Small Patients, Complex Challenging Cases

A Reappraisal of the Professional Efforts in Perinatal Autopsies

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We, representing the Society for Pediatric Pathology (SPP), commend Dr Sinard and members of the Autopsy Committee of the College of American Pathologists (CAP) for writing the article "Accounting for the Professional Work of Pathologists Performing Autopsies" that was published in the February 2013 issue of *Archives of Pathology & Laboratory Medicine*.[1] As compensation for pathologists' services becomes more closely tied to productivity, the application of workload units to the performance of autopsies becomes vitally important for pathologists performing these critical, but nonreimbursed medical procedures. It is to the benefit of pathologists, hospitals, and patients to fairly and accurately quantify the time, work, and professional expertise required for autopsy performance and reporting. Determination of appropriate workload values is especially crucial for pathologists performing large numbers of autopsies, such as those who staff children's hospitals or medical centers serving obstetric patients.

The national hospital autopsy rate hovers around 5%[2] and adult hospital autopsy rates range from around 10% to from 15% to 25% in some specialized medical centers[3,4]; however, pediatric and maternity hospitals show significantly higher autopsy rates, ranging from 25% to 66%.[5–7] The rates of postmortem examination of stillbirth and perinatal deaths range from 47% to 94%[5] in academic settings, and from 53% to 77%[8,9] in some special stillbirth programs. Moreover, as efforts to elucidate the causes and decrease the incidence of stillbirth remain prioritized clinical objectives,[8–12] fetal autopsy rates will likely increase. Finally, the improved resolution of prenatal imaging techniques has not negated the need to evaluate anatomy and assess for acquired pathology in nonsurvivors through a competent postmortem examination.[5,10,11]

Also see p. 869.

The article by Sinard and colleagues[1] undermines the perception of the value of fetal/neonatal autopsies among pathologists. This devaluation is not without precedent, as the American Board of Pathology (ABP) recently mandated that no more than 5 "normal" fetuses and 2 macerated fetuses can count toward a board applicant's requisite total of 50 autopsies.[13] While a solid foundation in "adult" pathology is critical to the practice of general pathology, undifferentiated pathology trainees should not be discouraged from pediatric or perinatal pathology by devaluing its practice. The aim of our response is to provide background, explanation, and data regarding fetal/neonatal autopsies to enable a critical reappraisal of the recommendations of Sinard et al.[1] We submit these points in the defense of the vital role of autopsy in medicine.

Given the above context, the SPP questions the general methodology, data collection and analysis, and resulting recommendations in the article by Sinard et al.[1]

GENERAL METHODOLOGY

Using a "recollection and reporting" method to assess time spent on any complex task with multiple parts performed over a series of days is very likely to yield a significant underestimate of the time required to perform the same task again. There is a robust literature on the causes for such underestimates.[14] We submit that using a recollection and reporting method resulted in a biased underestimation of the time it takes to perform and report any autopsy. The accuracy of self-reporting is likely to have been additionally compromised to the degree that resident pathologists did most of the labor, but the survey queried attending pathologists. Some simple calculations using the proposed Current Procedural Terminology (CPT) value assignments for both adult and fetal/neonatal autopsies demonstrate that Sinard et al[1] underestimated the time required. Sinard et al[1] propose that the professional work associated with autopsy performance be quantified by

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Table 1. Total Autopsy Numbers and Percentages of Stillborn, Spontaneous Previable Delivery, and Neonatal Intensive Care Unit Patient Infant Autopsies for 5 Representative United States Health Care Institutions/Systems

	Total Autopsies	Total Perinatal Cases,[a] No. (%)	Spontaneous Previable Delivery, No. (%)	Unexpected Intrauterine Fetal Demise, No. (%)	Fetus/Infant With Anomalies, No. (%)	Neonatal Death, No. (%)	Complex Perinatal Cases,[b] No. (%)
Community network hospitals (n = 2)	494	212 (43)	23 (11)	90 (42)	78 (37)	21 (10)	**189 (89)**
University hospitals (n = 3)	478	115 (24)	12 (10)	47 (41)	31 (27)	25 (22)	**103 (90)**
Ranges (n = 5)	108–260	37–116 (18–50)	4–12 (8–13)	10–55 (27–59)	7–41 (18–39)	4–13 (8–35)	**34–105 (87–93)**

[a] Defined by an intact fetus or neonate 20 weeks or more of gestational age or infant (age <1 year) who never left the neonatal intensive care unit.
[b] Defined by all perinatal cases aside from spontaneous preterm deliveries; see text for details.
[c] Bolded values equal the sum of "Unexpected Intrauterine Fetal Demise" cases plus "Fetus/Infant With Anomalies" cases plus "Neonatal Death" cases, representing the "Complex Perinatal Cases" for each of the hospital groups.

