Evolving Autopsy Practice Models

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Regional Autopsy Centers

The concept of a regional autopsy center (RAC) – a center of excellence staffed by dedicated and experienced autopsy pathologists who perform and report non-forensic autopsies for hospitals, private clients, and decedents' families within a geographic region – has been advocated for since at least 1974, when Dr. Joseph Freeman addressed an audience gathered at a symposium on "The Autopsy and the Geriatric Patient" at the annual meeting of the American Geriatrics Society. Especially in geriatrics where the autopsy is vitally important in delineating physiologic aging changes from pathologic processes, the procedure's decline was (and likely remains today) a serious concern to geriatricians. Dr. Freeman pointed to the rising costs associated with autopsy and the fact that they are not reimbursed by third-party insurance payers as together representing "an outstanding factor in the neglect of the autopsy." Furthermore, as fewer individual hospitals or institutions could likely afford to maintain their autopsy services moving forward, he proposed forming RACs which "could serve the surrounding institutions with greater competence and economy" [1].

Since the time Dr. Freeman addressed his audience of geriatricians, the manner in which healthcare is delivered in the USA has drastically shifted. Relatively simple, individual interactions between patients and physicians occurring in offices or hospitals have given way to more complex interactions between patients and various specialists in regionalized healthcare systems that serve populations of people. It is reasonable to assume, then, that non-forensic autopsy services should have undergone – or should now undergo – a similar transition from many independent autopsy pathologists working in different hospitals to fewer centralized autopsy

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pathologists serving populations of people and the health systems that care for them. RACs that are affiliated with academic medical institutions and staffed by independent, competent, and enthusiastic autopsy pathologists can provide a cost-effective way to sustain the autopsy as healthcare evolves [2].

Examples of RACs

Medical examiner offices located within or affiliated with academic pathology departments, such as presently exist in Vermont, North Carolina, and New Mexico, for example, represent some of the earliest RACs. Recently, the University of Alabama at Birmingham (UAB) published its experience developing a hybrid hospital-forensic RAC through contractual arrangements with the US Department of Veterans Affairs, the Alabama Department of Forensic Sciences (ADFS), local correctional facilities and community hospitals, and decedents' families [3]. Over the course of 10 years, the RAC performed between 215 and 374 autopsies each year and brought in nearly $2 million of income from the various contracted entities. UAB noted the following benefits of developing its RAC in association with an academic pathology department: (1) being able to expand rather than having to newly develop the requisite infrastructure necessary to run such a service, (2) being situated in a larger population center by nature of the affiliated university, and (3) maintaining access to a department of pathologists with subspecialty expertise who can provide diagnostic support in challenging cases.

Other than occasional articles advocating for RACs [4] or rare articles reporting experiences forming RACs [2, 3], there is little guidance on how to actually go about consolidating autopsy services among various practice settings in a geographic region. The College of American Pathologists in its 2003 *Autopsy Performance & Reporting* publication provided an overview of the non-forensic RAC, highlighting advantages such a center would bring to the referring institutions, the autopsy center itself, and the region the center serves, and it also summarized practical considerations that should be kept in mind when establishing a RAC [5].

The Northwell Experience

In 2011 Northwell Health (formerly North Shore-LIJ Health system) – one of the largest, nonprofit, secular healthcare systems in the USA – consolidated its anatomic pathology services including autopsy pathology into one Department of Pathology and Laboratory Medicine, with an integrated service line that spanned the health system [6]. Zucker School of Medicine at Hofstra University has been affiliated with Northwell Health since it welcomed its first class in 2011, as well. Presently, the Northwell Regional Autopsy Service (subsequently referred to in this chapter as a RAC for consistency purposes) is centralized at one of the system's largest hospitals and provides postmortem care to 16 hospitals within or affiliated with Northwell Health. The RAC is led by a pathologist with interest and expertise

in autopsy pathology who is board-certified in anatomic, pediatric, and forensic pathology. Almost all of the department's nearly 30 attending anatomic pathologists, including its chairman, participate in the RAC, and 16 residents each rotate through the RAC for 3 months during their 4 years of pathology training. Additionally, premedical and medical students, clinical residents, fellows, attendings, various allied health students and professionals, and healthcare administrators regularly attend autopsies at its centralized location. Four pathologists sign out all postmortem neuropathology. All autopsies are performed by one resident working with an autopsy assistant.

Presently, about two-thirds of autopsies are performed on adult decedents of all ages, most pediatric cases are perinatal cases including third-trimester fetal losses and neonatal deaths, most autopsies include neuropathology examination, and about three-quarters of the center's case volume is referred to the central hospital from other institutions. Currently, autopsies are only performed on decedents who were affiliated with the health system, and consequently, only the technical costs associated with body transportation, autopsy performance by assistants, supplies, and histology processing are charged to the referring sites. However, a fee schedule that will include fee-for-service pricing for private clients, other institutions, and research programs is being developed as the RAC continues to grow.

