Western Regional Children's Advocacy Center, Pueblo, CO, 719–543–0380. www.nca-online.org/wrcac OJJDP funds the National Children's Alliance and the four regional CACs to help communities establish and strengthen CAC and MDT programs. The alliance does this by promoting national standards for CACs and providing leadership and advocacy for these programs on a national level. The alliance also conducts national training events and provides grants for CAC program development and support. The four regional CACs provide information, on-site consultation, and intensive training and technical assistance to help establish and strengthen CACs and facilitate and support coordination among agencies responding to child abuse The alliance publishes a number of manuals and handbooks of use to MDTs, including *Handbook on Intake and Forensic Interviewing in the Children's Advocacy Center Setting, Guidelines for Hospital-Collaborative Forensic Investigations of Sexually Abused Children, Organizational Development for Children's Advocacy Centers,* and *Best Practices.* Grants are available to develop CACs at http://www.nationalchildrensalliance.org/funding-cacs-chapters
American Bar Association (ABA) Center on Children and the Law Washington, DC 202-662-1000 https://www.americanbar.org/groups/child_law.html

(continued)

Table 15.4 (continued)

Organizations
American Academy of Pediatrics Committee on Child Abuse and Neglect141 Northwest Point BoulevardElk Grove Village, IL 60007-1098 800-433-9016 847-434-8000 (fax) https://www.aap.org/en-us/about-the-aap/Committees-Councils-Sections/Committee-on-Child-Abuse-Neglect/Pages/Committee-on-Child-Abuse-and-Neglect.aspx
Federal Bureau of Investigation (FBI) Violent Crimes Against Children/Online Predators Quantico, VA 703-632-4400 https://www.fbi.gov/investigate/violent-crime/cac
Juvenile Justice Clearinghouse (JJC) Rockville, MD 800-638-8736 301-519-5212 (fax) https://www.ncjrs.gov/pdffiles1/ojjdp/180863.pdf
National Association of Medical Examiners Walnut Shade, MO 660-734-1891 Fax: 888-370-4839 http://www.thename.org/
National Center for Missing and Exploited Children (NCMEC) Alexandria, VA Phone: 703-224-2150 Fax: 703-224-2122 http://www.missingkids.com/home
Prevent Child Abuse America 228 South Wabash Ave., 10th Floor Chicago, IL 60604 Phone: 312-663-3520 Fax: 312-939-8962 E-mail: info@preventchildabuse.org 1-800-CHILDREN (1-800-244-5373) http://preventchildabuse.org/ E-mail: info@preventchildabuse.org

Adapted from US DOJ portable guides (Ells 2000)

Summary

The benefits of multidisciplinary child abuse investigation and evaluation are well-established in the legal, CPS, and medical arenas. The major goal of the MDT is to improve the community response to child abuse and neglect, with some MDTs providing assessment of efficacy and policy recommendations regarding systematic issues and others focusing on individual case management. While there are many benefits of evaluations produced by well-functioning MDTs, teams must be careful to avoid common pitfalls that can undermine an effectively functioning team. Care must be taken to ensure quality investigations and maintain the well-being and smooth function of the team. Many local, state, and federal resources are available to develop, train, and maintain an effective team. Many benefits to the MDT evaluation have been documented. An MDT evaluation can help to improve the outcome in individual cases and thereby help create stronger, safer communities.

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Chapter 16
Psychosocial Assessment of Alleged Victims of Child Maltreatment

Maria Scannapieco, Kelli Connell-Carrick, and Thomas Casolaro

Child abuse and neglect continues to be a major social issue in the United States, with nearly 3.36 million child protective services investigation responses in 2015 (US Department of Health & Human Services [DHHS] 2017). This number represents a 9.0% increase since 2011 (DHHS 2017). More than 75% of these children were victims of neglect with younger children being most likely to experience maltreatment (DHHS 2017). In fact, about one-quarter of reported maltreatment is related to children 3 years old and younger, with infants experiencing the highest percentage of victimization among that age group (DHHS 2017). The youngest children also experience the greatest rate of fatality due to child maltreatment. Children under age 3 account for nearly 75% of maltreatment fatalities, and 72.9% of these deaths are due to neglect. Again, infants are the most vulnerable, experiencing 3 times the fatality rate for older children (DHHS 2017).

Although the youngest children, due to their critical developmental period, are most vulnerable to death, all ages of children are susceptible to child maltreatment and its serious effects, including physical, cognitive, social, behavioral, educational, health, and emotional developmental sequelae (Norman et al. 2012; Palusci 2011; Pollack 2015; Scannapieco and Connell-Carrick 2005a; Shackman and Pollack 2014). It is imperative to identify child maltreatment when it exists in order to make appropriate referrals and provide treatment, and many children are first identified as

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alleged victims by professionals in schools, law enforcement, medical care, social and mental health services, and child care (Gilbert et al. 2009; Scannapieco and Connell-Carrick 2005a; DHHS 2017). In a medical-based setting, a social worker performs a psychosocial assessment to determine the needs and well-being of a family. In doing so and often as part of a multidisciplinary team (MDT), the social worker may be the first to suspect a child has been maltreated resulting in the legal mandate to report the incident to the state child protection agency for investigation.

The purpose of this chapter is to present the components of a psychosocial assessment that a social worker in a medical-based setting performs. Also, it discusses key elements social workers use while interviewing caregivers and children, the role of social workers on a multidisciplinary team, and the differences between a clinical social work psychosocial assessment and child protection investigation. Finally, it outlines the steps of the child protective services (CPS) process from investigation to termination of services.

Psychosocial Assessment

Social workers perform psychosocial assessments with their clients to explore overall functioning and risk, including psychological and developmental histories, and resources and stressors. The social worker in a medical setting should obtain as much information as possible from the patient's chart and physicians in order to prepare for conducting an assessment. A psychosocial assessment includes both interviewing and observation, and the social worker should build rapport and express genuine concern for the patient's well-being. Although each medical setting will have its own forms and set of criteria to guide an assessment, most psychosocial assessments will follow a similar format.

While an assessment may share many of the same methods of inquiry and topics of exploration as a child protection investigation, it is separate and distinct. Psychosocial assessment explores the psychosocial history of the child and family, as well as the social, environmental, developmental, and psychological functioning of the child, caregivers, and family. Psychosocial assessment may occur in conjunction with a CPS investigation or alone; it may produce information that warrants a referral to CPS, but its purpose is not to determine whether the family meets legal definitions of abuse or neglect. Rather, that is the job of the state child protection agency that is legally mandated to investigate charges of child abuse and neglect. Once maltreatment is suspected, a report to CPS should be made immediately. A psychosocial assessment will be able to provide information to the CPS agency and assess for other problems within a family. The information gathered during a psychosocial assessment will inform a CPS investigation, stand alone as an assessment of a family's current functioning, and may result in the provision of services to a family outside of the formal child welfare system. Different from a psychosocial assessment, a CPS investigation will determine areas of risk, protective factors,

safety, and family well-being and is guided by the principles of family-centered, strengths-based, and culturally responsive practice. Most importantly, it will determine whether an incident of abuse or neglect meets the legal definition of maltreatment and determine the provisions of services offered to the family, which are discussed in more detail later in this chapter.

Identifying Suspected Child Maltreatment The signs and indicators of physical abuse and neglect have already been discussed elsewhere in this book and are therefore not discussed in detail here. However, in conducting a psychosocial assessment, it is important to consider some types of maltreatment that are more easily identifiable than others and may lead a social worker to a different assessment focus. Two circumstances will be discussed here: neglect and shaken baby syndrome.

The most predominate form of child mistreatment is neglect, which accounts for 75% of all maltreatment (DHHS 2017). This process is often difficult to assess as it requires one to evaluate what is absent or may not be reported by the child due to being scared or upset (Gilbert et al. 2009). Chronic neglect is a persistent pattern or accumulation of harm that occurs when the basic needs of children are not met (Goldman and Salus 2003). Although developmental delays, low self-esteem, recurrent nightmares, and extreme rage may be soft signs of maltreatment (Hawkes 2017; National Institute for Health and Care Excellence 2009), physicians can identify and intervene with suspected maltreatment by corroborating the indicators of neglect in making referrals to CPS, with medical documentation, or as eyewitness for prosecution (Jackson et al. 2015; Scannapieco and Connell-Carrick 2005a). Thus, more time observing the child, parent, and parent–child interaction may be warranted to determine whether neglect is suspected.

Second, one specific type of child maltreatment that must be diagnosed medically is shaken baby syndrome (SBS)/abusive head trauma (AHT). SBS/AHT is a unique form of physical abuse that occurs primarily in the first 2 years of life and describes a number of signs and symptoms that result in some damage to the head. The degree of brain damage varies by the amount, duration, and force of the shaking (National Center on Shaken Baby Syndrome [NCSBS] 2017). Abusive head trauma (AHT) is a "child physical abuse that results in injury to the head or brain" (Chiesa and Duhaime 2009, p. 317). Narang and Clarke (2014) argue that "AHT should be considered in all children with neurologic signs and symptoms, especially if no or only mild trauma is described" (p. 1747). According to the American Academy of Pediatrics, AHT most often occurs as a reaction to an infant's inconsolable crying, and common signs of injury include bleeding of the brain and back of the eyes. Shaken baby syndrome (SBS) is a subset of AHT that occurs most often in babies younger than 6 months old and is the leading cause of physical child abuse in the United States with 1300 cases reported yearly (NCSBS 2017). Because infants have weak head and neck muscles, shaking a baby causes the brain to bounce back and forth inside the skull which results in bruising, swelling, and bleeding. SBS/AHT is diagnosed medically, using computed tomography (CT) scan or MRI. Common symptoms of SBS include irritability, lethargy, poor feeding, vomiting, pale or bluish skin, and convulsions (National Institute of Neurological Disorders and Stroke

[NINDS] 2017) with major effects including seizures, coma, stupor, and death (NINDS 2017). Many children present with retinal hemorrhages in one or both eyes (NCSBS 2017). Whether the child has been injured by shaking or by blunt trauma, the results may be "death or permanent neurologic disability, including static encephalopathy, mental retardation, cerebral palsy, cortical blindness, seizure disorders, and learning disabilities" (Christian and Block 2009; Damashek et al. 2013). Overall, the degree of damage varies by the amount, duration, and force of the shaking with injuries ranging from learning disabilities to death. The classic presenting factors for SBS/AHT include subdural hematoma, brain swelling, and retinal hemorrhages, and some, but not all, children also have bruising on some part of the body that was used for holding the baby during shaking. Thus, as with all forms of child maltreatment, when SBS is suspected, a report to CPS must be made immediately.

Although observation and the ability to identify indicators of child maltreatment guide the assessment process, the cornerstone of a psychosocial assessment is the interview. Obtaining as much accurate information from an interview requires skill, the expression of genuine concern and the development of rapport with the client. The following section outlines key aspects of interviews including types, the interview process, and interview techniques.

Interviewing Caregivers and Children

Types of Interviews

Generally, there are three types of interviews: (a) informational or social history interviews, (b) assessment interviews, and (c) therapeutic interviews. The type of interview the social worker engages in is based on the purpose and the type of information needed. The classification of types of interviews helps define the purposes and objectives:

1. Informational or social history: The social worker encourages the client to share his/her views and feelings about themselves, the problem and goal, and the situation. The purpose is not to learn all there is to know about the person's background but to seek information enabling the worker to better understand the client so decisions can be made regarding the kinds of services that should be provided. Information will include both objective and subjective feelings and attitudes.
2. Assessment interviews: These interviews are more focused in purpose than informational interviews. The social worker arrives at an assessment, diagnosis, evaluation, or recommendation. The questions asked in assessment interviews are aimed at making specific decisions involving human services (i.e., should you report suspected child abuse or neglect).

3. Therapeutic interviews: The social worker affects or helps to affect change. The purpose of therapeutic interviews is to help clients make changes, or to change the social environment to help clients function better, or both.

Regardless of the purpose of the interview, general principles and phases guide each type. This allows for a thorough assessment that elicits the most relevant information from the client to guide decision-making.

Interview: Preparatory Phase

In the assessment process, interviewing is the mechanism used for gathering data from clients. Planful execution of the interview will result in obtaining the most reliable and valid information from the client. Social workers should approach the interview in a standard way ensuring quality. The structure of the interview can be divided into three phases: preparatory phase, rapport building and information gathering phase, and closure phase.

The preparatory phase of the interview is critical for a thorough assessment and entails several steps:

1. Reviewing: This is a skill where the social worker examines and considers the current information available to the worker and medical facility prior to an initial contact. For example, it is important to review previous records. You want to have factual information to reduce the client having to repeat information previously provided. There could also be disadvantages if the prior records present bias or inaccurate information. The worker should approach this with the focus being to further check out unclear or ambiguous information.
2. Consulting: This involves seeking opinions and advice from a supervisor or colleagues concerning an upcoming first visit with the child or caregiver. Frequently the topics addressed involve identifying objectives for an interview or discussing other related practice considerations.
3. Planning: The worker should define the purpose of the interview, to plan what will be asked, what outcomes will be achieved, and what is the workers specific function or role.
4. Documentation: This is often dictated by the medical setting, e.g., computerized intake form, brief notes concerning identifying characteristics of a person and problem situation.

Interview: Rapport Building and Information Gathering Phase

The beginning phase of the interview starts with the first contact and embarks upon the process of exploration with the client. First impressions are important, and the initial contact often affects the nature and extent of all future meetings. Social workers' verbal and nonverbal behaviors impact the effectiveness of rapport building and interviewing. The atmosphere the social worker builds during the interview process

will influence the degree to which the client will be willing to disclose personal information. An effective interview results when the social worker and client accomplish the purpose for which they first meet. In general during the interview, the social worker hopes to:

1. Facilitate an exchange of introductions
2. Establish a tentative direction or purpose of the meeting
3. Outline the general expectations of the client and client's role
4. Describe the policies and ethical principles that might apply during this and future encounters with the client
5. Ensure that the prospective client understands the conditions under which the interview takes place (Cournoyer 2007)

To accomplish these, effective communication skills need to be used. Communication skills enable the social worker to let the client know they are being heard and understood, which is particularly important in the next step, information gathering.

Information gathering is facilitated through a variety of questioning methods for eliciting details concerning the problem or situation. Questions are asked to obtain information and to help the client tell her/his story. Open-ended questions are often used because they are less likely to lead the client and are more likely to elicit information. Probing questions are used by social workers to help the client elaborate on the specific details of their concerns and circumstances. It is important for the social worker to use neutral wording and not use loaded or suggestive questions. A loaded question may be "when did you last hit your child" versus a neutral question being "have you ever hit your child." The tone of the questioning should indicate caring and understanding and convey respect.

Interview: Closure Phase

Closing an interview is not always easy. There are a number of strategies recommended for use during closing. The social worker should note when the allotted time is almost up and ensure the caregiver or child is emotionally at ease. Ask the client to summarize decisions arrived at during the interview. Restate the way both the social worker and the client agreed to proceed. Explain to the caregiver or child what will happen next if the caregiver or child is reluctant to end the interview. Confront this situation directly. Since in a medical setting the social worker may not have a follow-up interview, referrals should be made by the social worker if the situation warrants. Other strategies may include switching to a neutral topic. The social worker may want to ask the client what they will be doing next, signaling the end of the interview.

Interview Techniques

In addition to the phases and guiding principles of the interview, there are specific techniques the social worker can use to build rapport and gather information. The following is by no means an exhaustive list of techniques used in interviewing but is presented as fundamental to the process. The techniques needed in an assessment interview include:

- Active listening: The social worker uses verbal cues (e.g., "and then…") or repeats part of the client statement in a way that encourages the client to explain in more detail. The social worker reflects or mirrors client content by paraphrasing or summarizing, using words the client uses in what is said back to them, and reflects client feelings in an accurate manner by observing and noting client nonverbal and verbal behaviors.
- Attending behavior: Attending behaviors include the physical posture of the social worker and client. An example is the social worker faces the client directly with a relaxed but attentive posture. Other examples are the use of eye contact in culturally and age-appropriate ways; use of congruent verbal and nonverbal behaviors; use of clear and audible voice volume, average pace, or slower voice rate; and use of verbal following—staying with the flow of the interview.
- Empathy and warmth: This technique involves communicating warmth and using reflective listening. The social worker uses voice tone to express caring for the client, is able to respond to the client statements of feelings with accurate reflections, and uses facial expressions to express caring for the client (i.e., warm smile).
- Genuineness: This involves conveying a genuine concern for the client and family. To do this, the social worker is consistent in her/his communication, is nondefensive and authentic, communicates honestly, communicates difficult information to the client, and describes the client problem/situation without judgment or discounting the worth of the client because of their circumstances.
- Supporting self-efficacy: The social worker recognizes the strengths of the client and their ability to carry out specific tasks and succeed.
- Exploring techniques: The social worker lets the client know she/he wants to understand their view of the problem/situation. Probes are used to elicit knowledge, ideas, and feelings concerning the person, problem, and situation from the client, and potential means for resolution of the difficulties are identified. The social worker seeks clarification to respond to an unclear, subtle, indirect, unfinished, or nonverbal expression and uses skills such as partializing, breaking down the issues into manageable parts, paraphrasing, asking open- and close-ended questions, focusing, and summarizing.

