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ORIGINAL ARTICLE

Development of a systematic protocol to identify victims of non-accidental trauma

Mauricio A. Escobar Jr.[1,3,8] · Bethann M. Pflugeisen[2] · Yolanda Duralde[1,4] · Carolynn J. Morris[1,5] · Dustin Haferbecker[1,3,6] · Paul J. Amoroso[2] · Hilare Lemley[1,7] · Elizabeth C. Pohlson[1,8]

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Abstract
Purpose Each year, nearly 1 million children in the USA are victims of non-accidental trauma (NAT). Missed diagnosis or poor case management often leads to repeat/escalation injury. Victims of recurrent NAT are at higher risk for severe morbidity and mortality resulting from abuse. The objective of this review is to describe the evolution and implementation of this tool and evaluate our institutional response to NAT prior to implementation.
Methods A systematic guideline for the evaluation of pediatric patients in which NAT is suspected or confirmed was developed and implemented at a level II pediatric trauma hospital. To understand the state of our institution prior to implementation of the guideline, a review of 117 confirmed NAT cases at our hospital over the prior 4 years was conducted.
Results In the absence of a systematic management guideline, important and relevant social and family history red flags were often missing in the initial evaluation. Patients with perineal bruising experienced significantly higher mortality than patients without perineal bruising (27.3 vs. 5.7 %; $p = 0.03$) and were significantly more likely to require surgery (45.5 vs. 14.2 %; $p = 0.02$).
Conclusion Development and implementation of a standardized tool for the differentiation and diagnosis of NAT and creation of a structured electronic medical record note should improve the description and documentation of child abuse cases in a community hospital setting. A

✉ Mauricio A. Escobar Jr.
Mauricio.Escobar@multicare.org

Bethann M. Pflugeisen
bethann.pflugeisen@multicare.org

Yolanda Duralde
Yolanda.Duralde@multicare.org

Carolynn J. Morris
Carolynn.Morris@multicare.org

Dustin Haferbecker
Dustin.Haferbecker@multicare.org

Paul J. Amoroso
Paul.Amoroso@multicare.org

Hilare Lemley
Hilare.Samayoa-Lemley@multicare.org

Elizabeth C. Pohlson
Elizabeth.Pohlson@multicare.org

[1] Mary Bridge Children's Hospital and Health Center, Tacoma, WA, USA

[2] MultiCare Institute for Research and Innovation, MS: 315-C2-RS, 314 Martin Luther King Jr. Way, #402, Tacoma, WA 98405, USA

[3] University of Washington School of Medicine, Seattle, WA, USA

[4] Child Abuse Intervention MBH, Safe and Sound Building - 11125-1-CA, 1112 S. 5th Street, Tacoma, WA 98415, USA

[5] Transfer Center, Business Support Center - 1002-1-TRA, 2108 Pacific Ave, Tacoma, WA 98402, USA

[6] Mary Bridge Children's Hosp - 315-O6-IPS, 317 Martin Luther King Jr. Way, Tacoma, WA 98405, USA

[7] Trauma MBH, Mary Bridge Children's Hosp - 311-1-TRM, 311 South "L" Street, Tacoma, WA 98415, USA

[8] Pediatric Surgery, MS: 311-3W-SUR, 311 South "L" Street, PO Box 5299, Tacoma, WA 98415, USA

retrospective analysis demonstrated that in the absence of such a tool, management of NAT may be inconsistent or incomplete. Perineal injury is an especially ominous red flag finding.

Keywords Non-accidental trauma · Trauma assessment · Emergency service · Child abuse · Process improvement

Introduction

Each year in the USA, nearly 1 million children are victims of neglect and/or non-accidental trauma (NAT). Approximately, three-quarters of all NAT fatalities occur in children under age 3, and an estimated 12 % of these fatalities involve families that had received CPS family preservation services in the 5 years preceding the fatal incident [1]. The annual societal cost of child abuse and neglect is estimated to be over $103 billion [2], but these estimates are likely conservative as identification of child victims of NAT is difficult and inconsistent, requiring that clinicians first suspect NAT as the mechanism of injury at presentation and then correctly evaluate and manage the trauma as non-accidental [3].