The potential benefits of a RAC associated with an academic medical center, drawn upon the Northwell experience and ideas expressed in the literature [2–5, 7–9], are summarized in Table 4.1. Standardization of processes through all phases of the autopsy – from obtaining consent to incorporating autopsy results into institutional quality management programs – is perhaps the most salient benefit of consolidating a region's autopsy services in one center of excellence. The high-quality and relevant autopsy data that such standardized processes generate can re-demonstrate or confirm the value of autopsy for interested stakeholders involved with the RAC, including clinicians, researchers, and administrators. Some of these stakeholders, in turn, will consequently be more likely to refer cases to and provide financial support for the RAC. With such a center of excellence established and supported, opportunities to design and advance training, education, and research follow, including creating organized rotations with formalized curricula for pathology residents, or implementing uniform research protocols for obtaining autopsy data. Very importantly, repetition of standardized processes leads to proficiency in the involved tasks, which increases efficiency while fostering safety.

Benefits and Challenges of RACs

Arranging laboratory support for autopsy services and complying with applicable regulations are tasks that are easier and more economical to accomplish at one site rather than across multiple sites. Financial viability of a RAC can be achieved and maintained through establishing fair contractual agreements with referring institutions, organizations, and families. In the case of a RAC, consolidation of resources and economy of scale, two consequences inherent in almost any centralization

Table 4.1 Potential benefits of a regional autopsy center (RAC) affiliated with an academic medical institution

Standardization of processes	
Autopsy performance	Policies and procedures Techniques Development of standards and guidelines Access to subspecialty expertise (clinical and pathology)
Autopsy reporting	Reporting format and diagnostic terminology Clinicopathologic correlation Death certification Quality assurance
Autopsy training	Pathologists (resident, fellow, attending) Pathologist and autopsy assistants Laboratory professionals Funeral directors
Autopsy education	Premedical and medical students Resident physicians, including pathologists Attending physicians, including pathologists Allied health professionals Healthcare administrators Medical researchers Public outreach (e.g., schools, interest groups)
Autopsy quality control	Performance Diagnosis Reporting
Data acquisition, storage, and dissemination	Research Epidemiology Quality management programs
Decedent affairs	Informed autopsy consent Administration of postmortem care (e.g., funeral arrangements) Jurisdictional legal compliance Information collection (e.g., medical records) Outreach and education (families, clinicians)
Safety and compliance	
Repetition of processes by personnel leads to proficiency which leads to safety	
Establishment and maintenance of one location in compliance with applicable safety regulations	
Financial incentives	
Economy of scale	Fixed costs of facility Staffing Materials and supplies Histology and ancillary testing Decedent transportation contract(s) Compliance with regulations
Reimbursement for autopsy	Fee-for-service (e.g., family request) Contract fees (e.g., hospital, medical examiner office) Procurement fees (e.g., brains for Alzheimer's Association)
Medicolegal assistance	
Provide independent and competent assessment of quality of care for referring institutions, without perceived conflict(s) of interest	
Alleviate stress on local medicolegal death investigation systems by assisting with natural and drug overdose death investigations	

process, will likely lead to attractive pricing structures in such agreements. Finally, although hospital pathologists should always perform independent, unbiased autopsies that involve objective evaluation and documentation of facts, basing pathologists at a center that is physically independent from referring healthcare facilities can help ameliorate any perceived conflicts of interest that might exist.

Although there are many benefits to centralizing regional autopsy services, the process also presents challenges that must be addressed. And in larger urban regions, there may in fact be competition among multiple RACs, particularly where there are competing healthcare systems. Table 4.2 provides a comprehensive overview of the considerations involved in establishing and maintaining the Northwell RAC. While not intended as an exhaustive list applicable to all autopsy regionalization efforts, the table hopefully will serve as helpful reference when forming and/or maintaining a RAC.

Perhaps the most important task in developing a RAC is to establish a single nidus of contact – ideally a decedent affairs office but at least a coordinator – through which all business related to the RAC can be developed, managed, and expanded.

Table 4.2 Considerations in establishing and expanding a regional autopsy center – the Northwell experience

Logistical and legal	
Establish and staff positions (including holiday and weekend coverage)	Decedent Affairs Office (ideal), or at least a coordinator position, to control all information through one email, one phone number, and one website
	Team of autopsy assistant(s)
	Autopsy pathologists
Draft and formalize contracts with referring institutions or people	Physicians' groups Hospitals and medical centers Government agencies (e.g., ME offices)
	Families
	National research organizations
	Ancillary service support (e.g., pathology, histology, microbiology, toxicology, if applicable)
Establish policies and procedures (in accordance with local legal requirements)	Transportation of bodies to and from the autopsy center with an appropriately licensed entity (e.g., funeral home)
	Disposition of remains, including fetuses
	Disposition of unclaimed bodies
	Handling special cases (e.g., prion diseases, exhumations)
	Directing anatomic gifts to medical institutions
	Collaborating with national research organizations (e.g., Alzheimer's association)
	Reporting results to referring site(s), including integration of health information technology system(s)
	Releasing material(s) to next of kin (e.g., report, photographs, devices)
	Securing and releasing autopsy materials in medicolegal cases

(continued)

Table 4.2 (continued)