Documentation of Information Gained in the Interview

Documentation was briefly mentioned in the preparation phase of the interview but needs more attention given the nature of child abuse and neglect and the need for support in making allegations as a mandatory reporter. All case records are professional documents and should be completed in a timely manner with confidentiality respected at all times. The medical-based setting will dictate in what form this takes, but all records should be in a place that ensures the security of the file. Other guidelines for social workers in documenting interviews are:

- Maintain only information that is relevant for the medical-based setting.
- Facts should be recorded and distinguished from opinions.
- Do not record personal information about the client, e.g., religious or political.
- Document as much information as possible on direct communication with the caregiver or child.
- Retain and update records to assure accuracy, relevancy, timeliness, and completeness (DePanfilis and Corey 2003).
- Follow any relevant HIPAA regulations based on the medical-based setting protocol.

Working as Part of a Multidisciplinary Team

Given the wealth of information in the areas of specialized child development issues, victim and offender dynamics, diagnostic imaging, traumatic memory, forensic pathology, and brain development, pooling the resources of a group of medical professionals is more advantageous than an individual social worker making a decision alone. In a medical-based setting, the social worker often is part of a multidisciplinary team (MDT) with representation from the physician staff, nursing staff, administration, and social services. It is important to remember that the psychosocial assessment, although often an individual interview with a child and family, occurs within the context of the important information available from the multidisciplinary team. Given the complexity of child maltreatment, MDTs serve as a mechanism for team decision-making. Team decision-making requires the full participation and collaboration of team members, who share their knowledge, skills, and abilities in deciding whether a report of child abuse and neglect should be filed with CPS.

MDTs are prevalent across the social work spectrum but are perhaps most visible in health-care, education, and child abuse investigation settings. Key components of these teams include:

- Committed members who have their departmental support
- Shared values established through guidelines that outline roles

- Collective ownership of goals and shared responsibility for meeting those goals (Bronstein 2003)
- Effective communication that promotes collaborative decision-making and establishment of team processes in a manner that is ethical, legal, and timely (Goldfarb 2016; Nancarrow et al. 2013)
- Development of a unifying mission statement that clearly sets for the purpose, scope, and activities of the team
- Interdependence and flexibility while respecting each person's professional role (Bronstein 2003; Nancarrow et al. 2013)
- Confidentiality policies in accordance with professional practices, laws, and medical/institutional policies
- Periodic reflection and analysis on processes and working relationships (Bronstein 2003)

MDTs serve as a tremendous asset to medical-based social workers who can seek the expertise of other professionals to determine whether a child is suspected of maltreatment. The wealth of information that can be obtained from a team approach comprised of different groups of individuals who each play a different role in the care of the patient can lead to a more thorough understanding of the patient's presenting problems and any further action that may need to be taken. Although the MDT model is not unique to medical settings, its utility in identifying maltreatment in this setting is noteworthy.

The role of the social worker on an MDT and the use of professional documentation are critical elements in deciding to make a report of alleged maltreatment. Professional documentation provides a sound basis for the report, and the multidisciplinary perspective and access to information from the MDT provide the social worker with a range of information that is unavailable in many settings. These key elements of professional social work practice within a medical setting help identify families in need of assistance and enable the social worker to make appropriate referrals and provide services to families, in addition to upholding one's legal duty as a mandatory reporter of suspected maltreatment.

Conducting a Psychosocial Assessment

In a medical setting, the social worker completes the psychosocial assessment and is often the person who makes a report to CPS when maltreatment is suspected. A psychosocial assessment focuses on areas of a child and family's overall functioning. It includes interviews and observation of the child, parent, and family. It also explores housing and employment, social support, history of prior injuries, substance use/abuse, and domestic violence concerns within the family system. The following are common questions and areas of exploration when conducting a psychosocial assessment.

Child A psychosocial assessment includes interviewing the alleged victim and observation of the child (Guine et al. 2003). The developmental level of the child and the child's verbal abilities are important considerations during the assessment process, and interviewers should recognize that children may not be able to accurately answer questions about the alleged abuse and that observations are simply "a moment in time" (Chae et al. 2011; Wherry et al. 2014). Nevertheless, the child's views "are valid and important predictors for their mental health and well-being" (Sierau et al. 2016, p. 53).

Assessment of the child focuses on (Scannapieco and Connell-Carrick 2005a):

- Physical and behavioral indicators of maltreatment
- Developmental indicators of maltreatment, including low weight, developmental delays, and other clinical signs of deprivation
- Child's description of the injury/problem, if child is verbal
- Past injuries the child has experienced, including old and new injuries
- Does the child go to school? If so, what grade?
- Does the child have friends?

Parent Interviewing the parent(s) is necessary when performing a psychosocial assessment that involves minor children. In cases of suspected maltreatment, a parent's explanation and reactions to the alleged maltreatment must be viewed in combination with what the child is presenting (Scannapieco and Connell-Carrick 2005a; Sierau et al. 2016). Some questions that guide parental assessment explore both facts about the parent and their perceptions of the child, injury, and allegation. Questions for assessment include (Scannapieco and Connell-Carrick 2005a):

- Parental age
- Parental description of the injury
- Caregiver behavior and appearance. Does the caregiver seem concerned about the child's injury?
- Parental history of past injuries to the child
- Exploring why the child was brought in for care now. What factors precipitated the visit?
- Who is the primary caregiver for the child?
- Caregiver mental health, developmental level, and use of drugs and/or alcohol
- Parental cultural background
- Parental knowledge of child's development, including the ability to articulate when developmental milestones were achieved or any special needs the child may have
- Does the caregiver enjoy being a parent?
- Is the parent satisfied with her/his child?
- Can the caregiver understand her/his role as a parent?
- Does the parent express concern about the child or interest in the child's injuries?
- Does the parent attempt to comfort the child?

With a parental assessment, information is sought not only for the immediate presenting problem but also the parent's reaction and explanation to the injury. As with the child, it is important to combine interviewing with observation of the parent and parent–child relationship. Because developmental periods require different parenting activities, it is also important to ask age-specific questions. For example, if the child is an infant, parental assessment should also address who feeds the child and what the child eats. The assessment should be tailored to each specific family and take into consideration the age of the child and her/his developmental level.

Family Family structural and relational characteristics have been shown related to overall family functioning and are essential areas to explore in assessment. Although families may have many risk factors for child maltreatment based on family characteristics, they must be understood within the context of the psychosocial assessment and presenting problem. Some questions that may be useful in the assessment of family characteristics and functioning include (Scannapieco and Connell-Carrick 2005a):

- What is the household composition?
- What is the housing arrangement in which the family lives?
- Who lives in the home?
- With whom does the child spend the most time?
- What is the family routine? What is a typical day like?
- Is the family living in poverty?
- Is there domestic violence in the family?
- Where does the child sleep?
- Who is involved in the child's care?
- What is the parent's current employment and what is the work history?
- Has CPS been involved with the family in the past or present? If so, why?

Social Environment The social environment of the family encompasses larger social structures including work, neighborhood, school, formal and informal support networks, socioeconomic status, and social services. Questions to guide the assessment of the social environment include (Scannapieco and Connell-Carrick 2005a):

- Is the parent or her/his partner employed?
- Does the caregiver have extended family in the area? How often is the contact?
- When needed, who helps the parent/caregiver with the children? Close friends? Family?
- Does extended family help with resources (emotional or material)?
- Does the family belong to any social or religious organization?
- With what other social service agencies is the family involved?

Overall, all family systems—child, parent, family, social environment, employment, violence, and current problems and stressors—need to be explored in a psychosocial assessment. The assessment should help the social worker identify family

functioning but should also help determine whether child maltreatment is suspected so an appropriate report can be made.

The psychosocial assessment does not have to be complete prior to making a report to CPS when maltreatment is suspected. Once maltreatment is suspected, a report should be made immediately. The information the social worker gathers during her/his assessment can assist the CPS worker obtain information and provide corroborating medical evidence to inform the CPS investigation.

Child Protective Services

The goal of the child welfare system is to promote the safety, permanency, and well-being of children and families (Child Welfare Information Gateway [CWIG] 2013), and this overall purpose often differs from the missions of other agencies that interface with CPS. Child protection work is guided by three underlying philosophical principles and theoretical perspective. CPS work (1) is centered on strengthening families, (2) is sensitive to and respectful of family and cultural diversity as well as individualized needs, and (3) shares responsibility among a community's citizens and professionals. These principles are also embedded within an ecological theoretical context (Goldman and Salus 2003; Pecora et al. 2017; Scannapieco and Connell-Carrick 2005a). The guiding principles will be presented, followed by a brief discussion of the ecological model of child maltreatment.

First, within the child welfare system, the family is considered essential for understanding how child maltreatment occurs. This philosophy maintains that individuals are best understood within the context of their family and within the reciprocal relationships that exist within the family (Scannapieco and Connell-Carrick 2005a). The family-centered practice principle maintains that services should be tailored to a family's specific needs because of the uniqueness, resources, and strengths of each family and of their specific situation (Pecora et al. 2017).

A second guiding principle of child welfare practice is the strengths-based principle, which sets forth a philosophy that individuals have the ability and motivation to grow and achieve competence (Pecora et al. 2017). Families and individuals within families have the ability to change, grow, and have numerous existing resources and strengths that are incorporated into treatment from which the family grows into a healthier-functioning unit. This perspective emphasizes family capability and strength, rather than family deficits (Scannapieco and Connell-Carrick 2005a). Family and individual strengths are operationalized into protective factors (Kirby and Fraser 1997), which are factors at each level of the ecological model that help the family and child ameliorate the risk of child maltreatment or its effects (Afifi and MacMillan 2011; Scannapieco and Connell-Carrick 2005a) and will be discussed in more detail below.

The third guiding principle of child welfare is cultural awareness. Practitioners must attain the knowledge, skills, and attitudes to provide effective care in a manner that is within the individual's values in relation to the larger social context (Simmons

et al. 2008). The effects of and societal attitudes toward those of different races, socioeconomic statuses, and cultures have profound impacts on families and how they experience the world. By being culturally competent, social workers have greater opportunity to learn the political, religious, and social nuances of their communities, emphasizing their attention on their clients rather than on their own prejudices (Allen-Meares 2007). Additionally, practitioners who are culturally trained and attentive may help activate the strengths of the culture toward positive results (Allen-Meares 2007). Being aware of one's own biases is imperative to effectively serving these and diverse populations (CWIG 2016). Because certain racial and ethnic populations are disproportionally represented in the child welfare and the foster care systems (CWIG 2016; Maguire-Jack et al. 2015; Padilla and Summers 2011; Wells et al. 2009), understanding this principle and continually striving toward greater cultural competence underpin all child protection work.

In addition to these guiding principles, the overall theoretical perspective that guides child welfare work is the ecological/transactional theory (Belsky 1980; Bronfenbrenner 1979; Cicchetti and Banny 2014; Cicchetti and Lynch 1993; Dixon et al. 2017; Scannapieco and Connell-Carrick 2005a). It is beyond the scope of this chapter to present a comprehensive discussion of this theory, which can be found elsewhere in the literature (Belsky 1980; Bronfenbrenner 1979; Cicchetti and Banny 2014; Cicchetti and Lynch 1993; Rosa and Tudge 2013; Scannapieco and Connell-Carrick 2005a), but a brief discussion is presented to provide a framework for CPS practice.

The underlying assumption of the ecological/transactional framework is that children's multiple ecologies influence one another, which affect development (Cicchetti and Lynch 1993; MacKenzie et al. 2011; Zielinski and Bradshaw 2006). The combined influence of the individual, community, family, and larger culture shapes the probabilistic course of the development outcomes of maltreated children (Algood et al. 2011; Barth et al. 2008; Cicchetti and Lynch 1993; Scannapieco and Connell-Carrick 2005a; Viezel et al. 2015). Thus, the presence of violence at one level does not sentence children to poor developmental outcomes. Rather, it is the interplay between risk factors and protective factors that either contribute to or protect the child from adverse developmental outcomes (Connell-Carrick 2010; MacKenzie et al. 2011; Ridings et al. 2017; Scannapieco and Connell-Carrick 2005a; Walker et al. 2011; Zielinski and Bradshaw 2006). As a result, the assessment of risk and protective factors is a key element of child protection work. It is within this ecological/transactional context that child welfare embraces its three guiding principles into practice that attempts to reduce maltreatment and support families by building upon family resources and strengths. CPS workers investigate and determine whether abuse or neglect has occurred but also assess current and future safety including the risk of future maltreatment and the presence of protective factors that may prevent or ameliorate the effects of maltreatment.

A combination of individual, community, societal, and family risk factors contributes to the occurrence of child maltreatment. Although risk factors correlate to child maltreatment, they do not cause it; they only increase the likelihood of a particular event occurring. Protective factors, on the other hand, moderate or buffer the

risks and therefore should reduce the likelihood of child maltreatment (Scannapieco and Connell-Carrick 2005a) and exist at the family, societal, and individual level. Numerous studies have examined the risk and protective factors and resulting resiliency that influence the occurrence of child maltreatment. Numerous studies have examined the risk and protective factors that influence the occurrence of child maltreatment. A brief discussion of risk and protective factors is presented, and a more thorough discussion can be found in the literature (Brown et al. 1998; Connell-Carrick 2003, 2010; Dubowitz et al. 2000; Erickson and Egeland 2002; Scannapieco and Connell-Carrick 2005a; Schultz et al. 2009; Wu et al. 2004).

Risk and Protective Factors Several factors have been identified in the empirical literature to increase the risk of child maltreatment including poverty, young maternal age, low education, and domestic violence (Campbell et al. 2017; Caniera and Myrick 2015; Centers for Disease Control [CDC] 2017; DHHS 2017; Douglas and Ebooks Corporation 2017; Krug et al. 2002; Maguire-Jack et al. 2015; Palusci 2011). Children with chronic childhood illness, premature birth, and congenital abnormalities have also been shown to increase the risk of maltreatment (Caniera and Myrick 2015; CDC 2017; Krug et al. 2002). In fact, DiScala and colleagues (2000) found that children who were physically abused were seven times more likely to have been born prematurely than children without an intentional injury. Other risk factors include a history of parental maltreatment (Campbell et al. 2017; Freer et al. 2017), problems during pregnancy (Barth 1991), low parenting pleasure (Douglas and Ebooks Corporation 2017; Freer et al. 2017; Scannapieco and Connell-Carrick 2005b), feelings of loss of control related to child's behavior (Freer et al. 2017), substance abuse (Campbell et al. 2017; Caneira and Myrick 2015; Freer et al. 2017; Gessner et al. 2004; DHHS 2017; Krug et al. 2002; Palusci 2011; Scannapieco and Connell-Carrick 2007), depression (Campbell et al. 2017; CDC 2017; Gessner et al. 2004; Palusci 2011; Ridings et al. 2017), single parenthood (CDC 2017; Douglas and Ebooks Corporation 2017; Li et al. 2011; Palusci 2011; Scannapieco and Connell-Carrick 2005a), parental mental illness (Campbell et al. 2017; Freer et al. 2017; Gessner et al. 2004), and living with a non-family member or intimate partner violence (Campbell et al. 2017; CDC 2017; Dixon and Smith Slep 2017; Krug et al. 2002).

Additionally, environmental factors such as lack of social support and poor social environment also increase the risk of child maltreatment (CDC 2017; Connell-Carrick and Scannapieco 2006; DHHS 2003; Scannapieco and Connell-Carrick 2005b). Environmental factors that have been correlated with child maltreatment include unemployment (Campbell et al. 2017; CDC 2017; Douglas and Ebooks Corporation 2017; Palusci 2011) and low social support and low social contact within one's community (CDC 2017; Connell-Carrick and Scannapieco 2006; Douglas and Ebooks Corporation 2017), living in high-poverty area, or other financial strains (Campbell et al. 2017; CDC 2017; DHHS 2003; Douglas and Ebooks Corporation 2017; Maguire-Jack and Font 2017; Palusci 2011). Social isolation is more characteristic of parents who neglect their children, while social conflict is indicative of abusive parents (Crittendon 1985). In neighborhoods with equal

socioeconomic disadvantage, neighborhoods with more social resources, such as high neighborhood social support (Finno-Velasquez et al. 2017; Molnar et al. 2016), less drug and alcohol availability (i.e., fewer bars and fewer drug possession incidents) (Freisthler 2004; Freisthler et al. 2005), and residential stability, experience less child maltreatment than neighborhoods with fewer social resources and less social contact (Belsky 1978; Freisthler et al. 2006; Pelton 2015). In addition, families who lack a connection to their community have fewer opportunities for exposure to child-rearing practices that could improve their own parenting skills (CDC 2017; Douglas and Ebooks Corporation 2017). Without this social filter and opportunities for parental learning, at-risk parents lack a connection to emotional and material support during stressful times which may contribute to maltreatment.

On the other hand, several protective factors can help reduce the chance of child maltreatment occurring. Parents whose pasts are free from violence are less likely to commit child abuse and neglect (Scannapieco and Connell-Carrick 2005a). An easy temperament of a child and personality/emotional attributes that match well with their caregivers promote attachment and can protect a child from abuse, as can a child's intellectual ability and responsiveness to a parent (Afifi and MacMillan 2011; DHHS 2003). In addition, mothers in happy, violent-free relationships and the presence of fathers or father figures decrease the likelihood of maltreatment (Centers for Disease Control 2017; US Department of Health and Human Services [DHHS] 2003; Scannapieco and Connell-Carrick 2005b). Families characterized by warm and secure family relationships and extrafamilial support, such as peers and teacher support, can serve as protective factors of child maltreatment (Afifi and MacMillan 2011; Bailey et al. 2015; CDC 2017; DHHS 2017), as do access to health-care and social services, adequate housing, employment, and supportive family environments (Bailey et al. 2015; CDC 2017; Ridings et al. 2017). Overall, the community plays a large role in setting and enforcing cultural norms. Risk is reduced when communities support parents and take responsibility for preventing abuse (DHHS 2003).