Jenny et al. [4] showed that 31 % of evaluated abusive head trauma cases were not properly identified by physicians at the time of the child's initial evaluation; 30 % of the children in their study were re-injured after the missed diagnosis. Larimer et al. [5] demonstrate the importance of including pediatric surgeons in the evaluation of NAT cases due to the high incidence of polytrauma in NAT patients. Early identification of NAT is critical, as children who are victims of recurrent NAT experience significantly higher mortality (25 %) compared to victims of initial NAT episodes (10 %) [6]. Studies published in France [7] and Finland [8] emphasize the importance of identifying risk factors and implementing effective screening programs, as prompt identification of NAT can potentially mitigate further injury, neurologic devastation, or death. Without sufficient provider training to identify NAT and coaching about communication with families, child survivors of NAT are at increased risk of re-injury or death due to missed diagnosis or insufficient case management.

In 2012, increasing awareness of the importance of identifying NAT at its earliest presentation prompted the development of a systematized procedure for differentiation and management of trauma that is non-accidental within our large, community health-care system. The objective of this review is to describe the evolution and implementation of this tool and evaluate our institutional response to NAT prior to implementation.

Materials and methods

Mary Bridge Children's (MBC) is the only pediatric hospital in the South Puget Sound region of Washington State and serves as the state-designated pediatric level II trauma center for Southwest Washington. In mid-2012, a group of concerned physicians began evaluating the diagnosis and management of NAT in our system. In the 3rd Quarter of 2012 an interdisciplinary NAT subcommittee was established under the pediatric trauma department with the dual aim of raising awareness about NAT and its warning signs and building and implementing guidelines for the screening and management of NAT patients. This subcommittee comprised physicians, nurses, trauma registrars, and social workers. The team met monthly throughout 2013 to develop a screening tool to be used in the evaluation of trauma patients and to prepare providers in the system for its deployment. This quality improvement initiative was developed over the course of a year and a formalized NAT management guideline went live January 1, 2014.

An NAT screening tool developed by the Children's Hospital of Pittsburgh of UPMC (© 2010, unpublished guideline) was chosen as a blueprint and adapted for our institution to meet the needs identified by the NAT subcommittee. The resultant systematized assessment procedure was designed to be used in the initial evaluation of any pediatric patient with suspected NAT and includes both a screening tool that features a series of NAT red flags (Fig. 1) and a structured note to be used by the pediatric surgeons in the child's electronic medical record (EMR) (Fig. 2). The EMR note guides providers with a series of best practice instructions in the differentiation of trauma that was non-accidental, facilitating evaluation and data capture critical to cases of NAT. The screening tool was posted at nurse stations in all of our hospital system's emergency departments and pediatric care units, as well as being readily available from the pediatric trauma department and posted online on the hospital's policies and procedures website. The tool also mandates a discharge huddle for any patient in which NAT is suspected or confirmed. The huddle includes the relevant members of the care team, such as the discharging physician, staff RN, social worker, and specialists involved in the patient's evaluation; no child is to be discharged unless every member of the discharge team agrees that discharge is appropriate.

The NAT subcommittee, through a series of in-service trainings, provides education about identification and management of NAT and the use of the tool by our system's surgeons and emergency department, and pediatric and family medicine providers. The outreach focused on identifying red flags associated with non-accidental trauma,