Logistical and legal	
Develop and disseminate common forms (in accordance with local legal requirements)	Autopsy information packet(s) for professionals and lay persons One autopsy consent form One decedent transportation form, to track body from place of death to autopsy center to funeral home One release of medical information form to obtain medical records One release of material(s) to next of kin form (e.g., photographs, specimens, devices)
Determine and meet local requirements (may be part of affiliated medical institution or may have to be contracted)	Sufficient and appropriate space for decedent storage Sufficient and secure storage for autopsy materials, including photographs Access to ancillary laboratory services (e.g., histology, microbiology, toxicology)
Establish and maintain professional relationships	Administration at referring site(s) Regional Medical Examiner Office(s) Regional organ donation network(s) Regional medical school(s) and graduate medical education training program(s)
Financial	
Establish and update as needed a fee schedule for provided autopsy services	
Arrange for and ensure collection of fees	
Incorporate work Relative Value Units (wRVU) for autopsy into a professional compensation model, if relevant (discussed in the next section of this chapter)	
Communication	
Produce comprehensive, clear, and correct autopsy reports	
Distribute autopsy reports to appropriate individual(s) or site(s) in a timely manner	
Engage in family meetings with clinicians, as appropriate, either in person or using information technology (e.g., videoconferencing)	
Engage in departmental, institutional, and/or system-wide quality improvement initiatives, either in person or using information technology (e.g., videoconferencing)	
Advertising	
Thoroughly and thoughtfully perform and report autopsies	
Make personal introductions to key regional personnel (e.g., hospital administrators and physicians from referring sites, medical school faculty, medical examiners/coroners, funeral directors)	
Be available to discuss autopsy results with inquiring parties (e.g., families, clinicians, administrators), either in person or using information technology (e.g., videoconferencing)	
Engage with teaching students, trainees, physicians, allied health professionals, and administrative personnel through the autopsy service	
Engage in public outreach education, including seminars or public education events	

Such an office or position should be staffed by a person with strong interpersonal skills and a sincere belief in the value of autopsy. Furthermore, most logistical processes, including drafting and executing contracts among involved parties, should be developed in conjunction with appropriate legal counsel; such legal resources

may exist at an affiliated academic institution, or they may have to be developed as part of the RAC. Policies and procedures should be created for almost every step in the preanalytic, analytic, and postanalytic phases of autopsy. Their existence will not only facilitate standardization of processes, as previously discussed, but it will also enable facile handling of time-sensitive or unusual inquiries, such as donating a brain to prion research or returning a pacemaker to the requesting next of kin. Generating and implementing the use of common forms, especially the autopsy consent form, are necessary for proper and efficient functioning of any RAC.

A RAC must have well-established working relationships with medical examiner offices and organ donation networks so that timely referral into these realms of postmortem care can be made with ease. If a RAC is to advocate for the autopsy in medicine and to influence the evolution of medical education, then its pathologists should be conspicuously involved with teaching at the affiliated medical school, and there should be a formalized agreement between the RAC and the institution that encourages medical students to rotate through the RAC. Periodically reviewing and updating the pricing of services in contracts, as well as arranging for consistent and timely collection of charged fees, are two tasks that are perhaps as important as the contracts themselves. And lastly, any RAC should be led by a champion of the autopsy who is effective in oral and written communication and who will advocate for the autopsy, for the RAC, and for the patients, families, and health system it serves.

Assigning Professional Value to Autopsy Performance

Of the many reasons why the art and science of hospital autopsy remain in decline, pathologists' own devaluation and lack of championing the procedure are perhaps the most alarming and perplexing. It can be reasonably argued that the autopsy gave us pathology – and in so doing gave us medicine. But sadly, many pathologists today consider the autopsy to have fulfilled its purpose and reached its zenith as their attention focuses on more "promising" pursuits such as advanced imaging applications or molecular medicine. Moreover, it is not difficult to understand the aversion many pathologists have toward the autopsy in light of the cost containment and decreasing reimbursements which characterize medical practice today [10].

Hospital autopsy practice can be challenging and time-consuming. Reviewing the voluminous clinical record of a man with multiple comorbidities who spent months in an intensive care unit before he succumbed to presumed sepsis of unknown source or meticulously dissecting and documenting the abnormal vessels in a newborn with total anomalous pulmonary venous return are tasks that are probably considered worthwhile and rewarding to most dedicated hospital autopsy pathologists. But to the typical anatomic pathologist who must sign out and bill for a certain number of biopsies per day or to the clinical pathologist managing a busy and often resource-limited blood bank, as examples, such activities can reasonably be viewed as pointless in the absence of remuneration for their performance. Planning and thoughtfully performing a hospital autopsy take time, time that is in addition to the subsequent hours required to prepare for and present the case at

interdepartmental meetings or to write up the findings from a unique and/or informative case with clinical colleagues. Additionally, as the autopsy now represents the major exposure to morbid anatomy that most pathology residents will encounter in their training, successfully incorporating autopsy pathology into educational programs also necessitates much planning and commitment by hospital autopsists.