Thus, different from some other social work settings, the child welfare system is guided by a family-centered, strengths-based, and culturally responsive philosophy within an ecological context. The family is assessed not only for the occurrence and risk of maltreatment but also for the strengths and protective factors that exist within the family. The child welfare system is complex and can be confusing at times even to professionals. As a result, the following section outlines the policy that mandates reporting for professionals, what happens after a report is made, and the process that families experience once an investigation is initiated.

Making a Report to CPS

If child maltreatment is suspected, a referral to the state child protection agency is legally warranted according to the Child Abuse Prevention and Treatment Act (CAPTA), which was amended and reauthorized in 2010 (P.L.111-320) (CWIG

2011). In order to qualify for federal funding under CAPTA, all states require certain professionals and institutions to report suspected maltreatment, including health-care providers, mental health workers, teachers and school personnel, social workers, day care providers, law enforcement, and in some states the general public. All states have a hotline for reporting suspected child maltreatment. Thus, in addition to a medical-based psychosocial assessment, the child protection agency will perform its own investigation to determine whether the child meets the legal definitions of abuse or neglect and assess risk and safety. The reporter can submit a report anonymously, but it is recommended and extremely valuable to the CPS agency if contact information is provided so they can follow up with questions if necessary (Crosson-Towers 2008; Children's Bureau 2017). When a report is made, the reporter will be asked to provide relevant information regarding the alleged maltreatment including (Crosson-Towers 2008):

- Information on the alleged victim, including the name, address, and telephone number of the child and parents, date of birth or age, sex, and race
- Actions taken by the reporter
- Specific information regarding the allegations, including specific information regarding the nature of the maltreatment, locations of bruises, bite marks, burns, signs of inadequate care, signs of parental provision of inadequate care, and developmental delays
- When/where the alleged maltreatment occurred
- Reporter's name and contact information (if the reporter chooses to provide this information)

The more specific information that can be given to CPS, the better information they have to determine the priority of the maltreatment which guides the timeline in which an investigation will occur.

Although states define the types of child abuse and neglect, these definitions are derived from CAPTA's Reauthorization Act of 2010 (P.L.111-320), which defines child maltreatment as:

> Any recent act or failure to act on the part of a parent or caretaker which results in death, serious physical or emotional harm, sexual abuse or exploitation; or an act or failure to act, which presents an imminent risk of serious harm. (DHHS 2017, p. 29)

Although each state derives its own definition of child abuse and neglect, federal legislation sets forth these minimal standards with which states must comply to receive federal funding.

What Happens After a Report Is Made A report to CPS is often made through a hotline, in which pertinent information about the alleged maltreatment is given by the reporter. At this "intake" level, it is determined whether the alleged incident meets the state's statutory and agency guidelines. The agency decides whether to investigate and the urgency with which an investigation is warranted (Crosson-Towers 2008). Some reports are screened out and never investigated because the referral does not constitute child maltreatment, according to state definitions, or the reporter has provided insufficient information for an investigation (CWIG 2013).

After a report has been accepted for investigation, a decision regarding the urgency with which CPS must respond is made (DHHS 2003). Criteria that inform the prioritization decision include the impending danger to the child and child vulnerability (Action 4 Child Protection, October 2009b). Generally, the more pressing the problem, the more quickly CPS responds: "immediately" for present danger and within 24 h for impending danger (Action 4 Child Protection, September, 2009a), with response times for lower risks maybe from 72 hours to 15 days. Prioritization decisions vary by states, and the criteria that inform the prioritization decision include the present danger to the child and child vulnerability. The Council on Accreditation (COA) and the Child Welfare League of America (CWLA) suggest all investigations be completed within 30 days (DHHS 2003).

During the investigation, CPS will determine through interviews; observation; corroboration with collaterals, such as the hospital-based social worker, physicians, and law enforcement; and examining the family's past history of maltreatment whether the child has been maltreated and by whom. The current and future safety of the child and risk of future harm will be assessed. The case will be assigned a case determination. This is typically either *ruled out*, which means that the maltreatment was not able to be substantiated, or *substantiated* which indicates that enough evidence exists that the child was maltreated. Following a case determination and after conducting a family assessment that explores not only the risks to the family but also the protective factors and their safety needs, a service plan for the child and family will be developed (CWIG 2013; DHHS 2003; Ungar 2013). This plan outlines the specific outcomes and goals that will reduce the risk of maltreatment (Crosson-Towers 2008) and includes whether the child will be provided out-of-home services (i.e., foster care) or in-home services, such as family preservation or parenting education. Specific timeframes for the completion of services and permanency goals will be established. Once the treatment is complete, it is determined whether goals have been met and risk of further maltreatment reduced. Families may be offered more services, a new plan may be developed, or the case will be closed if children in the home are safe and risks of further maltreatment have been reduced.

Conclusion

Social workers in a medical setting are in a unique position to serve as part of teams who have access not only to the information gathered during a psychosocial assessment but also to the information gathered in the medical setting. Corroboration from physicians, doctors, nurses, and social services can help inform the assessment process in cases of suspected child maltreatment. To complete a psychosocial assessment, a social worker in a medical setting may have only one meeting with a family, so she/he must be focused in approaching the assessment, obtain available and relevant background information, use good interviewing skills, and document

appropriately. When maltreatment is suspected, federal law mandates a report to the state child protection agency for an investigation be made. The information gathered during the psychosocial assessment will be invaluable to the CPS investigation and protecting the child from further maltreatment.

In Brief

A psychosocial assessment of the child's family is a critical component of the suspected child abuse and neglect evaluation:

- It is imperative to accurately identify the child's family and speak with the adult(s) who is (are) legally responsible and with those who were present when the child became ill or injured.
- It is essential to make the family aware of staff concerns and the legal mandate that requires reporting and sharing the results of the abuse evaluation.
- A thorough psychosocial assessment explores the structure of the family and the function of its members and includes social history and demographics.
- The psychosocial assessment uncovers information concerning the caregiver's understanding of the child's injury and how the injury occurred.
- The clinical social worker is involved early in the evaluation of suspected child abuse and/or neglect to optimize the evaluation.
- The social worker provides support to both the family and the staff.

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Chapter 17
Legal Issues and Documentation

Sandeep K. Narang and Nicole R. Johnson

In 2015, an estimated 1670 children died of maltreatment. Children less than 3 years old accounted for 74.8% of these fatalities. An estimated four million children were accepted by state and local child protective service agencies for the investigation of child maltreatment, a rate of 53.2 per 1000 children in the United States (US Department of Health and Human Services 2015). Those who survive face a lifetime of potential emotional, physical, and sexual difficulties directly caused by the abuse including a three times greater likelihood of developing psychiatric disorders or abusing drugs and alcohol (Kendler et al. 2000).

The investigation of suspected child abuse is a multidisciplinary effort; police officers, child protective services (CPS) workers, prosecutors, and health-care professionals all have vital roles to play in the identification and protection of the abused child. There are tensions inherent in the multidisciplinary approach. Professionals must maintain their distinct roles and perform individual responsibilities while recognizing that their actions have a great impact on the efficacy of the investigative effort. Because physicians, nurses, hospital social workers, and paramedics are often the first professionals to have contact with the abused child and his or her family, health-care providers become crucial participants in the gathering of information for the investigation and potential prosecution of the perpetrator. The safety of a child often depends on the health-care provider's awareness of the information needed by law enforcement officials and prosecutors to identify and prosecute the perpetrator successfully.

This chapter provides a discussion of the legal aspects of the medical professional's evaluation of suspected physical abuse and neglect. It addresses (a)

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mandatory reporting requirements for the health-care professional, (b) medical record documentation in cases of suspected abuse and neglect, (c) guidelines for preparation and presentation of testimony, and (d) hearsay evidence. The practices suggested in the following pages should be discussed by medical professionals, members of hospital child abuse teams and county multidisciplinary investigative teams, and local prosecutors. Health-care professionals are encouraged to adapt these suggested procedures to the law and custom in each specific locality.

Reporting Suspected Child Abuse

Every US jurisdiction has enacted some form of legislation regarding the reporting of child maltreatment. Many reporting laws discuss the following: (a) specific standards for reporting, (b) permissibility of delegation of reporting responsibility to other institutional individuals, (c) procedures for investigation of abuse and neglect cases, (d) immunity for reporting in good faith and limitations of that immunity, and (e) liability for failure to report.

Medical professional communities vary in their responses to the enactment of mandatory reporting laws. Some smaller communities have no reporting guidelines, leaving health-care professionals without guidance when faced with a case of suspected child abuse. Some health-care entities form multidisciplinary teams (see Chap. 13) staffed by nurses, doctors, clinical social workers, and others as child abuse response units. These multidisciplinary teams often develop protocols for evaluating, reporting, and treating suspected child abuse victims. The clinical social worker on the team often serves as a liaison between hospital staff and local investigators and prosecutors. In many jurisdictions, health-care professionals also participate in community-based multidisciplinary teams (MDTs), which may include law enforcement officials, prosecutors, CPS workers, mental health professionals, school personnel, and other involved professionals. These community-based MDTs not only provide input for reporting protocols but also serve as invaluable collaborations in the evaluation of child physical and sexual abuse cases.

State statutes dictate procedures that health-care professionals must follow when they suspect child abuse or neglect. When creating local protocols, the protocols should be clear and delineate step-by-step procedures for the medical professional to follow when evaluating and reporting a case of suspected abuse.

Mandated Reporting: Who Must Report Child Abuse?

The vast majority of US jurisdiction statutes delineate specific professionals who *must* report cases of suspected child abuse. These professionals and institutions are often referred to as "mandated reporters." Other jurisdictions (such as New Jersey and Wyoming), known as universal reporting states, simply require all adults to

report suspected maltreatment. Physicians, either as specifically mentioned professionals or by virtue of inclusion in universal mandatory reporting states, are mandated reporters in every US jurisdiction.

Some state statutes also define "mandated reporters" to include a broader set of individuals or institutions, such as those individuals who are not health practitioners but may be called upon to render aid or medical assistance to children. In all of these cases, the patient-client privilege is superseded by the duty to report (Myers et al. 2002).

Health-care professionals who work in hospitals, multiphysician practices, or other organizations must check state law to determine who is responsible for reporting. Some states specifically allow professionals who work as a team and jointly have knowledge of abuse to designate one individual from their team to make the report (Mandatory Reports of Child Abuse and Neglect: Summary of State Laws 2008). Other state statutes inform potential reporters that delegation of reporting responsibility will not absolve those reporters from ultimate legal responsibility for reporting.

Barriers to Reporting Child Abuse

As documented recent high-profile cases illustrated have reminded us, many adults fail to report suspicion or even knowledge of child maltreatment. Recent studies have elucidated many reasons for a physician failure to report. In a qualitative survey study, Jones et al. (2008) sought to identify factors clinicians weighed when deciding whether to report injuries suspicious for abuse. Four major themes emerged: (1) familiarity with the family, (2) elements of the case history, (3) availability of other resources, and (4) perception of expected outcomes of reporting to CPS. The authors concluded that, in the approximate 30% of the "highly likely" abuse cases that were not reported in the Child Abuse Reporting Experience Study (CARES), these factors were the primary determinants in physician decision-making on whether to report or not.

Who Receives the Child Abuse Report?

State statutes and local protocols dictate to whom a health-care professional reports when he or she suspects that a child has been abused or neglected. Generally, health-care professionals are required to call a CPS agency, which investigates allegations of caregiver abuse, or a police department, which investigates all criminal allegations of child abuse. Some jurisdictions require health-care providers to determine initially if the suspected perpetrator is a caregiver of the child. If the suspected perpetrator is a caregiver, health-care professionals must contact the local CPS agency. In all other cases, law enforcement officials are notified. Some jurisdictions

require that the medical professional contacts both CPS and law enforcement agencies, regardless of the relationship of the suspected perpetrator to the child. Again, the clinical social worker of a hospital's multidisciplinary team, a team member of the community's multidisciplinary investigative team, or the local prosecutor may be most aware of step-by-step protocols and legal requirements and can provide assistance.

Medical professionals may use local or state telephone hotlines to make the initial phone report required by most states. It is important to carefully document the phone call in the medical record, including the name of the agency, individual employee contacted, and the date and time of the report. A follow-up written report of the case is usually required. Hospital emergency departments or local CPS agencies often have a designated form for the reporter to complete.

How Quickly Must a Report of Child Abuse Be Made?

State statutes typically require that a phone report be made *immediately* upon suspicion of abuse (Mandatory Reports of Child Abuse and Neglect: Summary of State Laws 2008). How quickly a health-care provider forms a "suspicion" that a child has been physically abused or neglected varies, depending on the information available in any given case. After the phone contact, state law usually specifies a timeframe in which written documentation is to be submitted (Making and Screening Report of Child Abuse and Neglect: Summary of State Laws 2008).

When Is a Case "Suspected" Child Abuse?

State law defines such terms as *abuse*, *neglect*, *abused child*, and *neglected* child. In general, states mandate reporting when a child's physical or mental health or welfare is harmed, or threatened with harm, by the acts or omissions of a parent or any other person. *Harm*, or an equivalent term in the statute, is often broken into specific subject areas, including but not limited to nonaccidental physical injury; mental injury; sexual abuse and exploitation; abandonment; failure to supervise or to supply the child with basic food, clothing, shelter, or health care; and psychosocial (environmental) failure to thrive (Making and Screening Report of Child Abuse and Neglect: Summary of State Laws 2008). Some states mandate a report when a newborn is physically dependent on certain drugs or when the mother used a controlled substance during her pregnancy, although the ultimate impact on this approach remains in question (Ondersma et al. 2000). Health-care professionals must report suspected nonaccidental physical injury or neglect, even if it purportedly resulted from the caregiver's religious practices (Warner and Hansen 1994).

Health-care providers must report any suspected child abuse. A physician need not diagnose definitively that a condition is the result of abuse in order to trigger the

duty to report (Warner and Hansen 1994). Although the physician participates in the case, it is not his or her responsibility to prove that the case is one of abuse or who the abuser is. The juvenile or criminal court makes these determinations.

When does a medical professional's concern about possible child abuse become a suspicion, triggering the duty to report? In essence, the health-care provider must make a report when the provider has evidence that would lead a competent professional to believe abuse or neglect is reasonably likely to have occurred (Myers et al. 2002; Warner and Hansen 1994). Incontrovertible certainty is *not* required.

CPS screens the reports to assess which are appropriate for agency intervention. A thorough investigation is conducted by CPS and law enforcement officials to determine if an abuse has indeed occurred. CPS investigators then determine if the child's safety is in question and take appropriate steps to protect the child and provide supportive services to the child and the child's family. Law enforcement investigators will determine if a crime occurred and if there is probable cause to make an arrest. Figure 17.1 provides the health-care provider with guidelines for reporting physical abuse when evaluating an injured child.

Is the Reporting Medical Care Professional Immune from Liability?

Health-care professionals voice concern about professional and personal liability if CPS investigators determine the report to be "unsubstantiated" or "not indicated," or if law enforcement officials do not arrest a perpetrator. (See Chap. 1 for further discussion of substantiation.) Should an angry parent file a lawsuit against the reporter, state statutes provide immunity from civil and criminal liability to all mandated reporters who report suspected abuse in "good faith." This is true even if the report is investigated and determined to be unsubstantiated. Good faith does not include instances when a false report is knowingly made (i.e., the health-care provider making the report knew that the report was false) (Myers et al. 2002; Immunity for Reporters of Child Abuse and Neglect: Summary of State Laws 2008).

Are There Penalties for Failure to Report a Suspected Case of Child Abuse or Neglect?

It is a criminal violation in most states for a health-care professional to fail to report suspected child abuse. Penalties include fines and prison sentences. Some statutes also provide that mandated reporters may be held liable for civil damages caused by a failure to report (Myers et al. 2002; Penalties for Failure to Report and False Reporting of Child Abuse and Neglect: Summary of State Laws 2007).