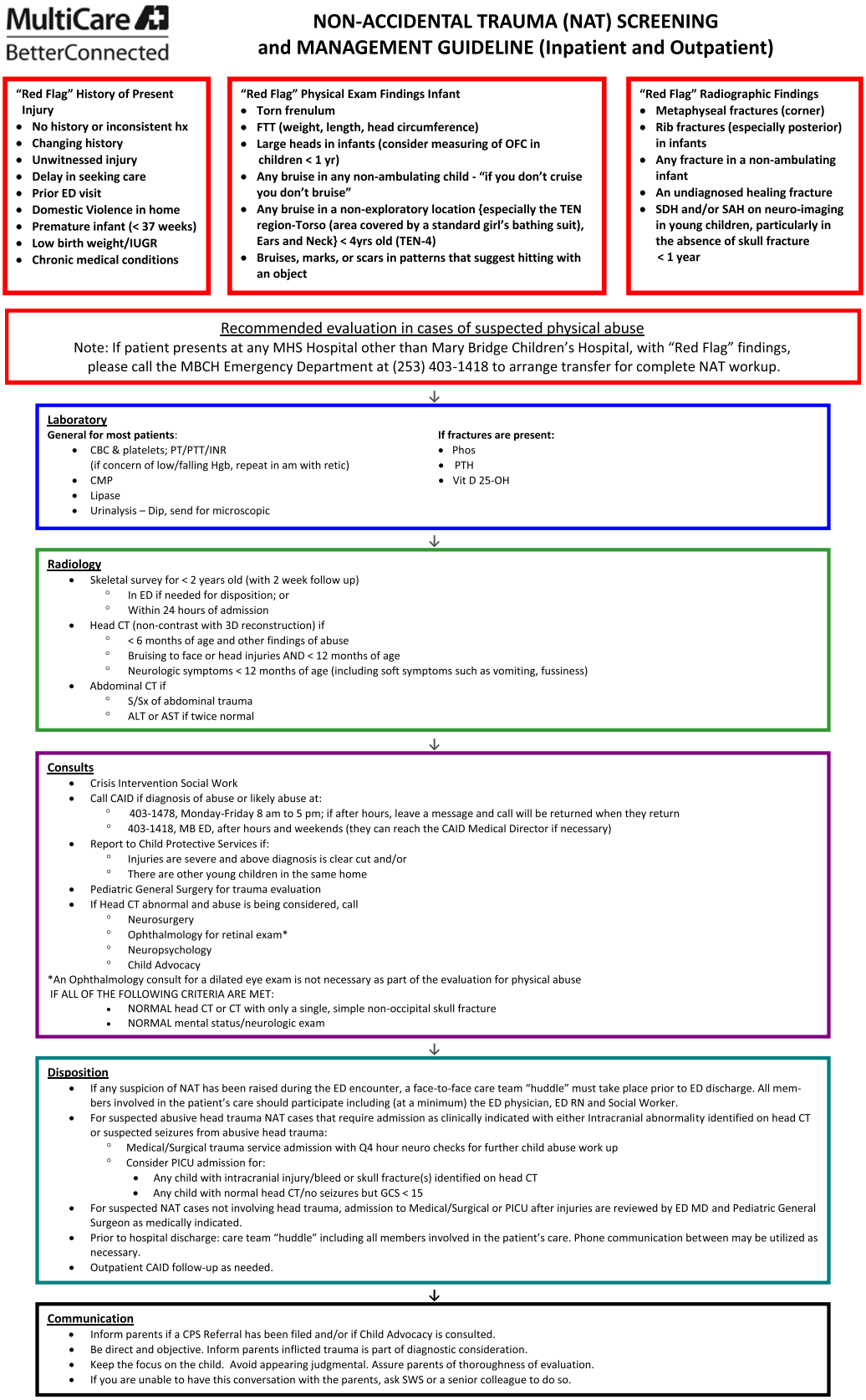

Fig. 1 Non-Accidental Trauma (NAT) Screening and Management Guideline (Inpatient and Outpatient)

I. MARY BRIDGE NON-ACCIDENTAL TRAUMA CONSULT

RE:	**@NAME@, @AGE@ @SEX@**
Date of Birth:	**@DOB@**
Medical Record Number:	**@MRN@**
Admission Date/Time:	**@ADMITDTTM@**

Chief complaint:

- @CC@

History of Present Illness:

- The patient is a @AGE@ @SEX@ who presents with ***
- The injury is described as: ***
- Activity status:
  - Rolling
  - Cruising
  - Walking
- NAT screen (history):
  - No history or inconsistent history
  - Changing history
  - Unwitnessed injury
  - Delay in seeking care
  - Prior ED visit
  - Domestic Violence in home
  - Premature infant (< 37 weeks)
  - Low birth weight/IUGR
  - Chronic medical conditions