CPTs and RVUs

The American Medical Association (AMA) has assigned Current Procedural Terminology (CPT) codes for postmortem procedures, but work relative value units (wRVUs) have not been assigned by the AMA or Centers for Medicare and Medicaid Services. Consequently, there is no way to document productivity or receive reimbursement for autopsy pathology. Conversely, because CPT codes assigned to almost all other procedures in anatomic pathology have associated wRVUs (e.g., performing gross examination of tonsils, CPT 88300, about 0.08 wRVU, or signing out a breast resection with lymph nodes for evaluation of cancer, CPT 88309, about 2.8 wRVU), pathologists engaged in these professional activities can document productivity through a perhaps imperfect but nonetheless objective metric assessment [11]. It is important to note that assigned CPT codes are constant, whereas the wRVU associated with a particular CPT code can vary depending on the year and geographic location of practice.

There have been a few clues regarding how to "value" autopsy performance in the preceding decades. In the Permanente Medical Group (TPMG), an independent corporation of physicians who negotiates and contracts with the Kaiser Foundation Health Plan – which is among the largest managed care organizations in the USA – a full-time pathologist each year was expected to perform 250 autopsies or to sign out 7500 surgical pathology cases, in the absence of additional responsibilities [12]. Similarly, the National Association of Medical Examiners recommends that full-time medical examiners ideally perform no more than 250 autopsies per year [13]. Based on these data, a full-time pathologist should perform about 250 autopsies per year, and 1 autopsy is approximately equivalent to signing out 30 surgical pathology cases (i.e., 7500 surgical cases divided by 250 autopsies = 30 surgical cases/autopsy).

The Autopsy Committee of the College of American Pathologists recently proposed guidelines for recognizing the professional work of pathologists involved with hospital autopsy [14]. Members of the Autopsy Committee were asked to equate their time spent performing a typical adult autopsy and a typical fetal autopsy to multiples of the 88309 CPT code (i.e., the code used for examination of total colectomy or mastectomy specimens), and subscribers to the Committee's Autopsy Pathology Education Program were asked to report how long it took them to perform a typical adult and a typical fetal autopsy. The committee members' responses regarding time spent performing autopsies correlated with those of the program subscribers. Furthermore, the committee's proposed guidelines for how many multiples of CPT 88309 constitute the elements of performing a typical adult autopsy

and a typical fetal autopsy were congruent with scant contemporaneous data in the literature regarding the effort invested in performing autopsies.

As there is great variability in autopsy practice among pathologists and institutions, these guidelines are best used as a benchmark that can and should be modified to accommodate diverse hospital autopsy practices. Members of the Society for Pediatric Pathology, for example, recognize that competent perinatal autopsies usually require more time and effort than is usually invested in examining the "typical" stillborn fetus encountered by many pathologists working outside of a dedicated pediatric care setting [15]. A recent study that surveyed pediatric pathologists performing fetal, perinatal, and pediatric autopsies also demonstrated that such autopsies – which often require complex dissections or additional ancillary testing – require additional time and therefore modified valuation with existing CPT codes [16].

An Example of Assigning Value

At Northwell, slight modifications to these proposed CPT guidelines for autopsy performance have been made. For example, complex fetal, neonatal, and pediatric autopsies are often performed by an attending pediatric pathologist with the assistance of a resident pathologist. These cases often involve complicated medical issues and/or complex dissections, audiences of medical students and clinicians often attend these autopsies, and these cases are almost always presented at interdepartmental morbidity and mortality conferences which require substantial preparation time on the part of the pathologists. On the whole, however, the Northwell Department of Pathology & Laboratory Medicine, which encompasses all subspecialties of pathology across the age spectrum, aligns fairly well with the proposed valuations from the Autopsy Committee of the College of American Pathologists and the Society for Pediatric Pathology. All currently available suggested valuations for measuring professional activity associated with adult, pediatric, and perinatal autopsies performed in hospitals, including Northwell's modifications, are summarized in Table 4.3.

Over the past 3 years, the Northwell RAC adopted these suggested valuations (with slight modifications as described above and noted in Table 4.3) to quantify autopsy work performed by attending pathologists in the department. The quantified work was then translated using prevailing wRVU scales for the region (currently 88309 = 2.8 wRVU), and the corresponding value of professional time dedicated to autopsy was incorporated into each pathologist's annual wRVU totals. The wRVU totals were then used in various departmental value-based determinations. Over the past 3 years, the total wRVU accrued on the Northwell RAC by attending pathologists aggregated to 5,796 wRVU in 2015, 7,576 wRVU in 2016, and 5,790 wRVU in 2017. These annual wRVU amounts are comparable to those of a full-time equivalent academic pathologist using presently available valuation methodology [11]. It is clear that autopsy needs to be considered and valued as is any other anatomic pathology specialty in today's subspecialized practice environment.