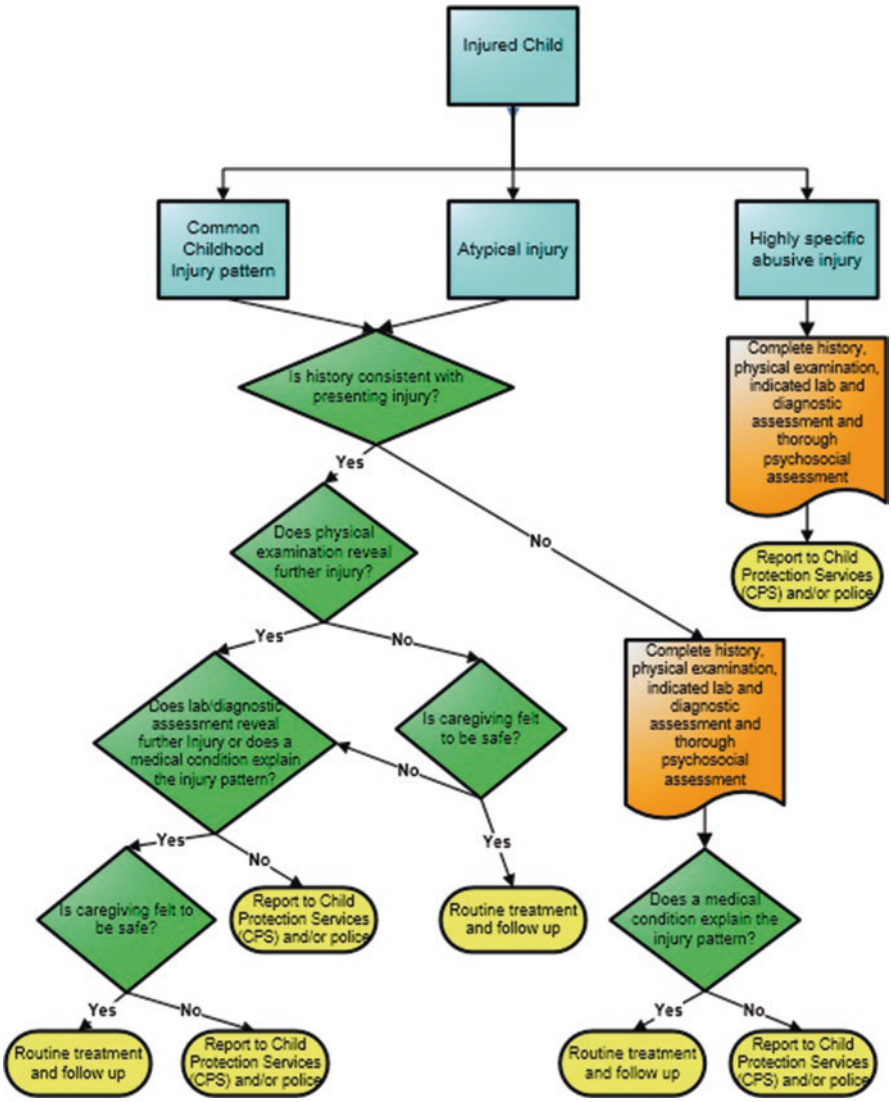

Fig. 17.1 Evaluating the injured child

Summary

Health-care providers fulfill a crucial child advocacy function as central participants in the identification, protection, and treatment of abused and neglected children. Medical communities should be in full compliance with statutes that mandate reporting of suspected child abuse and neglect. It is important that health-care providers be familiar with local protocols and community resources, including

institutional or local multidisciplinary teams. Should the community lack guidelines and resources, health-care professionals can take a lead role in developing protocols and beginning the process of multidisciplinary coordination.

Documentation of Findings

The best interests of abused and neglected children are served when health-care professionals provide clear and comprehensive documentation. Entries made in the medical record can provide essential clues needed to evaluate the safety of the child's environment. Accurate records that clearly reflect the child's medical history, physical examination, and laboratory findings are often pivotal in the investigation and prosecution of physical abuse and neglect cases. Should the health-care professional be called upon to testify, detailed, clear, and comprehensive documentation in the medical record is essential for recalling the case and preparing for court. Finally, medical records may be admitted into evidence at trial.

Documentation Guidelines

Statements made by the child, family members, and other caregivers and given to medical professionals for the purposes of medical diagnosis and treatment can be very useful. This initial information and history given by family members and other caregivers may be inconsistent with the degree or type of the child's injury. These initial inconsistent histories not only are strong indicators of abusive injury (Hettler and Greenes 2003) but may be utilized later by the court system for child protection and criminal justice. In addition, the abusing caregiver may give contradictory statements to health-care personnel during the initial evaluation and hospitalization and to law enforcement and/or CPS investigators. Thus, it is important for health-care personnel and investigators (law enforcement and CPS) to collaborate in MDT meetings, so as to review consistency of historical information and to properly exchange medical and investigative information. The following sections outline suggested guidelines for documentation of statements and other information relevant to the investigation of child neglect and physical abuse.

Documentation of Care: Who Should Document?

All health-care professionals, including paramedics or emergency medical technicians, triage nurses, emergency room personnel, attending and consulting medical staff, inpatient care nurses, and social work staff, should *objectively* (free of personal interpretation, narrative, or colorful commentary) document statements and

actions of the child, the child's family, and other caregivers during the evaluation of children. Documentation begins as soon as the child arrives at the site of care or the paramedic arrives at the scene. Documentation continues throughout the evaluation, workup, and treatment of the child's injuries. The MDT will utilize the documentary trail to analyze information, synthesize an impression, and develop an assessment and treatment plan for the particular case.

General Documentation Guidelines

Medical providers should strive to be objective in their documentation in the medical record and in recording the words and actions of the family members and caretakers of children who are victims of abuse. Any recorded loss of objectivity on the part of the medical provider can undermine his or her credibility, both in the hospital and in the courtroom. The following are examples of entries that should be included in the record:

1. Name/relationship of the person making the statement or exhibiting the behavior and his or her relationship to the child.
2. Date of the statement/behavior.
3. Exact words of the statement, using quotation marks where appropriate, and/or a detailed description of the behavior exhibited.
4. Demeanor of the person making the statement or exhibiting the behavior.
5. Name of the person making the entry into the hospital chart.

Health-care providers should avoid documenting personal opinions regarding caregivers even though working with suspected abusive caregivers may elicit a wide range of emotional responses. Negative or biased comments in the medical record such as "this mother is a flake" or "dad doesn't have a clue" signify a loss of objectivity. The health-care professional should document only what was said or observed.

Members of the community-based MDT may decide how to document their discussion, findings, and conclusions. This document may also be incorporated into the medical record. It is essential that all medical records be preserved for durations prescribed by law. As the majority of children's hospitals now have or are moving toward an electronic medical record (EMR), preservation of medical records has become much easier. All medical notes written by all health-care providers are entered into the EMR, and these notes can be quickly and easily obtained by anyone with access to the EMR in the future. Additionally, photographs of physical exam findings can be added to the child's chart in the EMR, as can outside hospital or clinic records. Thanks to the EMR, destruction or loss of documentation, which could call into question the accuracy or impartiality of a medical provider's testimony, is now very uncommon.

Interviewing the Child and Documentation Guidelines

Who Should Conduct the In-Depth Interview of the Child?

In the medical evaluation of possible child maltreatment, health-care providers initially determine whether the child's age and/or medical condition will delay or bar an interview. Many victims of child abuse are infants and toddlers who do not have the developmental capacity to be interviewed. However, in these cases, older siblings who are also in the home can at times be interviewed and provide fruitful information as to the particular injury or overall social environment of the child. Once a determination is made that a child can be interviewed, the health-care professional most familiar with child development and most skilled in interviewing children should conduct the in-depth interview of the child. This is particularly true in sexual abuse cases, where the child's disclosure can help determine how extensive an evaluation for traumatic injuries and sexually transmitted infections is required. Many children also receive a forensic interview, by interviewers with specific training, in the course of the CPS and law enforcement investigations.

What Should the Health-Care Professional Ask the Child in the In-Depth Interview?

An in-depth interview of the child, rather than a cursory history-taking, is essential in cases of suspected abuse. However, the in-depth interview may not always be completed immediately in the medical setting but may be completed in a forensic interview with a trained interviewer. Health-care providers should receive training regarding proper interviewing techniques to enhance the quality of child interviews and the information elicited. Guidelines for approaching this important interview are provided in Chaps. 2 and 14.

The following discussion directs the health-care professional to subject areas that will provide information needed to distinguish between abusive and accidental injuries and allow all concerned professionals to accurately assess the safety of the child's environment (Kellogg 2011). The "interview" continues during the entire evaluation. It begins by asking the child for a narrative about the incident by open, nonleading questions. Direct questions are used to fill in gaps or clear up confusing statements. Questions should cover the following topics:

1. *Circumstances surrounding the most recent injury*. Ask the child how he or she got hurt, if anyone else was involved with the injury, what the child was doing preceding the injury, and any "reasons" the child perceived for the incident (i.e., the child dropped his or her peanut butter sandwich; parent was inebriated). Reassure the child that the injuries were not his or her fault.

2. *Instrument used*. Ask the child what was used to hurt him or her (e.g., hand, fist, shoe, cigarette, lighter, coat hanger, curling iron).
3. *Current and prior injuries*. When asking the child about current and prior injuries, inquire as to how each injury occurred. Record each visible injury by taking photographs, as well as by describing in detail the size, color, and pattern of the injury in the medical note. Make sure to include in the child's medical record any photographs taken.
4. *Discipline practices in the home.* Ask the child, in age-appropriate language, what discipline practices are used on the child when the child exhibits bad behavior. Clinicians should remember that discipline can include language of verbal or emotional abuse and should inquire about children's feelings regarding the discipline practices.
5. *Use of photographs*

    - The current standard is to take photographs with digital quality, utilizing a digital camera when feasible.
    - Photograph all injuries if possible.
    - Photographs should include an anatomic landmark (e.g., an elbow, knee, belly button, or other body parts that identify the location of the wound).
    - When photographing, it is preferable to include an American Board of Forensic Odontology (ABFO) 90-degree scale as a measurement reference

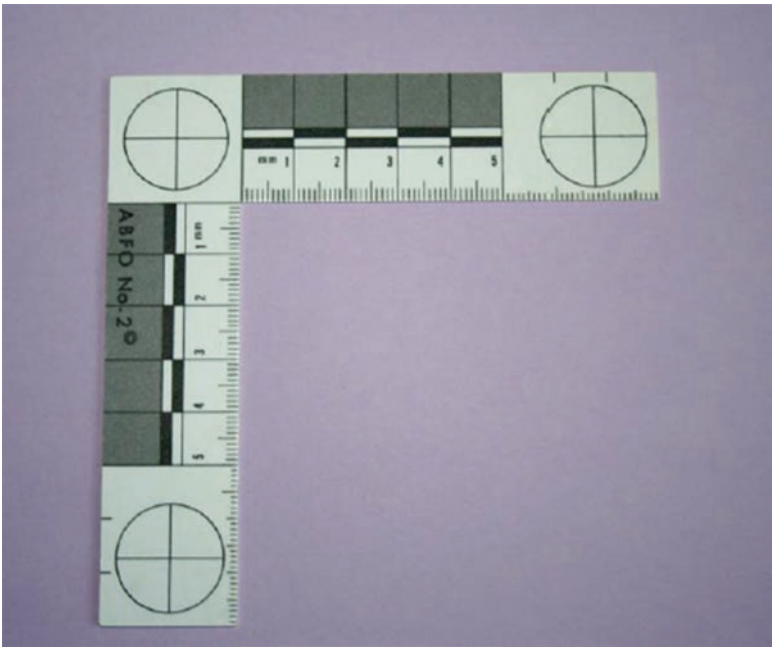

Photo 17.1 American Board of Forensic Odontology (ABFO) ruler

(Photo 17.1). If an ABFO 90-degree scale is not available, use a centimeter ruler.
- When warranted, photograph the child's injuries over the course of time, to assess healing and rule out other medical conditions on the differential diagnosis.
- Make sure photographs are added to the child's medical record. Digital photographs added to the EMR become a permanent part of the child's record.

6. *Perpetrator's statements to the child*. Ask the child if the suspected perpetrator said anything to him or her before, during, or after the incident. Statements of anger, frustration, or violence can indicate nonaccidental injury and provide the clinician with insight into the emotional impact on a child.

7. *Delay in seeking care*. Determining whether there is a delay in seeking medical care is a subjective assessment based on a variety of factors. Some of those factors include the severity of the medical symptoms/injuries (i.e., whether the child is having seizures or has diminished responsiveness or simply has bruising or swelling to a particular part of the body), the caregiver's reaction to the severity of symptoms/injuries, and the caregiver's medical assessment or intervention actions prior to coming to the hospital. The clinician should delve deeply into these historical factors before concluding that there was a delay in seeking medical care.
8. *Injuries to other children*. Ask the child about the presence of other children in the home. Make sure those children have a medical evaluation. Document all of the children's statements and injuries.
9. *Child's relationship with caregiver(s).* Ask the child about his or her relationships at home (whether it is a one-parent or two-parent home, presence of siblings, caretaking responsibilities by caregivers, etc.). What does he or she do after school? With whom does he or she do things?

Interviewing the Caregivers and Documentation Guidelines

What Should the Health-Care Provider Ask the Child's Caregivers?

During any medical evaluation, health-care providers discuss the child's condition with the child's caregiver(s). Although initial, cursory questions may be asked with all parties present, when conducting the crux of the medical history-gathering, each caregiver should be interviewed separately. Privacy may encourage each individual to speak openly. Document the following in the medical record: (a) caregiver's answers to questions posed by the health-care professional, (b) refusals to answer questions, and (c) equivocal responses.

In addition to the formal interview that occurs during the history-taking phase of all medical evaluations, the health-care provider should take note of more casual statements made throughout the child's evaluation and treatment. Documentation of all interactions paints a picture for health-care professionals and investigators that may, in turn, lead to the identification of safe placement for the child.

Chapters 2 and 14 include detailed descriptions of the interview process. The discussion that follows highlights subject areas that should be included in the caregiver interview:

1. *Timeframe of injury*. The health-care provider should make an inquiry as to a detailed timeframe leading up to the injury that led to presentation for medical care. If the caregiver has difficulty remembering dates or times, the health-care professional should note such in terms of reliability of the caregiver as a historian. *If physical injury is present, the health-care professional should inquire as to the last point in time when the child was without symptoms or "well"/"normal" in the caregiver's observations*. In addition to history for the injury that led to presentation, the clinician should inquire broadly with regard to trauma history, as further medical studies (i.e., a skeletal survey) may reveal older injuries for which no explanation was provided.
2. *Course of symptoms*. Ask the caregiver to describe the course of the child's symptoms, particularly if the caregiver claims no knowledge of the exact time of the injury. Health-care professionals and investigators can use the detailed description of the course of symptoms to approximate the time of injury or to determine if the caregiver's explanation of the injury makes sense.
3. *Exclusive custody*. Ask the caregiver about his/her caregiving timeframes with the child and whether any other caregivers have had caretaking responsibility for the child in the relevant injury timeframe. If the caregiver was the sole custodian of the child at the time of injury, ask the caregiver of any periods of time when the caregiver may not have directly observed the child (i.e., showering, bathroom breaks, etc.). If there are other children in the home, ask the caregiver the ages and relationship of those children and where they were in the home at the time of injury or development of symptoms. It is not uncommon for caregivers to attempt to blame small children for a child's injuries in child abuse cases (i.e., "I think the 3-year-old sibling landed on the child"). Clinicians should take caution in readily accepting such history and should be prepared to educate investigators as to the uncommonality of such an occurrence (Friedrich et al. 2013). Caregiver attempts to blame small children for a child's injuries warrant further detailed investigation before accepting such histories as explanatory of a child's injuries.
4. *Explanations, lack of explanations, and changing explanations*. The health-care provider should ask the caregiver how the child's injury occurred when initially obtaining a history from him or her, as well as any other trauma history. In some circumstances, it may be appropriate to ask the caregiver to demonstrate the described injury history. These demonstrations should be documented in detail. Additionally, it can be useful to have the caregiver provides a sketch when he or

she is describing the scene of where the injury occurred; scene photographs are also very helpful when available. The medical provider should record all of the caregiver's answers and use direct quotes when applicable.

The clinician may not wish to present all that is known about the mechanism of the child's injury at the beginning of the interview with the caregiver. This allows the caregiver to provide his or her unbiased history without the knowledge of the medical and biomechanical information regarding the child's injury, which could influence and potentially alter the caregiver's statements. The medical provider may later reveal some of the medical and biomechanical information regarding the mechanism of the child's injury, should the caregiver's explanation prove highly implausible. Record what information was given and the caregiver's response.

An example of such an encounter:

Q: "Tell me about the incident that led you to bring in your child."
A: "Well, I was home alone with the baby. The baby was upstairs in his crib. I was downstairs watching TV. I heard a thud. I ran to the stairway, and the baby was lying at the bottom of the stairs, crying. I guess he fell down the steps."
Q: "Where was the baby when you last saw him prior to finding him at the bottom of the stairs?"
A: "He was sleeping in his crib and the side of the crib was down."
Q: "Did anything happen to the baby before you found him at the bottom of the stairs?"
A: "No."
Q: "Did the child have any injuries before that?"
A: "No."
Q: "How did the child appear when you last saw him prior to finding him at the bottom of the stairs?"
A: "Fine."
Q: "How did your baby appear when you found him at the bottom of the stairs?"
A: "He was crying."
Q: "Did he have any loss of consciousness to your knowledge?"
A: "No."
Q: "Did your baby manifest any other symptoms at that time, like possible seizures, change in color or breathing, or altered mental state?"
A: "No."
Q: "Did your baby manifest any concerning symptoms in the days prior to this incident—symptoms like being lethargic, persistent or recurrent vomiting, possible seizures, change in breathing or color?"
A: "No, just some runny nose and occasional cough."
Q: "Has he had any other recent trauma or injuries in the last 3 days? These can include falls, drops, bonks, hits, shakes or other trauma."
A: "No."
Q: "Can you describe how you found him?"
A: "He was laying face up on the hardwood floor at the bottom of the stairs."

Q: "Was there anything on the stairs?"
A: "No, just the carpet."
Q: "Did he land on or hit anything?"
A: "No."
Q: "Can you describe the area around the bottom of the stairs?"
A: "The stairs are carpeted and floor is hardwood. There is not a rug at the bottom of the stairs. There is a small table a few feet away from the bottom of the stairs."
Q: "The baby has an injury to his abdomen." (Doctor points to the caregiver's abdomen.) "Do you know how he got that?"
A: "Oh, yes. I forgot to tell you that he must have hit himself on the table at the bottom of the steps when he landed."
Q: "Can you describe where the table was?"
A: "Well, it's usually off to the side, away from the steps, but I had just moved it in front of the steps to polish it."