Medical History:

- Medical Problems: ***

Operations:

- @PSH@

Allergies:

- @ALLERGIES@

Immunizations:

- @IMM@

Medications:

- @MEDLIST@

Family/Social History:

- Any cultural or social issues to be aware of?
- Any major illness in the immediate family?
-

Review Of Systems:

- {ROS - complete::All other systems negative unless otherwise noted in HPI.}

Physical Exam:

- Vital Signs: @VS@
- Head circumference:
- Length:
- General Appearance:
- Head:
- Eyes:
- ENT:
  - Torn frenulum?
- Neck:
- Chest:

Fig. 2 Mary Bridge NAT EMR note

- CV:
- Abdomen:
- Anus:
  - Perineal bruising or injury?
- Genitourinary:
- Extremities:
- Neurological:
- Skin:
  - Bruising? {YES/NO:103916}
    - Age < 4 YO? If yes:
      - Torso?
      - Ears?
      - Neck?
  - Scarring?

Tests Ordered/Reviewed:

LABS:

@LAB48R@
@AMYLASESERIAL@
@LIPASESERIAL@
@CRPSERIAL@
@ESRSERIAL@

LAST IMAGING:

- LFT's elevated?
  - **If LFT's elevated to twice normal, then order CT of the abdomen & pelvis.**
- NAT Screen (Radiology)
  - Metaphyseal fractures (corner)
  - Rib fractures (especially posterior) in infants
  - Any fracture in a non-ambulating infant
  - An undiagnosed healing fracture
  - SDH and/or SAH on neuro-imaging in young children, particularly in the absence of skull fracture < 1 year

Impression:

- The patient is a @AGE@ @SEX@ who presents with ***.
- Is there a suspicion for NAT?

Plan:

- CAID referrals
- Optho referrals
- Skeletal surveys
- Admission

Discussed with {FAMILY } who expressed understanding and agreement with plan as outlined above.

Fig. 2 continued

procedures related to diagnosis of trauma that is non-accidental, use of the EMR structured note, review of resources available to providers in the event of a positive diagnosis, and instruction on how to leverage the resources provided by social work, child abuse intervention department staff, and Child Protective Services (CPS) when necessary. Departments were responsible for implementing their own training sessions to ensure that staff was familiar with the guidelines.

To concurrently assess the state of our institution prior to implementation of education and a standardized NAT management tool, we performed a retrospective review of confirmed cases of NAT in the 4 years prior to the go-live (2010–2013). IRB approval for the study design was obtained (IRB 13.21). All cases appearing in the hospital's trauma registry and coded for NAT or child abuse were included. All of these cases entered the system through the emergency department and were admitted to the hospital, with the exception of patients who died in the emergency room or were transferred in from another facility as a trauma, regardless of hospital admission status. At our institution, trauma is defined as pediatric when occurring in patients $\leq$14 years of age, although exceptions are made on a case-by-case basis, as reflected by our data. Data were abstracted from our trauma registry by one full-time pediatric trauma registrar [HL]. Descriptive statistics for

cohort demographics and over 60 additional variables related to medical and social history, physical examination, radiographic findings, referrals, hospital procedures, and discharge information were calculated. Select associations were evaluated using Chi-squared tests of significance and Fisher's exact test in the event of small cell counts. All analyses were performed in the R statistical computing environment [9] and significance was assessed at the 0.05 level.

Results

117 Trauma cases diagnosed as non-accidental and occurring between 2010 and 2013 were reviewed. The annual percent of NAT diagnoses per total trauma cases ranged from 4 to 8 % (Table 1), but this variation was not statistically significant ($X(2) = 6.9$, $p = 0.07$). 43 (37 %) of the patients were female and 80 (68 %) were under 1 year of age at presentation (median age 6 months ± 2.2 years). 114 (97 %) patients presented with two or more red flags (Table 2) and more than half of the cohort ($N = 68$, 58 %) presented with 6 or more of the 19 red flags featured on the screening instrument. The most frequently noted red flags (Table 3) were no history or inconsistent history ($N = 104$, 89 %), caregiver report of an unwitnessed injury ($N = 88$, 75 %), fractures in non-ambulating infants ($N = 39/68$, 57 %), and bruising that is suggestive of abuse ($N = 67$, 57 %).