Table 4.3 Assigning professional value to autopsy performance

	CPT (multiples of 88309)			RVU (88309 = 2.8 RVU)		
	CAP	SPP	Northwell	CAP	SPP	Northwell
Adult total	**8.5**	N/A	**8.5**	**23.8**	N/A	**23.8**
Autopsy	5.5		5.5	15.4		15.4
Neuropathology	1.5		1.5	4.2		4.2
Clinicopathologic discussion	1.5		1.5	4.2		4.2
Pediatric total	N/A	**15.7**	**12.0**	N/A	**43.96**	**33.6**
Autopsy		9.9	8.25		27.72	23.1
Neuropathology		2.5	1.5		7	4.2
Clinicopathologic discussion		3.3	2.25		9.24	6.3
Neonate total	**6.0**	**9.7**	**11.0**	**16.8**	**27.16**	**30.8**
Autopsy	4.0	5.8	8.25	11.2	16.24	23.1
Neuropathology	0.5	1.6	0.5	1.4	4.48	1.4
Clinicopathologic discussion	1.5	2.3	2.25	4.2	6.44	6.3
Fetus >20 weeks total[a]	**6.0**	**9.7**	**6.0**	**16.8**	**27.16**	**16.8**
Autopsy	4.0	5.8	4.0	11.2	16.24	11.2
Neuropathology	0.5	1.6	0.5	1.4	4.48	1.4
Clinicopathologic discussion	1.5	2.3	1.5	4.2	6.44	4.2
Fetus <20 weeks total[a]	**6.0**	**5.7**	Billed as surgical pathology specimen (1 × 88309)	**16.8**	**15.96**	Billed as surgical pathology specimen (1 × 88309)
Autopsy	4.0	3.6		11.2	10.08	
Neuropathology	0.5	0.7		1.4	1.96	
Clinicopathologic discussion	1.5	1.4		4.2	3.92	

N/A = not applicable
CAP = College of American Pathologists; data from Ref. [14]
SPP = Society for Pediatric Pathology; data from Ref. [16]
[a]At Northwell: complex fetus >20 weeks treated as neonate; complex fetus <20 weeks treated as fetus >20 weeks

The Autopsy in Medical Malpractice Litigation

Among many potential factors contributing to declining autopsy rates since the 1940s is a perception among clinicians – and one that is probably propagated by pathologists, as well – that autopsy performance increases the likelihood of malpractice litigation and/or will corroborate physician culpability in such litigation. Today's autopsy pathologists must have at least a working knowledge of the medical malpractice landscape in which their clinical colleagues practice. Such knowledge hopefully will empower autopsy pathologists to best serve patients, clinicians,

and healthcare systems through careful, competent, and unbiased performance and reporting of postmortem examinations.

Errors in judgment, diagnosis, and/or technique have characterized and will continue to characterize the human practice of medicine. However, since the turn of the century, there has been increased focus on addressing and decreasing the incidence of error and adverse events in medicine [17, 18]. In general, medical malpractice claims usually arise following adverse events, of which there are two types: non-preventable and preventable adverse events. Preventable adverse events understandably are a serious concern in today's healthcare environment. Estimated numbers of deaths arising from preventable adverse events are comparable to mortality rates from various natural diseases or conditions in many countries including China [19], the USA [17, 20], the UK [21], and Germany [22].

Overview of Medical Malpractice

In medical malpractice proceedings, a plaintiff is the person or party who initiates the lawsuit – usually the next of kin in cases of autopsy – and the defendant is the person or party against whom the lawsuit is brought, usually a doctor or healthcare institution. To establish liability in medical malpractice, a plaintiff must generally prove (1) that duty inherent in a doctor-patient relationship was established; (2) that a breach of that duty, defined by failure to exercise or meet the generally accepted standard(s) of care, occurred; and (3) that, to a reasonable degree of medical certainty, the breach of duty was the proximate cause of injury or death. There are many reasons why a plaintiff may decide to pursue litigation, but it has been documented that a lack of open, clear, and honest communication, inadequately acknowledging the pain and suffering caused by an adverse event, and not demonstrating a willingness to learn and improve from a mistake all represent factors that are associated with patients suing physicians [23, 24].

A recent study examining malpractice claims among physicians who were covered by a national professional liability insurer paints a useful portrait of the medical malpractice landscape among various specialties in the USA [25]. Select data from the study is adapted and summarized in Table 4.4. Overall, nearly 7.4% of physicians faced a malpractice claim each year, whereas only 1.6% of physicians were involved in a claim that resulted in a payment being made to the plaintiff (i.e., an indemnity payment). Certain "high-risk" specialties (including neurosurgery, cardiothoracic surgery, and general surgery) were more likely to face a malpractice claim, but these specialties tended not to make indemnity payments. On the contrary, other "low-risk" specialties (including pathology, family practice, and pediatrics) were less likely to face a malpractice claim, but these specialties tended to make indemnity payments. The mean and median indemnity payments across all specialties were around $270,000 and $110,000, respectively, with the skewed distribution reflecting few very large payments. For example, four specialties – obstetrics and gynecology, pathology, anesthesiology, and pediatrics – made large indemnity payments exceeding $1 million, but such large sums only accounted for 1% of all payments analyzed in the study.