The health-care professional, as part of a multidisciplinary team, will analyze caregivers' statements in conjunction with the medical findings, photographs of the scene, and other evidence.

5. *Self-inflicted injury*. The caregiver may claim that the child accidentally injured him- or herself. In this situation, it is important to obtain details of how the caregiver believes the child sustained this self-inflicted injury, as well as the developmental capabilities of the child. For example, the caregiver may assert that the child climbed into the bathtub and turned on the hot water spigot. Follow-up questions might include: Where is the bathtub located? Can you show me how tall the bathtub is? What type of faucet is in the bathtub? What is the distance between the bottom of the bathtub and the faucet? Is the child able to walk? How long has the child been walking? Have you seen the child climb into the bathtub before? Have you seen the child turn the faucet on before? When you came into the room, where was the child? Was the child still in the bathtub? In what position was the child? What was the child doing? Was the water running when you found the child? What was the water level in the bathtub?
6. *Initial response*. Determine what the caregiver did when he or she noticed injuries or symptoms. Did the caregiver call 911? Was there a delay in seeking medical care? Did the caregiver attempt home remedies rather than take the child to the hospital? Did the caregiver keep the child home from school for a few days?
7. *Past injuries and illnesses*. A comprehensive history of prior medical problems and treatment is crucial, both to the medical diagnosis and to the investigative process. For example, if the child had actually been examined by a pediatrician 2 days prior to the emergency room visit and was found free from visible injury, the timing of the presenting injury may become easier to determine. Further concerns may arise should the child's medical history reveal neglect by the caregiver, such as failure to obtain immunizations or to bring the child in for well-child care visits.

Caregivers should be asked if the child has ever previously been to an emergency room and what the reason was for the previous emergency room visit. Caregivers should also be asked if the child has ever had a broken bone or a burn and how it was sustained. Have the caregiver describe the nature of any prior physical problems. What caused any prior injuries? Where was the child treated? Who treated the child? Has the child had any previous hospitalizations?

If suspected physical abuse, caregivers should also be asked if they have ever noticed bruising or other injuries to the child before and where the bruising/other injuries were located on the child's body. This is especially important in younger, nonmobile children. Should a caregiver claim at the emergency room that the child is "accident prone," prior medical records should be obtained, as they may show old injuries that, in fact, were inconsistent with accidental injury and most likely inflicted. When a caregiver claims that the child falls frequently because of a lifelong problem with recurrent dizziness, for example, the absence of prior complaints regarding that problem is highly significant.

8. *Child's relationship with caregiver*. Have the caregiver describe his or her relationship with the child. How does the caregiver describe the child and the child's personality? Does the child have any disabilities? Does the child have special needs? Does the child have behaviors that the caregiver found difficult? Does the child have toilet training difficulties? Is the child on medication for hyperactivity or any other condition? Did the caregiver only recently begin caring for the child? How does the caregiver discipline the child? How does the caregiver sooth or calm the child? With an older child, were there recurrent disciplinary problems? Questions like these will more clearly depict how the caregiver typically interacts with the child and may uncover possible "triggers" for an abusive incident.
9. *Caregiver's concerns and demeanor*. Document in the medical chart the concerns voiced by the caregiver. Does the caregiver want to know how long the child will be in the hospital? Is the caregiver concerned about the severity of the child's injury? Is the caregiver worried about the potential for long-term effects of the injury? Is the caregiver preoccupied with whether the doctor will contact CPS? Does the caregiver show any emotion when discussing the child's condition? Note the demeanor of the caregivers toward each other and toward the child throughout the hospital stay or course of treatment. Does either caregiver visit the child in the hospital or comfort the child? While taking note of the caregiver's affect and demeanor when discussing the patient can be useful, it is also very subjective, and this should be kept in mind when documenting in the medical record. Does one caregiver forbid another from talking to the medical staff? These observations can help inform the investigation and can augment the medical information and additional evidence that is gathered in the course of the investigation. Again, this information, along with all of the evidence gathered from a myriad of sources during the investigation, adds to the investigative picture (Snyder et al. 2011; Myers and Carter 1988).

Documentation of Medical Conclusions

In physical abuse and neglect cases, the circumstances and motivation of the abuser are often significant factors in culpability; however, they are often difficult to discern (Snyder et al. 2011). The exponential increase in medical diagnostic capability has had an effect on the criminal justice response with more cases being charged as our understanding of causation improves. Death review teams have been established in many communities to examine child fatalities with protection of surviving siblings and identifying institutional responses that might have been triggered to save the child before the homicide actually occurred.

Health-care professionals routinely record information that they elicit during the history-taking, physical examination, and laboratory assessment stages of clinical evaluation. After the completion of the clinical evaluation, the health-care provider will formulate two impressions regarding the abuse: (1) whether sufficient clinical information exists to satisfy the legislative mandate for reporting abuse (i.e., "reasonable cause to believe" or "reasonable suspicion") and (2), after attainment of additional clinical and investigative information, the degree of probability of an abuse diagnosis.

When at the clinical stage of assessing reasonable suspicion of abuse, the clinician should document their level of concern appropriately and objectively, with language to signify his/her level of concern (i.e., "this case represents low concern for abuse" or "with current information, this case represents high concern for abuse"). In the further course of diagnostic/clinical assessment, when injuries are strongly associated or consistent with abuse, it is certainly appropriate to diagnose child abuse. At that juncture, it is appropriate to document the conclusion or impression as either the injury(ies) being consistent with history provided or injury(ies) being inconsistent with history provided. It is likewise acceptable for health-care providers to state their medical impression in terms of "probability" or "likelihood" of abuse or accident. This also allows for the possibility that additional investigative information could be discovered that could impact the health-care provider's assessment.

The health-care professional is wise to avoid the use of universal or global statements such as "definite abuse/neglect" or "definite accident." While this may to some degree be an issue of semantics, expressing diagnoses within the parameters of probabilities acknowledges that subsequent investigative information could alter current impressions (and, therefore, that the medical provider remains open to such possibilities) and limits the health-care professionals' susceptibility to perceptions of bias and unreasonableness in subsequent courtroom encounters.

In some cases of suspected physical abuse or neglect, however, the medical evaluation may not yield enough information to diagnose abuse with high or any degree of probability. In such cases, the most appropriate way to frame the conclusion section of the medical record is to summarize the clinical information from the history, physical examination, and laboratory assessment and state the indeterminate nature

of the case. The health-care provider may also document that abusive injury cannot be excluded and remains a concern.

Finally, health-care professionals should document referrals to CPS and counseling information. This is helpful to those reviewing the chart at a later date. When documenting such, include the names of the health-care professional who made the referral and the CPS intake worker or counselor who accepted the referral.

Health-Care Providers in the Courtroom

Although not a common aspect of pediatric practice, health-care professionals may be called to testify in a variety of legal proceedings related to child maltreatment. In a criminal trial, the state seeks to prove the guilt of a defendant "beyond a reasonable doubt" and impose a sentence. In civil proceedings, litigants, including government officials (e.g., CPS), attempt to establish findings by "a preponderance of the evidence" so they can obtain orders regarding child custody, visitation, or child support. Pretrial hearings, such as *Frye* and *Daubert* hearings, determine what evidence or witness testimony will be permitted at a subsequent trial. And, rarely, medical professionals may become involved in governmental administrative hearings (e.g., licensure or revocation of licensure) tangent to maltreatment cases.

Health-care professionals who treat children, particularly physicians, may be subpoenaed to testify in child abuse cases. A subpoena is a legal document that notifies a witness that he or she is needed to present evidence in court. A subpoena might require testimony (subpoena ad testificandum), the production of documents (subpoena duces tecum), or both. Because a subpoena suspends typical rules regarding medical confidentiality, it is important for the health-care professional to read carefully what disclosures are commanded (and therefore allowed) by the subpoena. In a criminal case, a subpoena directs the health-care professional to come to court and provide information to aid a jury or judge in determining the guilt or innocence of a defendant. In a noncriminal case, a subpoena directs the health-care professional to come to court and provide information that will aid in a variety of determinations (e.g., whether a child should be removed from the home, offered court-ordered services, or awarded monetary damages for abuse suffered).

A health-care professional receiving a subpoena for a medical record that he or she did not create should notify the attorney issuing the subpoena of the appropriate custodian instead of disclosing the record. Upon receiving any subpoena, the wisest course is to call the attorney who issued the subpoena. The attorney should discuss exactly what testimony or documents are required and should also discuss what facts or opinions to which the attorney hopes the witness will testify. When potentially privileged documents (i.e., psychiatric or psychological records) are included in the medical record, the medical facility and the prosecutor may develop procedures to ensure judicial scrutiny of the material before the records are released to the attorneys.

In preparation for testimony, the medical professional should become thoroughly familiar with the medical facts of the case. Although many courts will permit a witness to refer to notes during testimony, the expert should be able to recite the basic facts of the case (patient's name, age, dates seen, high points of the history, and injuries found) from memory. It is advisable for the medical expert to have a preparatory session with the attorney who is calling him/her to testify. However, in practice, this does not always occur. When preparatory sessions do occur, the subject areas covered should include the expert's qualifications (and a general explanation by the attorney of how and in what subject matter the expert will be qualified as an "expert"), limitations in the witness's expertise, the expert's opinions, the basis for those opinions, any diagrams or charts that may be assistive in testimony (i.e., demonstrative aids), and any competing theories by opposing experts.

The Medical Professional on the Stand

While medical professionals may feel uncomfortable testifying as an "expert" in child maltreatment, it is important to remember that the definition of "expert" in this context is actually quite broad. The *Federal Rules of Evidence* define an "expert" as someone with "scientific, technical, or other specialized knowledge" that would assist the judge or jury in deciding the case (Myers 2013). One needs not be the foremost authority on child maltreatment nor understand every nuance of the subject to qualify (Myers 2013). Practitioners who are unsure about proper testimony in a child maltreatment case are advised to consult with a physician board certified in the recently established subspecialty of child abuse pediatrics.

The testimony of an expert witness begins with qualification as an "expert" witness. The qualification of a witness as an "expert" is a legal procedure by which the witness demonstrates to the court sufficient training, research, writing, professional activities, or other qualifications to serve as an "expert" (Federal Rules of Evidence 702 2017). An attorney will ask the judge to recognize the witness as an "expert" in a particular subject matter. Being qualified as an expert entitles the expert to offer opinions in court, a privilege not inured to other witnesses (Federal Rules of Evidence 703 2017). Although uncommon, a medical professional may be asked to testify just as a "fact" witness. A "fact" witness is one who testifies as to what was observed; an "expert" witness is one who because of specialized training, experience, and knowledge may testify not only to observations but to opinions based on those observations (Myers 2013). In most circumstances, the medical professional will be qualified by the court as an "expert" in a particular subject matter and thereby have the latitude, with the rules of evidence, to render opinions.

In providing testimony, the expert should adhere to the following general principles. In answering questions, from either party, the witness should consider himself or herself an impartial educator of the court about the topic of his or her expertise. *A physician has an ethical obligation to provide accurate, unbiased testimony based upon sound scientific principles* (Paul et al. 2017). Unfortunately, child

Table 17.1 AAP recommendations for physician expert witnesses

Should complete an expert witness affirmation statement and should offer to provide a copy of the expert witness affirmation statement to the legal counsel that secured their services
Preferable to be board certified in the area relevant to the testimony
Should be actively and meaningfully engaged in clinical practice in the medical specialty or area of medicine about which they testify
If retired, may render expert opinions on cases as long as they remain knowledgeable of the current standard of care and clinical literature in their field
Should render an opinion only after reviewing sufficient medical records and documents to enable the formation of unbiased and accurate conclusions
Should present testimony that reflects the generally accepted standard within the specialty or area of practice, including those held by a significant minority
Should provide objective, valid opinions that are well supported by their clinical experience and the best evidence-based medical literature, regardless of whether it is to be used by the plaintiff/prosecutor or defendant
Should testify to matters only within their expertise. If asked about matters outside of their expertise, physicians should refrain from testifying on those matters
Should testify in cases of abuse and neglect, especially if they have special knowledge and/or extensive experience in the field. General pediatricians testifying in these cases may wish to consult with subspecialists in child abuse pediatrics
Must not enter into agreements in which compensation for expert witness work is contingent on the outcome of the case

protection has long been hindered by physicians who give irresponsible testimony (Chadwick and Krous 1997). Irresponsible testimony includes testimony for which the expert is insufficiently qualified or testimony based on idiosyncratic theories that have either not been substantiated by well-conducted medical studies or have not gained wide acceptance in the medical community. Some of the American Academy of Pediatrics' recommendations for expert witnesses are listed in Table 17.1 (see above) (Paul et al. 2017).

Direct Examination

Direct examination is that part of testimony where the party calling the witness questions the witness with open-ended questions. Leading questions are not permitted in direct examinations and should prompt a "leading" objection from an observant opposing attorney. If conducted well, direct examinations should emulate a smooth-flowing conversation and should hold no surprises for the witness. Consider the following tips:

- While on the witness stand, use medical records to refresh recollection as needed. However, do not rely on the records; be thoroughly familiar with their contents.
- Listen carefully to the question. Answer honestly, succinctly, and without equivocation.

- Avoid “yes” or “no” answers if greater explanation is needed.
- If there is an objection by either the prosecutor or the defense attorney, do not answer until the judge has indicated that you may do so.
- If possible, get off the witness stand during direct testimony and utilize a demonstrative aid to demonstrate your knowledge. Prior to trial, make arrangements with the prosecutor for the necessary equipment.
- Explain all medical terms in simple language; use analogies and examples to clarify medical concepts.
- Do not argue with attorneys or be evasive in answering questions.
- Always be patient and polite on the witness stand, even with the most confrontational attorney.
- Do not lose your temper no matter how hard you are pressed. If you lose your temper, you have played right into the hands of the cross-examiner.
- Avoid condescending language toward anyone.
- Be courteous and respectful.
- Acknowledge limitations of opinions and concede points that are validly made by opposing attorneys.

Cross-Examination

Cross-examination can be a stress-provoking experience. For the fact witness, cross-examination tends to be narrow in focus, emphasizing discrepancies in the records and the relative lack of experience of the witness. An expert witness may be cross-examined more extensively, first as to qualifications and then as to the opinions given and the bases for those opinions.

Defense attorneys usually cross-examine witnesses to uncover alleged bias. The expert may be questioned about compensation for testimony. The expert witness should honestly disclose any payment received for testimony. Reasonable expert witness fees, particularly when a large percentage of the fee goes to the expert’s hospital, may be understood by the judge and jurors.

The defense counsel may ask questions concerning the health-care provider’s role on a hospital or community multidisciplinary team. If such is pertinent to a particular case, it may be prudent to cover the function of the team and clarify that not every case consultation results in a finding of abuse or a prosecution on direct examination. The defense counsel may also emphasize witness bias by virtue of being a child abuse medical professional (i.e., an “advocate” for children). Again, it may be prudent to preempt such questions on direct examination by reviewing the general percentage of cases the expert finds to be “abuse” or “accident” and in emphasizing that the medical professional’s salary does not increase based on the number of cases found to involve abuse. If the defense attorney questions the health-care provider about repeated court appearances on behalf of the prosecutor and few, if any, for defense attorneys, point out any prior consultations with defense attorneys on child abuse cases. Although such consultations may not have culminated in

courtroom testimony, the willingness to discuss cases with either the prosecutor or defense attorney can mitigate claims of bias (Kellogg 2011).

Expert witnesses will be cross-examined regarding their opinions and the bases for their opinions. The witness should ask the prosecutor, prior to trial, about the opposing counsel's demeanor, familiarity with the literature, questioning style, and other issues of concern. An expert witness should be familiar with the relevant literature because defense attorneys may cite studies without a complete understanding of a study's methodology. After testifying, the medical professional should discuss the experience with the attorney that called him/her to find out what went well and what steps should be taken to make the testimony more effective in the future.

Hearsay Evidence

Statements made to health-care professionals by children and their caregivers are essential to the investigation and prosecution of child abuse cases (see the section "Documentation of Medical Conclusions"). The health-care provider may be subpoenaed to relate those statements to the jury. The admissibility of such statements at trial depends on the law of hearsay in specific jurisdictions.

Hearsay statements are statements (a) made outside of the courtroom, (b) recounted by the person to whom the statements were made, and (c) offered as evidence of the truth of the statements' contents (Myers 2013). For example, a child may report to an examining physician that "My daddy burned me with an iron." The physician may then be called to the witness stand and asked to tell the judge or the jury what the child said in the hospital. If the testimony is offered as evidence that the father of the child did, in fact, burn the child with the iron, then it is hearsay.

A hearsay statement is inadmissible unless it fits an exception to the hearsay rule. In general, there are certain statements that may be admissible at trial, such as those made by a child, caregiver, or other persons when startled or excited by an event ("excited utterances"); statements made by a caregiver against his or her own interest ("statements against interest"); and statements made by a child during the course of a physical examination ("statements made for purposes of medical diagnosis and treatment"). Other out-of-court statements that do not fit traditional hearsay exceptions may be admissible at trial for other reasons. Document all statements carefully, whether or not they appear to fit into a hearsay exception, and check with the local prosecutor regarding the particular nuances of your state's hearsay law. For a more detailed reading on the law of hearsay, see Myers (2013).