Prior to implementation of the NAT management guideline, adherence to procedures identified as important were generally high (Table 4), with the exception of the discharge huddle, which was performed for only 49 patients (42 % of cohort). Head injury was suspected and followed up with head CT in 50 cases (43 % of cohort) and findings were positive for subdural/subarachnoid hemorrhaging in 42/50 (84 %) of these patients. The median age for the children for whom head CT was performed was 4.8 ± 10.6 months and five of these children (10 %) were victims of a fatal incident. 106 (90 %) patients were admitted to the hospital. Mean ED length of stay was 3.6 h (±2.5 h; range = <1–11.1 h) and mean hospital length of stay was 5.3 days (±7.2 days; range = 1–51 days). Three of the 11 patients not admitted to the hospital died in the ED. Of the remaining eight patients not admitted, the majority did not require hospitalization due to minor injuries. Six patients were evaluated in the ED as a point of entry into the CPS/foster-care system. One patient was admitted to the hospitalist service not under the auspices of the trauma service. One patient was evaluated for assault and released home in stable condition from the ED. Relevant social history information collected by the structured EMR note was missing for most patients, including caregiver drug and alcohol use (53 and 62 % missing, respectively), a history of caregiver mental illness (71 % missing), and caregiver criminal history (41 % missing). The presence/absence of domestic violence in the home was missing in only 17 % of cases; five of the patients for whom this information was not collected were victims of a fatal incident.

Over the 4 years, severe Injury Severity Scores ([ISS] ≥ 16) were significantly more frequent in the NAT population (52/117, 44 %) than in the accidental trauma population (167/1845, 9 %) ($X(2) = 139$, $p < 0.001$). To investigate this highly significant discrepancy, we compared the NAT population with the accidental trauma population, excluding patients with a hospital length of stay <1 day, thereby removing a potential bias incurred by a high rate of minor injury. 116/502 (23 %) accidental trauma patients with a hospital length of stay >1 day had an ISS ≥ 16 ($X(2) = 22$, $p < 0.001$). Furthermore, NAT patients were significantly more likely to die from their injuries than accidental trauma patients regardless of the length of stay ($p < 0.001$) or when considering only accidental trauma patients with a length of stay >1 day ($p < 0.001$; see Tables 5, 6.)

Nine children (8 %; Table 7) sustained fatal injuries and each of these children had ISS > 16. These patients presented with four to eight red flags, seven (78 %) were under 3 years of age, and six (67 %) had a prior ED visit on record at our institution. Eleven patients (9 %) presented with perineal bruising. Eight (73 %) of these patients were under age 4 and three (27 %) were victims of fatal trauma. Compared to the rest of the cohort, patients with perineal bruising experienced significantly higher mortality (27 vs. 6 %; $p = 0.03$) and were significantly more likely to require surgery (46 vs. 14 %; $p = 0.02$). However, the rate of severe ISS in patients with perineal bruising was consistent with the rest of the cohort (46 vs. 40 %; $p = 0.33$). Four patients in the cohort were diagnosed with NAT-induced cerebral palsy and four (including two of the patients with cerebral palsy) sustained injuries severe enough to require placement of a gastrostomy tube prior to discharge.

Referral patterns were generally high for patients in the NAT cohort, with 109 of 114 eligible patients (96 %; three patients died in the emergency department) referred to our

Table 1 Trauma cases, 2010–2013

Year	NAT	Trauma	% NAT	$X(2)$	p
2010	23	354	6.5	6.85	0.076
2011	23	442	5.2		
2012	27	609	4.4		
2013	44	558	7.9		
Total	117	1963	6.0		

Table 2 Numbers of red flags by category

	Mean (SD)	Median	Range	Subjects with ≥2 red flags	
				N	% Cohort
Medical/social history	3.1 (1.3)	3	0–6	108	92.3
Physical examination	1.8 (1.4)	2	0–5	59	50.4
Radiographic	1.6 (1.7)	1	0–5	48	41.0
All	6.5 (2.7)	6	1–15	114	97.4