Table 4.4 Proportion of US physicians facing malpractice claim with mean and median malpractice payment amounts among representative specialties

Specialty	% Physicians with a malpractice claim (annual)	% Physicians paying a claim to a plaintiff (annual)	Mean value of payment made to a plaintiff (multiples of $10,000)	Median value of payment made to a plaintiff (multiples of $10,000)
Neurosurgery	17.5–20	2.5–5	30–35	20–25
Thoracic/ cardiovascular	17.5–20	2.5–5	25–30	15–20
General surgery	15–17.5	2.5–5	25–30	15–20
Orthopedic surgery	12.5–15	2.5–5	25–30	10–15
Obstetrics and gynecology	10–12.5	2.5–5	35–40	15–20
Internal medicine	7.5–10	0–2.5	30–35	15–20
Emergency medicine	7.5–10	0–2.5	15–20	5–10
All physicians	**7.4**	**1.6**	**27**	**11**
Anesthesiology	5–7.5	0–2.5	25–30	5–10
Pathology	5–7.5	0–2.5	35–40	15–20
Family practice	5–7.5	0–2.5	25–30	10–15
Pediatrics	2.5–5	0–2.5	50–55	15–20

Adapted from figures 1 and 3 in Jena et al. [25]

The authors calculated that physicians face a high cumulative risk of encountering at least one malpractice claim during their careers. Nearly 75% and 99% of physicians in "low-" and "high"-risk specialties, respectively, will face a malpractice claim by age 65 years, and nearly 19% and 71% of physicians in "low-" and "high"-risk specialties, respectively, will make an indemnity payment. Physicians, particularly those practicing in the "higher-risk" surgical specialties, rightfully perceive that they will face malpractice litigation. However, an important observation in this study was that across specialties most medical malpractice claims did not result in payments being made to plaintiffs. This "good news" must be tempered with the reality that medical malpractice litigation can take a toll on physicians' emotions, finances, and reputation, regardless of its outcome.

Role of Autopsy in Medical Malpractice: The USA Experience

Literature meaningfully evaluating the role that autopsy plays in malpractice litigation is limited. A retrospective review of appeals court decisions regarding alleged malpractice cases in the USA is perhaps the most frequently referenced publication dealing with the issue [26]. The authors reviewed records of malpractice litigation adjudicated in state appellate courts between 1970 and 2000. The oft-cited finding from this study, presented in Table 4.5, is that even when autopsy findings were

Table 4.5 USA experience with autopsy in alleged malpractice cases

Autopsy findings favor	Total cases	Malpractice verdict	
		Yes	No
Plaintiff	49	39% (19)	61% (30)
Neither	14	21% (3)	79% (11)
Defendant	19	0% (0)	100% (19)

Adapted from Fig. 4 in Bove and Iery [26]

interpreted by the authors to have favored the plaintiff, the defendant physicians were exonerated of malpractice in the majority of cases. In other words, performance of an autopsy did not correlate with physicians being convicted of malpractice in this study.

Careful reading of the article reveals additional observations that shed brighter light on the role of autopsy in medical malpractice. All reviewed cases included the performance of an autopsy, and overall, findings favoring the defendant physician outnumbered the findings favoring the plaintiff by a 3:1 margin. Moreover, while autopsy confirmed clinical diagnoses in nearly a third of the cases (27/99), major discrepancies between antemortem and postmortem diagnoses were revealed in just over half of the cases (54/99). And although the authors considered most of these postmortem diagnoses (40/54) to have been potentially treatable in life, the majority of defendants were acquitted of malpractice in the original trials. Finally, 8 of 13 physicians convicted of malpractice in their original trial were acquitted of malpractice in their appeal process when autopsy confirmed the clinical diagnoses, and astonishingly, 32 of 36 physicians convicted of malpractice in their original trial were acquitted of malpractice in their appeal process even though the cause of death determined at autopsy had not been recognized in life.

Based on their findings, the authors suggest there is no relationship between accuracy of clinical diagnoses as revealed by autopsy and an unfavorable outcome for defendant physicians in malpractice litigation. For instance, findings of medical negligence that were upheld on appeal (19 cases) were all related to standard of care issues and not to the autopsy findings, even though in over half of these cases (10/19) there were discrepant antemortem and postmortem diagnoses. As the authors state, "...medical perfection, which is unattainable in any event, is not the standard of care." Moreover, the authors considered postmortem examinations that either confirmed antemortem diagnoses or, more often, revealed major unexpected findings that could not have reasonably been acted upon while the patient was alive, important in acquitting 17 defendant physicians initially convicted of malpractice.

Minor additional findings at autopsy were usually rendered irrelevant as opposing expert witnesses disagreed about their significance. No unequivocal cause of death was determined at autopsy in nearly 10% of the cases, including perinatal and postoperative deaths, but the majority of physician defendants involved in these cases were acquitted of malpractice. Interestingly, in 16 malpractice trials in which no autopsy had been performed (which served as "control" cases), the ratio of outcomes favoring either plaintiff or defendant physicians was similar to those in the study group, corroborating the conclusion that autopsy does not necessarily lead to adverse decisions for defendant physicians involved in malpractice litigation.

Role of Autopsy in Medical Malpractice: The International Experience

In recent years the international community has increasingly shared its experience with the role of autopsy in medical malpractice litigation [19, 22, 27]. In these studies, cases suspected of medical malpractice were evaluated by the relevant medicolegal pathology institution rather than by hospital autopsy pathologists. Similar to the experiences reflected with appellate court decisions in the USA, in Germany and Italy the majority of physicians involved with malpractice litigation were exonerated of the charges brought against them in cases in which an autopsy had been performed. When malpractice was confirmed in Germany, autopsy did not establish causality in most cases, whereas when malpractice was confirmed in Italy, autopsy established causality in a majority of cases.