Appendix: Pointers for Expert Witnesses

1. Maintain a ready file of literature pertaining to the specialty area in which you will be offering expert testimony, including monographs, articles, and books.
2. If you are going to be interviewed by opposing counsel, avoid doing so in your office. A neutral place like a conference room or even the attorney's office is a better place for your meeting.
3. Remember, when approaching or inside the courthouse, anyone you pass may be a judge, juror, opposing witness, or opposing attorney. Always conduct yourself accordingly.
4. When testifying, sit alertly in your chair and maintain good body posture. Do not slouch.
5. When answering an open-ended question, on direct or cross-examination, turn and face the fact-finder (i.e., jury or judge).
6. When anxious, calm yourself by taking a deep breath and consciously pausing for three counts before answering the question.
7. When answering questions, don't guess. If you don't know, say you don't know.
8. Understand the question before you attempt to give an answer. You can't possibly give a truthful and accurate answer unless you understand the question.
9. Keep a sharp lookout for questions with a double meaning and questions that assume you have testified to a fact when you have not done so.
10. Answer the question that is asked and then stop, especially on cross-examination. Don't volunteer information not called for by the question you are asked.
11. Choice of words is very important. Develop your ability to use words that not only depict what happened but also convey the impression you intend.
    Positive "Soft" Words

    mother
    father
    child
    cut
    molest
    bruise

    Negative "Hard" Words

    woman, respondent, abuser
    subject, suspect, defendant
    juvenile, youth
    laceration, open wound
    rape, sexual assault

12. Talk loudly enough so everyone can hear you, yet not too loudly such that your tone seems abrasive or arrogant.
13. Avoid distracting mannerisms such as eating mints, chewing gum, or fumbling through a file.

14. Give an audible answer so the court reporter can hear it. Don't nod your head yes or no. Remember that the court reporter is recording everything you say for appellate review.
15. Avoid joking, wisecracks, and condescending comments or inflections. A trial is a serious matter.
16. An opposing attorney may cross-examine you with articles, books, other people's opinions, or things you have said previously. You may be confronted with something that appears contradictory in an effort to show that your opinion is inconsistent with these other sources. Ask to see the book or article the opposing attorney refers to. Read it, compare it, and almost every time you will find that something has been taken out of context or misinterpreted by the attorney.

Summary

Dos

- Describe medical findings clearly and simply.
- Use diagrams and photographs to supplement written descriptions of injuries.
- Document thoroughly any statements given by the child or caregiver, using, if possible, the speaker's exact words.
- Document statements throughout contact with the child and the family. Urge the entire clinical staff to do likewise.
- Question caregivers separately from each other and from the child.
- Document speaker's demeanor and behaviors.
- Note inconsistency of explanations with the nature of injury.
- Consult with your local multidisciplinary investigative team.
- Prepare with the attorney calling you to testify.
- Listen carefully to all questions put to you by attorneys and judges and answer clearly and truthfully.

Don'ts

- Don't include personal opinions about the patient or the patient's family in the medical record.
- Don't record inflammatory language or judgmental comments.
- Don't testify without adequate preparation.
- Don't destroy notes or other documentations.
- Don't guess; if you cannot answer with certainty, say so.
- Don't answer a question unless you are sure you understand it.

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Chapter 18
Mental Health Issues: Child Physical Abuse, Neglect, and Emotional Abuse

Nizete-Ly Valles, Toi Blakley Harris, and John Sargent

Introduction

Child maltreatment is defined by the Child Abuse Prevention and Treatment Act (CAPTA) as "any recent act or failure to act on the part of a parent or caretaker, which results in death, serious physical or emotional harm, sexual abuse, or exploitation, or an act or failure to act which presents an imminent risk of serious harm" to a child. This definition includes four types of child maltreatment that are generally identified by both federal and state statutes: neglect, physical abuse, sexual abuse, and emotional abuse. Some states include parental substance use and abandonment as forms of abuse as well. Data collected by the National Child Abuse and Neglect Data System (NCANDS) indicates that 3.3 million children were investigated for potential child maltreatment in 2015 (US Department of Health and Human Services [USDHHS] 2017). A review of the most current data available indicates a rise in investigations, from a rate of 38 per 1000 in 2013 to a rate of 45 per 1000 in 2015. Of the children who received an investigation by Child Protective Services (CPS), 694,757 were substantiated and required post-investigation services (USDHHS 2017). Abuse can at times co-occur, with the USDHHS (2017) reporting that 14% of cases are for two or more types of maltreatment, with the most

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common combination being neglect and physical abuse at 5%. These numbers indicate that despite attempts at preventing child maltreatment, it continues to occur in epidemic proportions. A dearth of research is dedicated to examining the links between exposure to child maltreatment and physical and psychological outcomes. This chapter focuses on the physical and psychological sequelae of childhood physical abuse, neglect, and emotional abuse.

Definitions and Trends of Neglect, Child Physical Abuse, and Emotional Abuse

Neglect is defined as a parent or caregiver's failure to provide for the physical, supervisory, and medical needs of a child, which places the child at risk for physical or psychological harm. Neglect encompasses several types of acts of omission, including care neglect, supervisory neglect, medical neglect, educational neglect, and emotional neglect. Given the broad range of behaviors that encompass neglect, it accounts for a large proportion of maltreatment cases. In 2015, 78% of the substantiated CPS cases were for neglect (including medical neglect; USDHHS 2017). Rates of neglect have fluctuated across time and have shown a marked increase since 2012 (Child Trends Databank 2016). Risk factors of neglect include sociodemographic factors, parental factors, and child factors. Poverty has long been linked to neglect, but not all families that live in poverty neglect their children. This implies an indirect relationship between low socioeconomic status (SES) and neglect. Studies have found that parental mental health, including depression, social isolation, and substance use moderate the relationship between low SES and neglect (Venta et al. 2016). Using data from over 100 counties in 2005–2006, the National Incidence Study of Child Abuse and Neglect (NIS-4) found that children whose parents were unemployed were up to 3 times more likely to experience neglect, compared to children with employed parents (Sedlak et al. 2010). Race and ethnicity are also related to rates of neglect. Results of the most recent NIS-4 study found that White children were more likely to experience physical neglect by a biological parent compared to African-American and Hispanic children (Sedlak et al. 2010). Child factors that may contribute to neglect are age, with infants being at greater risk for neglect; difficult temperament (i.e., difficult to soothe, increased negative affect); and children with special needs (e.g., physical disability, extensive medical needs; National Institute of Mental Health 2017).

Physical abuse is defined as "any nonaccidental physical injury to the child and can include striking, kicking, burning, or biting the child, or any action that results in a physical impairment of the child" (Child Welfare Information Gateway 2016). In 2015, NCANDS reported that 17.2% of child maltreatment victims were physically abused. While physical abuse has shown a decline over time, physical forms of discipline, such as spankings and corporal punishment, continue to be utilized (Berlin et al. 2009; Taylor et al. 2010). While supporters of corporal punishment

believe that spankings lead to immediate compliance and internalization of values (Coley et al. 2014), studies have routinely found that physical forms of punishment lead to negative outcomes in children, including externalizing (Berlin et al. 2009; Gershoff 2002; Kazdin 2008; Ohene et al. 2006) and internalizing behaviors (Gershoff and Grogan-Kaylor 2016). While corporal punishment is not synonymous with physical abuse, studies have found that some parents who use corporal punishment are also likely to use physical abuse (Frechette et al. 2015; Gonzalez et al. 2008). However, some studies have found little to no association between physical forms of discipline and childhood outcomes (Gunnoe et al. 2006; Larzelere 2008; Morris and Gibson 2011). Ferguson (2013) conducted a meta-analysis of longitudinal studies examining the relationship between physical forms of discipline (not including physical abuse) and externalizing outcomes, internalizing outcomes, and cognitive performance in children. Results indicated small effect sizes (i.e., ≤ 0.10 range) between spankings or corporal punishment and externalizing and internalizing behaviors with a higher association between physical forms of discipline and low cognitive performance (Ferguson 2013). Gershoff and Grogan-Kaylor (2016), however, conducted a meta-analysis of over 160,000 children and found that spanking was associated with both internalizing and externalizing problems, similar to physical abuse. These findings were irrespective of study design (e.g., longitudinal versus cross-sectional), country of origin, assessment methods, and age of the child (Gershoff and Grogan-Kaylor 2016). Despite the controversy surrounding corporal punishment, different organizations, including the American Academy of Pediatrics, the American Academy of Child and Adolescent Psychiatry, and the American Psychological Association, caution against the use of physical forms of punishment.

Emotional abuse is a more complex structure to define and assess. However, most states include in the definition "injury to the psychological capacity or emotional stability of the child as evidenced by an observable or substantial change in behavior, emotional response, or cognition" (Child Welfare information Gateway 2016). Emotional abuse is synonymous with psychological abuse and includes such acts as belittling, shaming, rejecting, endangering, and being overly critical of the child. Emotional abuse accounted for 6% of the substantiated maltreatment reports (USDHHS 2017). CPS workers are left with the task of determining whether or not the parental acts or the emotionally neglectful parenting directly causes the problem behaviors noted in the child. As such, emotional abuse is not investigated as often as physical abuse or sexual abuse (Sedlak et al. 2010). However, the effects of emotional abuse are just as deleterious as those of other forms of abuse. Emotional abuse has been linked to internalizing and externalizing disorders, substance use, and personality disorders. Emotional abuse, when it co-occurs with physical or sexual abuse, has also been found to exacerbate the risk for developing a psychiatric problem in childhood (Spinazzola et al. 2014). Using a large birth cohort of 7223 children, a combination of both neglect and emotional abuse was found to predict more severe outcomes (i.e., internalizing and externalizing symptoms) after controlling for sociodemographic factors (Mills et al. 2013). Despite its association with negative outcomes, emotional abuse is not as often studied as other forms of abuse.

Therefore, little is known about the risk factors of emotional abuse. Parental alcohol use has been found to be a predictor of emotional abuse and was more strongly associated with emotional abuse compared to other forms of maltreatment (Sedlak et al. 2010). Girls are also more likely to experience emotional abuse compared to boys (Kim et al. 2017). Treatments for children who have experienced emotional abuse are also lacking (Spinazzola et al. 2014).

Psychological Outcomes of Maltreatment

According to criterion A of the *Diagnostic and Statistical Manual*-5th Edition (DSM-5; American Psychiatric Association 2013), child abuse and neglect qualify as traumatic events, as they have the potential to cause traumatic stress. Traumatic stress refers to the physical, cognitive, and emotional responses to events that threaten the life or physical or psychological integrity of the child or someone critically important to the child. Traumatic stress can occur in response to both direct and indirect trauma exposure. Traumatic experiences are unexpected, unpredictable, and uncontrollable. Emotional responses to traumatic experience are often overwhelming and may include terror, helplessness, and extreme physiologic arousal that do not lead to purposeful and effective reactions. Of note, the current diagnostic nomenclature no longer includes the "intense fear" criterion. Nonetheless, these emotional responses often coincide, leading the child to feel overwhelmed, confused, and out of control and unable to utilize appropriate coping skills to reregulate. Central nervous system effects of this set of responses can impact later neurophysiologic responses. Hyperarousal and overgeneralization of threat can evolve, as well as other cognitive deficits, leading the child to react in an extreme fashion to events which resemble or remind the child of the original trauma. In fact, it is the child's subsequent reactions to trauma reminders, or triggers, which place a child at risk for developing post-traumatic stress disorder (PTSD) and other psychiatric conditions. The degree and frequency of significant arousal responses also reinforces the avoidance of discussion or consideration of traumatic memories, which further puts a child at risk for adverse outcomes. Another common reaction is reexperiencing in the form of flashbacks, nightmares, and intrusive images of the traumatic events. Manifestations vary based on the child's developmental stage, with the current DSM-5 now accounting for differences in traumatic stress responses across the life span. All children exposed to a traumatic stressor will have one or all of these reactions; however, not all will develop a psychiatric condition. Using a nationally representative sample of 1420 children tracked across time, Copeland et al. (2007) found that two-thirds of the children experienced at least one traumatic event before the age of 16 years, but less than 1% met full criteria for PTSD. Therefore, it is crucial to examine the risk factors that contribute to the development of deleterious effects post-trauma exposure.

Risk Factors of Developing Psychiatric Disorders After Traumatic Stress

Mental health clinicians, child regulatory agencies, and researchers have attempted to characterize child maltreatment in terms of chronicity, duration, developmental timing of abuse, level of exposure, and subtype of abuse, as these parameters have implications for the onset of psychiatric conditions, as well as interventions and outcomes (English et al. 2005; May and Wisco 2016). The presence of any of these exposure-specific risk factors, and other individual factors, may increase the likelihood of developing psychiatric disorders. Risk factors associated with trauma exposure are generally grouped into three categories: pre-trauma, peritrauma, and post-trauma. Pre-trauma factors are present before the traumatic exposure. For example, gender is a pre-trauma risk factor as studies have found that females have higher rates of PTSD compared to males (McLaughlin et al. 2013; McLean et al. 2011). Females have also been found to be at higher risk for anxiety disorders and depression after trauma exposure (Martin et al. 2014). Males who experience violent traumas are also more likely to develop antisocial tendencies (Ballard et al. 2015). Ethnicity can also put children at risk for developing a psychiatric condition with some studies finding that African-American youth are at greater risk of developing PTSD compared to Whites and Hispanics (Asnaani et al. 2010). This finding coincides with reports that African-American children experience higher rates of abuse, with a rate of 14.5 per 1000, compared to other races/ethnicities (e.g., rate of 8.4 for Hispanics and 8.1 for Whites). Native American children also experience high rates of abuse, at a rate of 13.8. Preexisting psychopathology may also be a risk factor for developing PTSD. Both internalizing and externalizing disorders prior to the traumatic event have been associated with the development of PTSD. This is especially true if the child was previously anxious or fearful or has a slow-to-warm-up temperament. It appears that individuals with significant interpersonal sensitivity and marked emotional reactivity either to their own or to other's distress are also more likely to develop significant traumatic stress. In this light, PTSD can be viewed as a phenomenon occurring as a result of a gene-environment interaction. Witnessing or experiencing traumatic interpersonal violence may lead to traumatic stress in those with high interpersonal sensitivity. This is consistent with the diathesis-stress model of trauma. Prior exposure to traumatic stress is also associated with increased risk for developing PTSD and is related to the notion of "allostatic load" (Juster et al. 2011). Attachment style has also been linked to the onset of psychiatric conditions after a traumatic event. The mechanisms by which attachment style places a child at risk can be associated with stress sensitivity, inability to self-regulate, and difficulties help-seeking (Cook et al. 2005). Using a meta-analytic design, Trickey et al. (2012) examined 25 risk factors found in other studies to be associated with the development of PTSD in childhood. These risk factors included pre-, peri-, and post-trauma factors. Results found small to medium effect sizes for pre-trauma factors, such as female gender, low intelligence, race, low SES, and psychological problems prior to exposure (Trickey et al. 2012).

Peritrauma factors occur at the point of traumatic exposure and include trauma severity, trauma type, proximity to the traumatic event, and cognitions/perceptions related to the traumatic experience. Traumas that include physical injury tend to increase the odds of developing a psychiatric disorder. This may be due to the combination of both psychological and physical effects that a child must effectively cope with. Level of exposure, that is, whether the child directly or indirectly experienced the traumatic event, may also predict the onset of PTSD. Affective responses to the event can also predict the onset of a psychiatric condition. For example, even though the subjective experience of intense fear was removed from the diagnostic criteria of PTSD, it has been found to predict the onset of PTSD. Interpersonal traumas are also more likely to lead to PTSD as opposed to nonviolent traumas. The timing of maltreatment is also associated with the onset of adverse outcomes. While child maltreatment at any age predicts the onset of depression and PTSD, child maltreatment in early childhood (ages 0–5) results in more severe depression and PTSD in adulthood (Dunn et al. 2017). Socioeconomic status (SES) may also pose a risk for the development of psychiatric symptoms. For example, one study examined the outcomes of different types of maltreatment, specifically emotional abuse, physical abuse, and neglect, in a racially diverse low SES child sample (Vachon et al. 2015). Results indicated that all forms of maltreatment predicted both internalizing and externalizing vulnerabilities in children (Vachon et al. 2015).

Post-traumatic factors include social support, complex traumas, and continued alterations in cognition (e.g., rumination, negative alterations in the view of the self and the world). Complex traumas, or the frequency of traumatic experiences, are potentially traumatic experiences that occur in response to the original trauma. Complex trauma appears to influence the presence and severity of psychological sequelae. For example, some physical abuse or neglect results in physical injury that requires intensive medical treatment. In those instances, the psychological impact is not only the result of the physical abuse but is also affected by the impact of necessary painful medical treatment. The pain and unpredictability of these medical or surgical procedures, prolonged hospitalization, and any uncertainty in the medical prognosis all heighten the possibility of traumatic stress for children with serious illness or injury. Other examples of complex traumas include subsequent moves among foster homes and CPS placements for children in state custody following abuse or death or serious injury of a close relative in the traumatic experience. The injury or death of a close relative impacts a child in three distinct ways: (1) the child is affected directly by the loss or serious injury, (2) that relative is not available to support the child through his or her traumatic experience, and (3) there are frequently significant confusion, worry, and sadness in the child's family as the family grieves the deceased loved one or cares for a seriously injured family member, further decreasing support for the affected child. Low parental support after a traumatic experience can increase the severity of the traumatic stress experienced by the child (Lauterbach and Armour 2016).