Table 3 Red flag findings

Medical/social history	*N*	Denominator[a]	%
No history or inconsistent history	104	117	88.9
Changing history	48	117	41.0
Unwitnessed injury	88	117	75.2
Delay in seeking care	33	117	28.2
Prior ED visit	43	117	36.8
Domestic violence at home	33	117	28.2
Premature infant (<37 weeks)	15	80	18.8
Low birth weight/IUGR	12	80	15.0
Physical examination findings			
Torn frenulum	8	117	6.8
Failure to thrive	10	80	12.5
Large heads in infants (<1 year)	50	80	62.5
Any bruise in a non-ambulating child	27	68	39.7
Any bruise in a non-exploratory location (<4 years)	46	108	42.6
Bruising suggestive of abuse	67	117	57.3
Radiographic findings			
Metaphyseal fractures	49	117	41.9
Rib fractures in infants	26	80	32.5
Any fracture in a non-ambulating infant	39	68	57.4
An undiagnosed healing fracture	32	117	27.4
SDH/SAH on neuro-imagining in young children (<1 year)	43	80	36.8

[a] Denominator = 68 represents the non-ambulatory subset of patients <1 year of age; denominator = 80 represents the subset of patients <1 year of age; denominator = 108 represents the subset of patients <4 years of age; denominator = 117 represents the full cohort

Table 4 Rates of adherence to NAT guideline elements prior to implementation

	N	%
Radiology		
Skeletal survey	105	89.7
Head CT if head injury is suspected	42/50	84.0
Consults		
Child abuse intervention department	109	93.2
Pediatric general surgery	89	76.1
Ophthalmology <2 years of age	59/80	73.8
Disposition		
Huddle documentation	49	41.9
Admitted to hospital	106	90.1

Table 5 Comparison of accidental and NAT victim ISS and percentage of fatalities

	All accidental		NAT		*p*
N	1845	–	117	–	–
Median ISS	4	–	13	–	–
Mild ISS	1541	84 %	51	44 %	–
Moderate ISS	137	7 %	14	12 %	–
Severe ISS	167	9 %	52	44 %	<0.0001
Expired	16	<1 %	9	8 %	<0.0001

system's child abuse intervention department. 59/80 (74 %) patients under 1 year of age were referred to ophthalmology; retinal hemorrhaging was present in 48 % (28/

Table 6 Comparison of accidental and NAT victim ISS and percentage of fatalities for accidental trauma patients with length of stay >1 day

	Accidental with LOS > 1 day		NAT		*p*
N	502	–	117	–	–
Median ISS	9	–	13	–	–
Mild ISS	319	64 %	51	44 %	–
Moderate ISS	67	13 %	14	12 %	–
Severe ISS	116	23 %	52	44 %	0.0004
Expired	6	1 %	9	8 %	<0.0001

Table 7 Characteristics of fatality victims

Age	Sex	Prior ED visits	CPS history	Domestic violence	Fractures	Hemorrhaging	Perineal injury	Surgery performed	Injury Severity Score	ED LOS (h)	Hospital LOS (days)
4 months	M	No	Yes	Yes	Yes	Yes	No	Frontoparietal decompressive craniectomy	26	0.6	5
4 months	M	Yes	Yes	Not asked	None	Yes	No	None	26	<1	2
8 months	F	Yes	Yes	Not asked	None	Yes	No	None	27	1.6	3
1.7 years	F	Yes	Yes	No	Not available	Not available	Yes	None	21	3.1	1
2.0 years	F	No	No	Yes	None	Yes	No	None	26	1.2	1
2.1 years	M	Yes	No	Not asked	Not available	Not available	No	None	29	1.9	1
2.1 years	M	No	Not available	Not asked	Not available	Not available	Yes	None	26	1.8	1
3.1 years	M	Yes	Yes	Not asked	Not available	Not available	No	None	42	3.3	0-Patient died in ED
4.7 years	M	Yes	No	Yes	None	NA	Yes	Repair of esophageal and duodenal perforations	26	<1	3

59) of these patients. 89 patients (76 %) were referred to pediatric surgery and surgery was performed on 20 of these patients (13 neurosurgeries and 7 general surgeries; Table 8). Only 24 patients (21 %) were discharged home, with over 60 % of the cohort ($N = 72$; 62 %) discharged to foster care.