In China the situation appears to be slightly less favorable for defendant physicians in general, with nearly half of all cases of suspected malpractice being confirmed when an autopsy had been performed. Moreover, discrepancies between antemortem and postmortem diagnoses were also associated with malpractice more commonly being confirmed in China, although when there was an indeterminate diagnostic discrepancy, malpractice was more commonly negated. Reasons for the reported discrepancy between China and the western countries probably reflect a variety of factors, including a younger patient population referred for malpractice proceedings in China (mean age of 31 years in China, mean age around 59 years in Italy, modal age range 71–80 in Germany), a higher incidence of suspected malpractice in China over the study period, and the fact that many cases referred for medicolegal evaluation in China reflect more complex cases that were not initially resolved by arbitration.

Recommended Practices in Hospital Autopsy Pathology

In their review of the US appellate court records discussed above, the authors also noted problematic issues relating to autopsy performance and reporting as well as death certification that affected the appeals process in nearly 20% (18/99) of the examined cases, including those that were reversed on appeal [28]. Autopsy pathologists should always perform and report postmortem examinations in a complete, careful, and consistent manner. Furthermore, autopsy pathologists should encourage clinicians to incorporate provisional autopsy findings into death certifications and to amend those death certifications as necessary in light of final autopsy findings.

Although most significant postmortem diagnoses are macroscopically evident by the end of dissection, histology can provide, modify, or confirm the cause of death in a substantial number of cases, especially in hospital-based, non-forensic deaths. For example, significant pulmonary or hepatic pathology can be missed by relying only on macroscopic examination of these organs, and there is poor agreement between the degree of coronary artery stenosis as assessed by macroscopic and

histologic methods [29]. Diligent examination of autolyzed tissue, with assistance of special stains as necessary, must always be performed, as pathologies such as fibrosis and hemosiderosis can be diagnosed in almost every stage of postmortem decomposition, and such diagnoses can have important diagnostic or familial relevance (e.g., cirrhosis or hemochromatosis, respectively).

As it's very unlikely that the legal fate of a given autopsy will be known by a pathologist at the time of postmortem examination, it is advisable to approach every autopsy as though it will have medicolegal implications. Listed below are some recommended practices (based on the author's experience and the literature [28, 29]) for pathologists to consider when performing and reporting autopsies, so that objective data and not subjective speculation are on trial in potential medical malpractice proceedings.

- Be aware of specific clinical concerns or questions before beginning an autopsy, and adequately address such issues during the autopsy and in the resulting report (e.g., venous thromboembolism, specimens needed or requested for toxicology).
- Document all pathology, regardless of its lethal potential, and objectively describe relevant positive and negative macroscopic and microscopic features (don't just focus on the cause of death!).
- Adequately document and sample lesions for assessment of chronicity (e.g., hemorrhages, thrombi and emboli, infarcts) so that correlation with a clinical sequence of events can later be performed, if necessary.
- In accordance with hospital policy, collect, preserve, and appropriately maintain the integrity of specimens for toxicology or other special testing.
- Always submit appropriate specimens for histology, including at least sections of the heart, lungs, liver, kidneys, stenotic coronary arteries, and any macroscopically abnormal tissue; neuropathologic histology should be submitted, as well, when indicated.
- Keep representative sections of all examined organs and tissues in a stock jar, including a block of the cardiac conduction system if the heart base is not routinely retained.
- Issue quality autopsy reports in a timely fashion, and amend final autopsy reports as necessary (e.g., if new clinical or laboratory testing information becomes available).
- Incorporate relevant clinical history into the final autopsy report to allow for independent review of and conclusions to be drawn from the final report.
- Include a cause of death statement, when relevant, in the final autopsy report in a style that is compatible with local death certification practices.
- Review and rectify antemortem and postmortem diagnostic discrepancies with the clinician, if possible, or at least address the discrepancies in the autopsy summary, before finalizing the autopsy report.
- Ensure the final autopsy report contains no discrepancies or disagreements across its various sections (particularly the final diagnoses, gross description, and microscopic findings sections).
- Ensure autopsy reports are free of grammatical and spelling errors (remember – sloppy autopsy reporting suggests sloppy autopsy performance and sloppy autopsy conclusions).

Thoughts on the Future of These Evolving Autopsy Practices

This chapter has reviewed three evolving facets of modern (non-forensic) autopsy practice – consolidating autopsy services in regional centers of excellence, assigning professional value to autopsy performance, and promulgating reasonable expectations for the role of autopsy in medical malpractice litigation. For a long time, practitioners of the autopsy served families, physicians, and hospitals in a relatively simple and individualized context. But now autopsy pathologists must adapt their practice to serve these same parties in complex, integrated health systems that are keenly interested in optimizing patient outcomes in a value-based manner.

Regional Autopsy Centers

Autopsy pathology must be recognized and supported as is any other subspecialty within pathology. Concentrating and developing autopsy resources and expertise within regional autopsy centers (RACs) will effectively achieve such a goal. Although RACs have been promoted in the literature for decades, few have emerged in recent years. It is time to acknowledge that RACs are the future of autopsy pathology and to act accordingly. RACs should be established in all health systems, either as free-standing institutions or within one of the system's existing hospitals. RACs need to be staffed by dedicated pathologists who care about postmortem care, who are competent in autopsy pathology, who are capable educators, and who will champion the autopsy. Such autopsy pathologists will have a twofold effect on autopsy pathology: first, they will provide competent autopsy pathology services in the regions they serve, and second, they will inspire and instruct the next generation of autopsy pathologists.