The experience of future traumas after experiencing a trauma also increases the risk of developing psychiatric symptoms. The National Child Traumatic Stress Network analyzed data for over 11,000 children who experienced at least 1 traumatic

experience and found a dose-response effect for both internalizing symptoms (except sleep difficulties) and externalizing symptoms, with each additional traumatic experience increasing the odds of scoring in the clinically significant range on a measure of broadband outcomes (Greeson et al. 2014). Notably, the average number of trauma types experienced in this sample was 3.6, supporting the finding that children who experience one traumatic event are at risk for experiencing another. The meta-analysis by Trickey et al. (2012) found medium to large effect sizes for both peri- (e.g., subjective experience of the traumatic event) and post-trauma factors (e.g., maladaptive coping styles, low social support, and poor family functioning). Although the role that a combination of risk factors plays in the development of psychiatric disorders is not yet well understood, these should be considered at the assessment phase of responding to a traumatized youth.

Maltreatment and Psychiatric Disorders

The relationship between childhood maltreatment and psychiatric disorders has been replicated. However, several methodological challenges have hindered the scholarly examination of the relationship between childhood adverse life events and their impact on the child, adolescent, and adult functioning. One challenge is in the definition of maltreatment and accurate identification, while another challenge is that these associations can only be analyzed using correlational studies. Despite these limitations, stressful life events have been consistently and robustly found to result in both short- and long-term adverse outcomes that cross multiple physiological and psychological domains.

Trauma has been linked to neurobiologic and neuroendocrinologic changes and adverse health outcomes across the life span that includes intergenerational transmission (Ballard et al. 2015; Carliner et al. 2016; Cowell et al. 2015; Danese and Tan 2014; Dunn et al. 2017; Felitti 2009; Harford et al. 2014; Jaffee 2017; McLaughlin et al. 2012; Norman et al. 2012; Buss et al. 2017). Neurobiologic changes include changes to the hypothalamic-pituitary-adrenal (HPA) axis, alterations in neurotransmitters (e.g., corticotrophin-releasing factor), and changes to limbic and cortical brain areas, all of which potentially contribute to the onset of psychiatric conditions (Nemeroff and Binder 2014). The HPA axis regulates the body's response to stressors, with chronic activation leading to the risk of psychiatric conditions. Maltreatment and trauma have also been linked to inflammatory markers associated with both medical and psychiatric conditions such as depression and some cancers. Baumeister et al. (2016) conducted a meta-analysis of studies that examined the relationships between C-reactive protein (CRP), interleukin-6 (IL-6), and tumor necrosis factor-α (TNF-α) and childhood maltreatment. Results indicated that physical abuse is related to increased TNF-α, although the effect size was small. Notably, increased TNF-α is associated with both depression and PTSD. Maltreatment has also been linked to structural changes to the developing brain. The limbic area is responsible for fear conditioning and processing of

emotional stimuli, whereas the cortical areas are responsible for higher-order cognitive processes such as executive functioning abilities – two areas which have been found to be affected after traumatic experiences (Jaffee 2017). One study, using a low SES sample of children who were maltreated, found that maltreated children performed lower on tasks of inhibition and working memory, compared to children with no history of abuse (Cowell et al. 2015). Executive functioning has been linked to such abilities as problem-solving, planning, and impulse control, abilities needed for emotion regulation. As such, deficits in executive functioning may place a child at risk for developing psychiatric conditions throughout the life span as executive functioning is related to emotion regulation.

Childhood maltreatment has been linked to numerous psychiatric conditions including PTSD, depression, anxiety, eating disorders, antisocial behaviors, bipolar disorder, substance use, and psychosis (see Table 18.1; Aas et al. 2016; Agnew-Blais and Danese 2016; Banducci et al. 2014; Carliner et al. 2016; Crusto et al. 2010; Duhig et al. 2015; Gibson et al. 2016; Infurna et al. 2016; Hamburger et al. 2008; Janiri et al. 2015; Kolko et al. 2009; Mills et al. 2013; Sugaya et al. 2012). The most common psychiatric disorder following a traumatic event is PTSD (Crusto et al. 2010; McLaughlin et al. 2013). Using the National Comorbidity Survey Replication Adolescent Supplement (NCS-A) survey data, McLaughlin et al. (2013) found that nearly 62% of the adolescents surveyed reported a potentially traumatic event, with a lifetime prevalence of PTSD at 7.3% for females and 2.2% for males. Of those who experienced physical abuse, the conditional probability of developing PTSD was 25% (McLaughlin et al. 2013). This study corroborates the notion that children experience numerous types of stressful life events prior to adulthood. PTSD may co-occur with other disorders, including depression and anxiety (Copeland et al. 2007). Furthermore, children who experience a traumatic event may also develop an anxiety disorder. This is likely due to hypervigilance to threat cues, which activates a child's fear response. Frequent activation of the HPA axis is a risk factor for the onset of anxiety disorders, including social anxiety, phobias, obsessive-compulsive disorder, and panic disorder. Mood disorders are also associated with child maltreatment (Dunn et al. 2017). For example, one study examined the onset and recurrence of depression and anxiety in young adulthood and adulthood (ages 18–65) for individuals with a childhood history of maltreatment (Hovens et al. 2015). Results indicated that child maltreatment predicted the onset of depression in adulthood, but not anxiety disorders (Hovens et al. 2015), indicating that the predictors of anxiety differ from those of depression. This finding was especially true for emotional abuse (Hovens et al. 2015). Childhood adversities, which include child abuse and neglect, also predict behavior disorders such as conduct disorder, oppositional defiant disorder, and attention-deficit/hyperactivity disorder (McLaughlin et al. 2012). While the majority of studies examine the relationship between sexual abuse and eating disorders, some studies have examined physical abuse as well. For example, using a meta-analytic approach, Caslini et al. (2016) examined the relationship between eating disorders and child physical abuse and found that experiencing physical abuse as a child increases the odds of developing

Table 18.1 Psychological outcomes of childhood maltreatment: literature review

Psychiatric condition	Emotional abuse (EA)	Neglect (N)	Physical abuse (PA)
Post-traumatic stress disorder	Childhood maltreatment, which included EA, increased risk of PTSD (Dunn et al. 2017)	N was associated with elevated post-traumatic stress symptoms in children (Kolko et al. 2009)	PA increased probability of developing PTSD (Dunn et al. 2017; McLaughlin et al. 2013)
Depression/ anxiety	EA associated with internalizing disorders (Mills et al. 2013; Spinazzola et al. 2014) EA predicted depression in young adulthood and adulthood (Hovens et al. 2015) EA was associated with emotion dysregulation, more so than PA (Banducci et al. 2014)	N associated with onset of depression (Infurna et al. 2016)	Physical forms of punishment lead to increased internalizing disorders (Gershoff and Grogan-Kaylor 2016) History of PA in childhood associated with anxiety and depression in adulthood (Lindert et al. 2014)
Substance use	EA was associated with an increased risk for use of nicotine, alcohol, and other substances in adolescence (Tonmyr et al. 2010)	N, specifically severe supervisory neglect predicted onset of polysubstance use disorders in young adulthood (Snyder and Merritt 2015)	Childhood maltreatment including PA related to use of substances (Carliner et al. 2016) PA associated with preadolescent alcohol use (Hamburger et al. 2008)
Psychosis	History of EA was reported by adolescents with early-onset psychosis (Duhig et al. 2015)		History of PA was reported by adolescence with early-onset psychosis (Duhig et al. 2015)
Bipolar disorder	EA associated with development of BD Type II (Janiri et al. 2015)		PA associated with any type of mood disorder including bipolar (Sugaya et al. 2012)
Disruptive behaviors	EA associated with externalizing disorders (Mills et al. 2013; Spinazzola et al. 2014)	N predicted the development of ODD, CD, and ADHD (McLaughlin et al. 2012)	Physical forms of punishment lead to increased disruptive behavior disorders (Berlin et al. 2009; Gerhsoff and Grogan-Kaylor 2016; McLaughlin et al. 2012) PA associated with increased risk for aggressive behaviors, above and beyond sexual and emotional abuse (Banducci et al. 2014)

anorexia nervosa, bulimia, and binge-eating disorder. Substance use has also been found to be related to childhood trauma, as it can become a form of coping with unwanted traumatic memories (Snyder and Merritt 2015). Using the National Comorbidity Survey Replication—Adolescent Supplement study data of nearly 10,000 adolescents, the authors found that exposure to potentially traumatic events before age 11 was associated with the use of different types of drugs (Carliner et al. 2016). Both physical abuse and emotional maltreatment have been associated with increasing the likelihood of substance use in adolescence (Tonmyr et al. 2010). Childhood trauma has also been linked to early-onset psychosis. One study utilized retrospective data of individuals experiencing early-onset psychosis, and 54% reported emotional abuse and 23% reported physical abuse (Duhig et al. 2015). Results indicated that childhood trauma was related to positive symptoms of schizophrenia (Duhig et al. 2015). Therefore, exposure to childhood trauma places a child at risk for a myriad of psychiatric disorders across the life span.

In an attempt to understand the causal mechanisms between maltreatment and psychiatric outcomes, researchers have examined both mediators and moderators. Mediators are variables that create indirect pathways by which exposure to maltreatment can lead to adverse outcomes. One of the most studied mediators is emotion regulation, the ability to adaptively recover from the intense arousal caused by emotional stimuli. Studies have found that emotion regulation is a partial mediator of the association between childhood trauma and depression in adults (Hopfinger et al. 2016). Other studies examining the role of emotion regulation have found that child maltreatment increases a child's tendency to overreact to emotional stimuli, which predicts poor emotion regulation, with poor emotion regulation predicting symptoms of depression, anxiety, and withdrawal (Kim-Spoon et al. 2013). Emotional reactivity and maladaptive responses to traumatic events have also been found to mediate the relationship between child maltreatment and both internalizing and externalizing symptoms in youth (Heleniak et al. 2016). Relatedly, experiential avoidance, or the reluctance to experience painful thoughts or emotions, has also been found to mediate the relationship between child abuse and PTSD (Shenk et al. 2014). Studies have examined the processes by which children who experience maltreatment develop mental health concerns. For example, a child who has been physically abused tends to be more hypervigilant to cues of danger and will then misinterpret other's behaviors as hostile (Curtis and Cicchetti 2011), findings which implicate the role of cognitions. Both depression and anxiety have been found to mediate the relationship between traumatic events and anxiety sensitivity (Martin et al. 2014).

Moderators are factors which decrease the strength of a relationship between two variables. Moderation analyses are useful in helping to identify protective factors. Moderators such as genetic factors and psychosocial factors have been found to moderate the relationship between maltreatment and psychological effects (Jaffee 2017). Two of the most consistent gene-environment interactions are the low activity variant of MAOA, which predicts the onset of antisocial behaviors in boys, and the 5-HTTLPR S allele genetic marker, which predicts the onset of depression in children who experience maltreatment (see Jaffee (2017) for a review of the find-

ings). Hence, genetic predispositions may play a role in whether or not a child who experiences maltreatment will develop some form of psychopathology. The timing of the maltreatment may also determine whether a child develops internalizing and/or externalizing symptoms. A study examining the relationship between neglect, internalizing problems, and adolescent substance use found that children who experienced neglect between 0 and 4 years old were more likely to develop internalizing problems compared to children who experienced neglect after age 4 (Duprey et al. 2017). Notably, children between the ages of 0 and 3 years are at greater risk for maltreatment (Jaffee 2017). This finding is consistent with the notion of "sensitive periods" during which the experiences of the child impact and restructure brain development. Social support and attending psychotherapy after a traumatic experience have been found to reduce the association between trauma and adverse outcomes (Lauterbach and Armour 2016; Maxwell et al. 2015). Social support includes such actions as letting the child know that the parent is there to offer support, listening to the child as they discuss their traumatic experience, modeling the use of affect modulation, and offering praise (Cohen et al. 2017). Adaptive cognitive processing, specifically accommodation, moderated the relationship between maladaptive cognitive processing (overgeneralization) and internalizing symptoms and worsening of externalizing symptoms (Hayes et al. 2017; Ready et al. 2015). Higher educational attainment, adaptive coping skills, and supportive family and friends may also lead to good mental health outcomes after experiencing child maltreatment (Afifi et al. 2016). The study of protective factors is hindered by reliance on correlational study designs, as the directionality of causation cannot be determined. Nonetheless, identification of protective factors is crucial to increasing the likelihood of minimizing the negative impact of traumatic stress.

Resilience

An examination of moderators can also help identify protective factors associated with resilience. Resilience is an individual's ability to cope with adverse life events in an adaptive manner, given environmental resources and support, which prevents or minimizes negative outcomes (Rutter 2012). Studies that have examined resilience in adolescence and adulthood following childhood maltreatment have identified essential ingredients to resilience that include (1) genetic factors, (2) biologic factors, (3) cognitive factors, and (4) interpersonal factors (Collishaw et al. 2007). Physiologic studies of resiliency have found that 50% of the variance between resilience and adverse outcomes is explained by genetic factors (Amstadter et al. 2016). Genetic factors associated with resilience include high levels of MAOA and the homozygous long allele of the 5-HTTLPR (Jaffee 2017). Cognitive factors associated with resilience include meaning making, hopefulness about the future, spirituality, and empowerment (Ben-David and Jonson-Reid 2017; McLaughlin and Lambert 2017). While some studies have examined resilience as a dichotomous factor, that is, the presence or absence of a disorder, others have operationalized

resilience along a continuum. This operationalization defines resilience as having lower-than-expected symptoms in comparison with the number of traumas experienced. For example, utilizing the National Epidemiological Survey on Alcohol Related Conditions (NESARC), Overstreet et al. (2017) operationalized resilience as the standardized residual variance between the predictor variable and the outcome. Results indicated that resilience decreased the likelihood of anxiety disorders and depression. This effect was above and beyond the effect of other known risk factors such as sex, education level, stressful (but not abusive) life events, and even social support (Overstreet et al. 2017). Interpersonal factors of resilience include secure attachment patterns, appropriate utilization of social support, emotional intelligence, and communication skills (Bailey et al. 2015; Howell and Miller-Graff 2014; Juster et al. 2011). In a study of polyvictimization, which included childhood maltreatment, researchers found that resilience in young adults was associated with higher levels of emotional intelligence, spirituality (which differs from religiosity), and peer support (Howell and Miller-Graff 2014). A study of Latin American families involved with the child welfare system found that family functioning, or the ability for family members to effectively communicate and solve problems, can also promote resilience by improving protective factors that may set the stage for resilience (Bailey et al. 2015). Future studies should examine resilience factors associated with different types of maltreatment, as they might differ based on maltreatment type (e.g., neglect versus physical abuse).

Assessment

Once a child has been identified as having experienced maltreatment, a thorough assessment of the child's and the family's needs should be conducted. This preliminary assessment should include ongoing safety concerns, an assessment of risk and protective factors (e.g., social support, child symptomatology, family functioning, and coping styles), and basic needs. One of the most important environmental determinants of the degree of psychological distress a child experiences after trauma is the degree of attuned emotional support the child receives from important adults in their lives. Usually, the supportive adults are parents, but they can be others with whom the child has meaningful relationships. This support validates the child's experience and provides an opportunity for the child to feel cared about and understood even when the child is terrified and overwhelmed. For example, the psychological outcome for maltreated children depends a great deal upon the emotional support of the non-offending parent. Many factors affect the degree of emotional support available to the traumatized child (Cohen et al. 2017). A child's attachment relationship with their caretakers is very important. The greater the security of attachment, the more the child will trust and rely on the support of others and ask for help accordingly, while coping with the arousal associated with trauma. Caretakers' ability to manage their own distress associated with their child's traumatic experience is an essential element in their ability to be emotionally available to support the child, as this helps to foster resilience (Afifi et al. 2016).

Evaluation of the child's context includes understanding family relationships and individual strengths and deficits. The assessment of the family includes attention to the family's organization, the family members' understanding of the trauma, and the family's capacity to obtain the resources needed for recovery, which may include medical and mental health care. The professional must also report abuse to the child protective system if it is suspected. If child welfare is involved with the child, the clinician can agree to provide support to the child and if feasible support the family's efforts to improve their situation and continue to be connected to their child. The assessment should also include understanding the situations that trigger arousal for the child, which often result in impulsive, aggressive behaviors, and recognizing ways that the child calms down when upset. Many programs have been designed to instill family resilience in response to traumatic events (Saltzman 2016). Family resilience programs include psychoeducation on traumatic stress and PTSD symptoms and ways to respond to a child who has experienced a trauma (Saltzman 2016).

Developmental considerations must be applied throughout the evaluation and treatment process. Traumatic experiences have varying effects on children of different ages, although adolescents' reactions tend to be similar to those of adults (National Institute of Mental Health 2017). Preschool children with a history of maltreatment may exhibit problems primarily related to separation (i.e., developmental regression, school refusal, sleeping with a parent or caregiver, difficulty sleeping, nightmares, reactive aggressiveness, poor social interactions, and/or clinging behavior with parent) (Naughton et al. 2013). Regressive behaviors such as enuresis and fears may occur. There are similarities with maltreated school-age children, but they may also experience sleep disturbances, school avoidance, academic difficulties, disruptive peer interactions, and angry outbursts. Attention and concentration problems, somatic complaints and depression, and withdrawal are other features of abused school-age children. During adolescence, maltreatment may manifest as hypervigilance and intrusive thoughts, emotional numbing, avoidance, and nightmares, along with mood dysregulation and depressive symptoms.