The subset of patients under 1 year of age (mean age 4.2 months ± 2.8 months) represents 68 % of the full cohort ($N = 80$, Table 9). This subset was more likely to present with bruising or fractures than children over 1 year of age ($p < 0.001$), to have undiagnosed healing fractures ($p = 0.001$), and to be positive for subdural or subarachnoid hemorrhaging ($p = 0003$). Patients under 1 year showed a higher proportion of severe Injury Severity Scores (ISS $\geq$ 16), with 50 % of patients under 1 year of age diagnosed with a severe ISS compared to 32 % of patients over 1 year of age ($p = 0.075$), and they were as likely to demonstrate elevated results on a liver function test as older children ($p = 0.72$). Fewer of these patients had a prior ED visit ($p = 0.07$; 31 vs. 49 %).

Discussion

This quality improvement initiative demonstrates that development and implementation of a standardized tool for the differentiation and diagnosis of NAT is feasible in a community hospital setting. A multidisciplinary approach to the development of the tool was critical to ensuring establishment of a thorough evaluation process and widespread acceptance of the protocol within our system. This tool serves two purposes: one, to provide a framework within which patients can be evaluated for suspected NAT; two, to increase awareness about which patients are at greatest risk for NAT. The historical elements highlighted in the guidelines serve as a first level of screening that can be applied to the general population and direct providers as to which patients warrant further laboratory and radiologic testing. The initial focus is broad and meant to serve as a screening tool for the entire population. Further work will need to be done to further evaluate which red flags are most useful for screening. Furthermore, the standardized procedure can

Table 8 Surgeries performed on NAT victims

	N
Neurosurgical procedures	
Craniotomy for evacuation of subdural hematoma	6
Placement of intracranial pressure monitor	2
Placement of subdural peritoneal shunt	2
Drainage of a subgaleal hematoma	1
Aspiration of subdural hematoma	1
Closure of scalp wound dehiscence	1
General surgery procedures	
Gastrostomy tube placement	2
Repair of vaginal laceration	2
Left thoracotomy for repair of esophageal perforation and exploratory laparotomy for repair of duodenal perforation	1
Exploratory laparotomy for repair of duodenal perforation	1
Exploratory laparotomy and drainage of intrahepatic biliary leak	1

Table 9 Comparison of patients <1 year with patients >1 year

Variable	<1 year		≥1 year		*X*(2)	*p*
	N	%	*N*	%		
All patients	80	68.4	37	31.6	–	–
Mean age (SD)	4.2 months (2.8)		3.4 years (3.0)		–	–
Bruising	36	45.0	31	83.8	15.6	**<0.001**
Fracture (metaphyseal or rib)	48	60.0	2	5.4	30.8	**<0.001**
Undiagnosed healing fracture	29	36.3	3	8.1	10.1	**0.001**
SDH/SAH on neuro-imaging	36	45.0	6	16.2	9.1	**0.003**
Severe ISS (≥16)	40	50.0	12	32.4	3.2	0.075
Elevated liver function test	13	16.3	7	18.9	0.1	0.72
Prior ED visit	25	31.3	18	48.6	3.3	0.069

All patients noted in bold achieved statistical significance as assessed at the 0.05 level

facilitate discussion with the family, providing caregivers with a script that can ensure a comprehensive workup for NAT patients while removing some of the stigma associated with investigation of an NAT diagnosis.