Most of today's attending pathologists received only a few months of autopsy pathology training in residency, which was likely of variable quality. Presently, completing a forensic pathology fellowship is almost the only way to receive advanced training in autopsy pathology, and most graduates of forensic pathology fellowships understandably go on to serve as medical examiners. Fellowships in autopsy pathology need to be created and supported, and RACs provide a logical place for such graduate medical education programs to reside. A RAC couples large case volume with professional expertise in all aspects of autopsy performance and reporting, resulting in a rich experiential and educational program for the autopsy pathology fellow. Access to the large amount of aggregate data available at a RAC would allow for myriad research endeavors to be pursued by the fellow, as well, enhancing the fellow's development while promoting autopsy pathology scholarship. Finally, as a RAC is likely to be affiliated with at least one academic medical institution within the region it serves, the fellow would be able to engage and develop skills in all levels of education. Establishing RACS and then using them to train the next generation of autopsy pathologists represent vital steps as autopsy pathology moves forward.

Establishing and supporting RACs, let alone autopsy pathology fellowships, requires funding. Initially, RACs are likely to pay for themselves as the savings generated from closing and consolidating individual autopsy services within a region can be concentrated in a RAC through thoughtful contractual arrangements. As a RAC succeeds in producing high-quality autopsy data in an efficient and cost-effective manner, the data can then be used to demonstrate a benefit to the region the RAC serves. Then relevant stakeholders – including clinicians and administrators – will likely invest in the RAC and thereby allow its service, education, and research endeavors to grow.

RACs that incorporate forensic pathology services can play a vital role in addressing this country's critical shortage of resources dedicated to adequate medicolegal death investigation. In fact, the Scientific Working Group on Medicolegal Death Investigation (SWGMDI) has outlined plans for constructing, staffing, and financing RACs to address this problem [30]. In the University of Alabama (UAB) experience, for example, autopsies in suspected cases of natural death or accidental drug overdose were performed at UAB with appropriate forensic oversight, thereby freeing up medical examiners to concentrate their resources on other forensic death investigations. As many jurisdictions around the country face increasing drug overdose deaths [31], the role of RACs in assisting medicolegal death investigation in this country is likely to become more important in the years ahead.

Assigning Value to Autopsy

Before relevant stakeholders outside of pathology even consider paying for autopsies, pathologists and pathologists' organizations must themselves acknowledge the value of autopsy through action. Over the past 3 years in the Department of Pathology and Laboratory Medicine at Northwell, documenting and incorporating wRVU from the autopsy service into each attending pathologist's annual productivity assessment have been well received by the department's faculty. The pathologists universally appreciate being recognized for their autopsy work, and the chief of service has subjectively noted increased faculty engagement in resident autopsy education as well as improved quality of autopsy reporting. Such outcomes continue to be monitored and will objectively be assessed and reported in the future. Hopefully, other pathology departments will adopt, modify, and share their experiences with documenting and assigning professional value to autopsy pathology. Only with such aggregate data can valid proposals for reimbursement be advanced, so that autopsy pathology can ultimately receive appropriate compensation.

Although quantifying the value of autopsy in this fashion might potentially open the door to reimbursement for the procedure down the road, in the USA there remains no specific governmental reimbursement for hospital autopsies from either Medicare Part A (hospital insurance program) or Part B (supplementary medical insurance for physician services) payments. There is hope, however, that autopsy might one day be directly financed by a third-party payor such as the government, as the most recent USA Institute of Medicine report recommended "… funding for

a designated subset of health care systems to conduct routine postmortem examinations on a representative sample of patient deaths" [18]. Even some insurance companies have acknowledged that autopsy could be reimbursed if it demonstrated value to an insured population [2]. For this dream to become a reality, though, the autopsy must first be appropriately valued by its practitioners, and then we can serve as advocates for having autopsy adequately funded.

Autopsy in the Medical Malpractice Environment

Finally, in today's healthcare environment – which is characterized by evidence-based medicine, patient-centered care, and cost-effectiveness – the autopsy will remain relevant if it helps optimize patient and health system outcomes through assuring the quality of healthcare. Always performing complete, consistent, and competent postmortem examinations in an objective and unbiased manner will ensure a productive and appreciated engagement in this endeavor. And as preventable adverse events will undoubtedly continue to occur in medicine – given that human nature is inherent in the practice of medicine – autopsy pathologists must prepare for and embrace their role as autopsy experts in legal proceedings involving non-forensic deaths.

The only aspects of a medicolegal case which autopsy pathologists can control are the thoughtfulness and thoroughness with which they perform and report their autopsies. It has been long recognized that well-performed and reported autopsies help "… eliminate suspicion …provide reassurances to families … substitute facts for conjecture … construct a better defense … reduce the number of claims …and improve the quality of care" [32]. Autopsy pathologists who appreciate such far-reaching consequences of a well-performed and well-reported autopsy, and who are able to meaningfully engage in the medicolegal realm, will help ensure that autopsy pathology remains an integral component of healthcare moving forward.

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