Treatment

The treatment of children who have experienced trauma and have symptoms of traumatic stress begins with a thorough assessment of the child and his or her context, as this will help identify goals and targets for intervention. This evaluation includes obtaining a history of the child's traumatic experiences throughout their life and gaining an appreciation of the child's strengths and capacities. In gathering this history, one should take care not to re-traumatize the child; the use of ancillary historians is essential in this endeavor. If the child spontaneously discloses, validation of their emotional reactions is warranted. Assessment of symptoms – including the psychological symptoms of acute stress reaction, PTSD, and depression as well as behavioral manifestations including aggressiveness, impulsivity, substance use, sexual acting out, and self-harm – is essential. Assessment of symptoms should be

conducted at the outset, during, and at the end of treatment to help monitor symptom improvement and to identify continued targets for intervention.

Several authors have described approaches to the treatment of children who have experienced trauma and have psychological or behavioral difficulties (Briere and Scott 2015; Cohen et al. 2017; Saxe et al. 2007). The National Child Traumatic Stress Network (NCTSN) also presents a comprehensive review of evidence-based treatments for PTSD and post-traumatic stress reactions on their website, nctsnet.org. Psychotherapeutic interventions for traumatic stress are typically initiated weeks after the child has been exposed, as the risk for developing PTSD may occur within 3 months of exposure to the trauma. Just as in the assessment phase, development must be taken into consideration when choosing an appropriate intervention. For children 0–3 years old, Child-Parent Psychotherapy (CPP; Lieberman and Van Horn 2008) has been identified by the NCTSN as being efficacious in reducing traumatic stress reactions by improving the attachment between a mother and the child. Preliminary data suggests that CPP may also help expectant mothers reduce their own post-traumatic stress symptoms and depression and improve maternal attitudes (Lavi et al. 2015). For children ages 2–7, Parent-Child Interaction Therapy (PCIT) (Eyberg and Calzada 1998; Eyberg and Robinson 1982) has been found to reduce anxiety and disruptive behaviors and to indirectly reduce symptoms of traumatic stress. PCIT was originally designed for children with disruptive behaviors, but it has since been modified for children who have experienced physical abuse. A meta-analysis of PCIT's effectiveness at reducing recurrence of physical abuse found that PCIT can reduce the likelihood of recurrence ($g = 0.52$, medium effect size) and decreases parental stress ($g = 0.35$, small effect size) (Kennedy et al. 2016). For children 6 years and older, the most common psychotherapy is Trauma-Focused Cognitive Behavioral Therapy (TF-CBT) (Cohen et al. 2017). TF-CBT is designed to reduce both externalizing and internalizing symptoms as well as PTSD and has been modified for several types of maltreatment and traumatic experiences. TF-CBT works by teaching the child adaptive coping skills such as affect identification and modulation, cognitive restructuring, and behavioral strategies to manage related behaviors (e.g., sleep difficulties), before using imaginal or in vivo exposure to the memories of the traumatic event via the construction of a trauma narrative. A meta-analysis of both TF-CBT and play therapy found that TF-CBT had better outcomes compared to play therapy, except for externalizing behaviors (Slade and Warne 2016). Notably, TF-CBT, applied with and without the trauma narrative component, has been found to reduce PTSD symptoms, depression, and anxiety, with these gains maintained at 6-month follow-up (Nixon et al. 2012). It is likely that both CBT and cognitive therapy alone were efficacious in reducing psychiatric symptoms as exposure to the trauma is commonly conducted at every session of TF-CBT. TF-CBT has also been found to improve resiliency in children by increasing a child's sense of mastery and relatedness and decreasing emotional reactivity (Deblinger et al. 2017). This study examined sexual abuse; therefore, it would be beneficial to replicate these findings for other forms of maltreatment. Prolonged exposure (PE), which is based on emotional processing of the trauma, has recently been modified for use with adolescents (Foa et al. 2008). Preliminary results suggest

that PE can reduce symptoms of PTSD in adolescents, with improvements in PTSD symptoms leading to improvements in depression as well (Aderka et al. 2011). Mediational analyses have found that reductions in PTSD and depression symptoms are mediated by improvements in negative trauma-related cognitions (McLean et al. 2015). Notably, CBTs appear to be the most efficacious treatments for PTSD; however, other approaches focus on building resilience by utilizing the child and the family's strengths, as opposed to symptom reduction (Chandler et al. 2015). More studies examining the use of CBT for the prevention of PTSD are needed, as well as studies examining the application of trauma-focused psychotherapies via telehealth methods (e.g., Tuerk et al. 2010).

Regardless of the treatment utilized, the goals of treatment are to assist the child's return to safe development and functioning and to build the capacity of the child's context (family and other important adults) to support the child's behavior and development. The process of treatment also assists the child in integrating the memory of the trauma so that the child can remember the trauma, manage his arousal, and not need to either avoid or reexperience the traumatic experience. Offering opportunities to voluntarily participate in a debriefing discussion with a trained professional may be helpful for those who freely choose to discuss their traumatic exposure at that time. Treatment is designed to develop and maintain expectations of safety and predictability, reestablish self-control and self-direction, and build the child's capacity for resilience in future experiences of adversity. A final goal of treatment is to reduce the possibility that the child approaches his or her life as a victim with limited self-respect and self-regard and is re-traumatized or continues the cycle of abuse. For instance, Maxwell et al. (2015) found that attending psychotherapy to process childhood maltreatment mediated the relationship between childhood maltreatment and perpetrating abuse in adulthood.

Sargent (2009) describes the treatment process in a series of eight steps (Table 18.2). Notably, these stages coincide with TF-CBT's "A PRACTICE" model, which focuses on assessment, psychoeducation, improved parenting practices, affect modulation, cognitive processing, exposure (both imaginal and in vivo), and enhancing safety (Cohen et al. 2017). These stages are appropriate in the acute

Table 18.2 Eight steps in traumatic stress treatment

1. Ensuring safety
2. Ensuring availability of basic needs
3. Building child and family knowledge about the trauma and its effects
4. Reinforcing normative behavioral routines
5. Identifying and supporting the child's emotional states
6. Supporting those who support the child
7. Building the child's trauma narrative and helping the child share the narrative with important others
8. Building a compassionate and healing response to the trauma (in family, community, and a wider society)

From Sargent (2009). http://www.psychiatrictimes.com/print/article/10168/1388613?printable=true

treatment of children after traumatic injury and acute abuse, as well as in treatment of children with PTSD and children who have experienced repeated trauma and evidence complex traumatic stress.

Step 1: Safety

The first step involves ensuring the child's safety. In situations of acute danger, this involves making sure that the child is physically safe. Compassion and caring involvement of police, rescue workers, health-care professionals, and child protective workers maximize the likelihood that the child will feel psychologically supported while these professionals are ensuring the child's physical safety. This is a critical first step as psychotherapy will not be effective if the child is still being exposed to traumatic experiences.

Clinicians working with traumatized patients should always ensure that these children feel safe in their lives and in the therapist's office. Some victims of child maltreatment do not have an internal sense of safety and may need to learn relaxation techniques as they become more comfortable with their therapist and in participating in therapy. The therapist can then help the patient associate safety with the experience of calmness and to begin to search out safety and avoid dangerous situations. In some instances, the therapist may need to assist parents in assuring safety for children endangered through domestic violence and community violence.

Step 2: Basic Needs

After ensuring the child's safety and supporting the child psychologically, attention to the child's basic needs for food, shelter, sleep, and medical care is necessary. After traumatic injury, this may include surgery and hospital care. For children removed from abusive homes, the state is responsible for certifying that foster homes have the resources needed to care for the child. Ensuring adequate nutrition and sleep are often essential aspects of treatment of both acute and chronic traumatic stress.

Currently, there are no Food and Drug Administration (FDA)-approved psychopharmacologic treatments of pediatric PTSD. However, psychopharmacology to assist with sleep, severe anxiety, and significant hopelessness and withdrawal may be useful. Depression is frequently comorbid with PTSD in children and adolescents. Selective serotonin reuptake inhibitors (SSRIs) are most commonly used with appropriate informed consent and monitoring. Informed consent by parents and consistent monitoring for suicidal ideation in the youth treated with SSRIs are essential parts of treatment. Frequently, there is off-label use of SSRIs in the child and adolescent population based on FDA approval for adult psychiatric disorders and/or pediatric indications for alternate anxiety or mood disturbances (Leslie et al. 2005). Sertraline, fluvoxamine, and fluoxetine all have FDA pediatric indications

for the treatment of obsessive-compulsive disorder; however, only fluoxetine is FDA approved for the treatment of adolescent depression (Martin and Volkmar 2007; US FDA 2003a). Although most SSRIs are widely used in the pediatric population for the treatment of PTSD, only paroxetine and sertraline have FDA indications for adult PTSD (Lubit 2008; US FDA 2003b). Guanfacine and clonidine have been cited as effective in open trial studies for the treatment of PTSD in pediatric populations; however, neither has FDA approval for this treatment (De Bellis and Van Dillen 2005; Martin and Volkmar 2007). If a youth has associated psychosis, affective dysregulation, agitation, and dissociation, atypical antipsychotics may be utilized particularly in the acute phases of care (Martin and Volkmar 2007). Prazosin, which has been found to reduce impulsivity and sleep disturbances in adults (Raskind et al. 2003), has not been as extensively studied in children or adolescents. However, a chart-review-style study found that prazosin may help youth with sleep-related difficulties (e.g., nightmares; Keeshin et al. 2017). In sum, these categories of pharmacologic agents have been successful with careful monitoring in conjunction with a multimodal treatment plan. However, a meta-analysis found stronger effect sizes in the reduction of PTSD symptoms with the use of psychotherapy (specifically TF-CBT) as compared to psychopharmacological treatments (Morina et al. 2016). However, very few psychopharmacological studies were included in the analysis, which indicates the need for more randomized clinical trials of psychopharmacological treatments of pediatric PTSD.

Step 3: Knowledge

It is essential that the child and family understand as fully as possible all aspects of trauma recovery. For acute situations, this involves information about the psychiatric conditions (e.g., PTSD, depression, anxiety), making connections between the child's behavior and traumatic stress, treatment options, the recovery process, and expectations for the future. In all instances, the therapist will need to ensure that the family and child understand the psychological effects of trauma and how behavioral symptoms may be a response to traumatic experiences. Parents will need to learn the importance of validating their child's emotional experience and to set consistent limits in a firm but caring manner. Parents may also feel guilty about their inability to protect their child physically and/or emotionally. These caregivers might also feel guilty regarding their perpetration of psychological maltreatment, physical abuse, or neglect. Accurate information may help them to resolve their guilt and be available to support their child. Providing information is the first step in developing a recovery-oriented therapeutic collaboration with the child and family. By encouraging the family and child to ask questions and to build a thorough understanding of their situation and what can be expected in treatment, the therapist begins the process of empowerment and builds self-control.

Step 4: Resuming Behavioral Routines

An important next step in the psychological recovery process involves the establishment of behavioral competency. This can occur as the child participates in therapy after the trauma. While in therapy, skills are taught to the child, the child practices, and the therapist and caregivers praise the child's participation in therapy. Parents/caregivers and the therapist also reinforce the child's role in the recovery process. The same can occur for children who are experiencing chronic traumatic stress. Encouraging the child's attendance and achievement at school, their participation in activities, and their successful completion of chores at home – anything that the child can be expected to do and praised for – builds the child's sense of competency and self-control. If the child is experiencing behavioral disruptions at school or if the child's academics are being negatively impacted, parents/caregivers are encouraged to discuss the child's needs with school personnel to determine what accommodations the school can put in place to help the child function at school. The clinician can ensure that the child and family practice relaxation techniques, calming exercises, and deep breathing outside of sessions. The child and the family can use these skills as methods of managing arousal and affective instability. This process further builds the engagement of the child and family in treatment and with the therapist. The use of the skills outside of the sessions by parents could help the child utilize the skill as well, as children tend to model what they observe adults doing. Parents can also utilize praise for supporting and reinforcing their child's competency. A critical component of resuming behavioral routines is resuming age-appropriate rules/expectations and utilizing age-appropriate disciplinary strategies. Caregivers often feel guilty about setting limits and implementing consequences as needed after a child has experienced a traumatic event. Therefore, treatment providers can help the caregiver process this guilt and provide the parent with age-appropriate disciplinary actions and developmentally appropriate expectations of the child.

Step 5: Affect Exploration, Identification, and Regulation

This step encourages the child and family to realize that trauma produces an immediate emotional response including fear and powerlessness and subsequent reactions including continued fear, anger, sadness, and possibly shame. These emotions often occur simultaneously and can be confusing for the child and family as they might be expressed via intense anger outbursts, extreme anxiety, or withdrawal. By identifying individual emotions and helping the child, and caregiver, to understand how each emotion is appropriate and understandable given the situation, the therapist helps the child's emotional experience become predictable and understandable. In this process, the child learns to manage their emotions and the parents have the

opportunity to support their child. This also provides the parents with the experience of parenting effectively and builds their sense of control and competency. The child also learns that they do not have to suppress emotions or avoid awareness of their experience, as experiential avoidance increases the likelihood of developing a psychiatric condition. Mindfulness strategies may be useful in helping a child identify the physiological cues of their emotions, as well as help the child manage the emotion more effectively. Mindfulness may promote adaptive cognitive processing by reducing experiential avoidance and thought suppression (Thompson et al. 2011).

Step 6: Supporting the Supporters

The mental health provider creates an atmosphere of emotional support for all participants. Being involved with traumatized children can be arousing and upsetting for all involved, including the therapist. Working with traumatized children can be difficult and requires that special understanding and purposeful support be offered and available to the child, the parents, and the relatives. Emotional support is also essential for first responders, hospital staff, child welfare workers, and other staff who work with traumatized children. Repeated exposure to traumas experienced by others or repeated exposure to details about the trauma is considered indirect trauma by the DSM-5 (American Psychiatric Association 2013). Mental health providers are at risk for developing PTSD via vicarious trauma (Cohen and Collens 2012). Respite from traumatic work, supervision/consultation/mentorship, on-the-job support, and peer support for the mental health provider, as well as increased self-care and self-efficacy, are important aspects of preventing PTSD and vicarious trauma in mental health providers (Finklestein et al. 2015). These strategies can also help prevent burnout for mental health providers who work with traumatized children.

Step 7: Creating the Trauma Narrative

Given the role that cognitions play in the onset of psychiatric conditions (LoSavio et al. 2017), organizing traumatic memories into a coherent narrative of the traumatic experience is an essential part of the recovery process. This helps the child appreciate what has happened and ultimately experience mastery over their recollections. The child is helped to attend to his level of arousal and to monitor arousal while creating a step-by-step description of what happened. One method for this process is to help the child develop an emotion thermometer. This allows the child to rate their level of arousal between 0 and 10. This helps the child to recognize, while building the trauma narrative, when their level of arousal is rising to a distressing level. The therapist can ask the child to stop telling the story and use relaxation skills to calm down. When arousal decreases to an easily tolerable level, the

child can begin to elaborate on the trauma narrative again. The goal is for the child to be able to tell the story and manage the arousal. Simultaneously, the therapist strongly supports and reinforces this process, while also noting maladaptive cognitive coping strategies (e.g., self-blame, overgeneralization). The therapist then helps the child utilize cognitive restructuring skills as needed. Ultimately, the child presents the trauma narrative to their parents, who will need the therapist's support in order to be able to hear the story and praise their child for their courage, for their persistence, and for the child's ability to describe the experience. As the child organizes and manages the narrative, the overwhelming nature of the trauma becomes a memory over which the child experiences increasing control, which increases self-efficacy and empowerment. The parents have a unique opportunity to understand, accept, and show their child love and support. The resiliency of all is apparent and is readily recognized.

Step 8: Making Meaning of the Trauma

There is always the opportunity for those involved in trauma recovery to make unique meaning or significance of the trauma. This can be personal – through artistic expression or journal writing or via volunteer and professional activity. It can also be community-wide – through memorialization or volunteer efforts to improve the community through organizations such as the International Society for Prevention of Child Abuse and Neglect. National and international efforts to enhance social justice or respond to human rights abuses are also important responses to trauma. These efforts provide an opportunity for those who care about those who experience trauma and those who have survived traumatic experiences to grow through the recovery process. Meaning making works to reduce the negative alterations in cognition that often occur after a traumatic experience by helping the child find meaning in their pain, which can increase the child's sense of purpose.

In addition to addressing psychological sequelae secondary to traumatic experiences, clinicians are called to address other problematic sequelae of abuse. These psychiatric conditions include substance misuse disorders, depression, emotion dysregulation, and aggressive acting-out behavior. For youth who do not demonstrate trauma-related anxiety and/or depression but meet criteria for an anxiety or mood disorder, CBT as well as pharmacotherapy with antidepressants and anxiolytics may also be beneficial. An individualized treatment plan will need to focus on decreasing outbursts, setting limits, providing effective supervision, assisting the child with alternative methods of expression, and soothing. The engagement of the non-offending parent, foster parents, adoptive parents, and extended family is an important part of the therapeutic and recovery process, as trauma affects the entire family system.

Conclusion

Traumatic experiences are common during childhood. While physiological, emotional, and cognitive reactions in response to traumatic stress are common and expected, understanding the mechanisms by which the development of psychiatric conditions occur is of pivotal importance. Some children's intrinsic capacities and environmental contexts can lead to resilience and even growth following a traumatic experience. By understanding the elements inherent in resilient situations—that is, predictability by resuming normal routines, self-control, competence, and meaningful emotional support and working to enhance these elements in situations where symptoms of traumatic stress exist – mental health providers can help build resiliency and support the recovery of children and families experiencing significant traumatic stress.

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