Bringing the NAT subcommittee under the trauma department enabled us to launch this initiative within a formalized infrastructure capable of effecting change within our organization. Adopting the trauma department's systems for minutes, policies, and operations facilitated education and the launch of the program, provided quality standards within which we could evaluate our program, and enabled us to include a research component to our work. Additionally, it standardized the admission process to the trauma service for at least the initial evaluation. In January 2014, the Non-Accidental Trauma Screening and Management Guideline (Inpatient and Outpatient) was rolled out in Mary Bridge Children's, and over the next several months the tool was shared with other emergency departments, primary care offices, and urgent care centers within our region. In the 18 months between implementation and the time of this writing, we have been asked to present and share the tool at nine hospitals and conferences in our region, which demonstrates the urgency with which providers are seeking guidance and standardization for the management of non-accidental trauma.

Multiple studies have shown that mortality is significantly higher in children who experience repeated NAT [4, 6, 10], making early recognition and intervention critical to avoiding severe morbidity and mortality for these children. Nearly one-third of patients less than 1 year of age in our cohort had prior ED visit(s), providing at least one earlier instance in which intervention could have potentially changed the child's outcome. This is an especially critical finding, given that two of the three patients under 1 year of age whose death was directly attributable to NAT had been evaluated in the ED prior to the fatal incident. This high rate of repeat ED visits also raises the possibility that repeat emergency department visits in a previously well child may be a family stressor that becomes a risk factor for subsequent NAT. Although chart review for all-cause prior ED

visits was beyond the scope of this study, further investigation into this hypothesis is warranted.

Torso bruising has been described in the literature as an identifier for NAT [11]. Our study is the first of which we are aware to highlight perineal bruising as a subset of torso bruising that presents concurrently with significantly increased morbidity and mortality. Our data also demonstrate that NAT patients are victims of polytrauma, with nearly a third of the cohort presenting with undiagnosed healing fractures, corroborating Naik-Mathuria's justification for evaluation of NAT patients by a pediatric trauma service [12] and supporting the routine use of skeletal surveys in the event of suspected NAT. The startling difference in the proportion of accidental versus NAT patients with an ISS $\geq$ 16, regardless of selecting of patients with a hospital length of stay >1 day, underscores the severity of trauma that is inflicted upon children. This finding highlights the need to focus an international spotlight on this heinous topic.

We also show that, in the absence of a formalized procedure, social history information that may be useful to the care team is largely uncollected by providers. This may be a result of provider discomfort on asking questions about drug/alcohol use, mental health, and criminal history, or a lack of understanding regarding their relevance. Discomfort for the provider and parent/guardian alike can be mitigated by the use of the EMR structured note, giving the provider the ability to frame the questions as routine inquiry for trauma cases.

Special mention needs to be made of the details of the patients who died as a result of NAT (Table 7). Due to the retrospective nature of this study, it is impossible to conclude if having a standardized process in place would have altered the outcome for these children. Nevertheless, it is interesting to note that 8/9 (89 %) of the patients who died presented with bruising and inconsistent history. Six patients (67 %) had prior ED visits, and five (56 %) had a history of CPS. Of note, three patients had a recorded history of domestic violence at home, and in five cases (56 %) documentation of domestic violence at home was not made. One victim of a fatality appeared earlier in our trauma registry for an incident that was believed to have been accidental at that time.

The work of the NAT subcommittee began raising provider awareness of and sensitivity to NAT in late 2012 and throughout 2013 in preparation for the 2014 launch of the assessment tool. The tool was also used to retrospectively evaluate our existing data to better understand where we stood as an organization with regard to our screening of suspected/confirmed cases of NAT prior to the active launch and utilization of the tool in January 2014. As such, a potential source of bias exists in the 2013 data, and to some extent in the 2012 data, in that the management of NAT cases in these times may have been influenced by the generally heightened awareness of NAT in our system. Areas for future work include evaluation of the management of NAT in our system after implementation of the tool and analyses designed to delineate which red flags, or constellation of red flags, should mandate a comprehensive NAT evaluation. It will also be important to evaluate the impact that this tool has on patient length of stay and to conduct a cost analysis to assess the impact that standardized management of suspected NAT has on a hospital system.

Development and implementation of a standardized tool for the differentiation and diagnosis of NAT and creation of a structured EMR note should improve the description and documentation of child abuse cases (which was inconsistent and incomplete in its absence) in a community hospital setting. Perineal injury is an especially ominous red flag finding.

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