multipliers of the 88309 CPT code, with an adult autopsy = 5.5 × 88309 units; fetal/neonatal autopsy = 4 × 88309 units; adult brain = 1.5 × 88309 units; fetal brain = 0.5 × 88309 units; and detailed clinicopathologic correlation in either case = 1.5 × 88309 units. Using the nationally applicable CPT to relative value unit (RVU) conversion of 1 × 88309 CPT = 2.8 RVU, the multipliers used by Sinard et al[1] translate into 23.8 RVU for an adult autopsy and 16.8 RVU for a perinatal autopsy (both of them including brain examination and clinicopathologic correlation discussion). Thus, full-time pathologists in an academic pathology department with a 7600 RVU target[15] would have to perform 319 adult autopsies or 452 perinatal autopsies per year, using the workload assignments of Sinard et al.[1] These numbers are greater than those recommended for most adult pathologists,[16] pediatric pathologists,[17] and medical examiners,[18] and it is likely that expecting this level of productivity would lead to compromised autopsy quality, avoidance of autopsy service, and/or high turnover among autopsy pathologists. Clearly, the method used by the authors underestimates the time required to perform and report autopsies of all types, but this is especially true for perinatal/neonatal intensive care unit (NICU) patient autopsies. We believe that without formal prospective time studies, an accurate accounting of time and effort spent on autopsy cannot be determined.

DATA COLLECTION AND ANALYSIS

The pathologist sample used by Sinard et al[1] does not appear to be representative, and does not reflect the experience and perspective of pathologists performing large numbers of perinatal/neonatal autopsies.[1] The CAP Autopsy Committee received input on fetal/neonatal autopsies from only 4 of its 9 members. In addition, while there were similar numbers of survey responses from pathologists reporting they performed fetal/neonatal autopsies and adult autopsies, the percentages of fetal/neonatal and adult cases that comprised each respondent's autopsy workload were not elucidated. The level of perinatal pathology expertise among the survey respondents was also unclear.

RESULTING RECOMMENDATIONS

The authors state that "[t]he lower value for perinatal autopsies is not in any way intended to suggest that all fetal autopsies are easier or otherwise require less professional work than adult autopsies. Rather, as with all CPT codes, the value assigned is intended to represent an average for all fetal autopsies, and many fetal autopsies…do require less work." [1] In response, we provide Table 1, which summarizes 2012 autopsy data from 5 medical institutions that in aggregate reflect the current practice of fetal/neonatal autopsy among the US-based SPP membership in both academic and community practice settings. The tabulated data represent 3 large university-based academic institutions as well as 2 large community-based health care systems (which, together, serve nearly 12 million people) in 5 states (Alabama, California, Illinois, New York, Virginia) and with diverse patient populations.

Table 1 reflects evaluations performed on (1) intact fetuses/briefly viable infants of 20 or more weeks of gestational age (wk GA) and (2) NICU nonsurvivors. Autopsies were defined as examinations with complete external and internal examinations with histologic evaluation. Ancillary studies were performed in all institutions, as indicated, and included postmortem radiographic imaging, bacterial and viral cultures, karyotyping, and fibroblast culture, polymerase chain reaction studies for organisms and genetic defects, and blood and vitreous chemistries. Almost all cases had correlative placental examinations. Per the 1997 CAP recommendations for the pediatric and perinatal autopsy,[19] all cases included a clinicopathologic correlation that integrated pertinent prenatal, delivery, and/or postnatal histories, genetic information, and discussion of gross and microscopic findings causing or contributing to death and/or to risk of recurrence in subsequent pregnancy. Specifically, the data did *not* include disrupted fetuses or those less than 20 wk GA, despite the fact that such cases represent an increasing and often very challenging part of perinatal pathologists' workload, especially in hospitals with active perinatology and prenatal diagnosis programs.[20]

The data in Table 1 reveal several aspects of fetal/neonatal autopsy practice that belie the conclusions by Sinard et al[1] regarding the effort required for perinatal autopsy. (1) Fetal/neonatal autopsies are not rare; they comprise approximately 20% to 50% of the autopsy workload in academic and community-based hospitals. (2) Approximately one-third (20%–40%) of these fetuses/neonates are not "normal," and have 1 or more anomalies. (3) Cases of clinically unexpected fetal demise, which are particularly challenging diagnostically, account for approximately one-third (27%) to two-thirds (59%) of fetal/neonatal autopsies. (4) Although the percentage of autopsies performed on NICU patients varied from 10% to 35%, these cases also represent some of the more challenging encountered in practice, requiring assessment of the effects of prematurity, evaluation of the effectiveness and unintended consequences of ever-chang-

Table 2. Causes of Death in Cases of Unexpected Intrauterine Fetal Demise (IUFD) by Center (Ctr)[a]						
Cause of Death in Unexpected IUFD	**Ctr 1**	**Ctr 2**	**Ctr 3**	**Ctr 4**	**Ctr 5**	**Total, No. (%)**
Disseminated fetal infection[b]	2	1	1	2	6	**12** (8.6)
Diabetic fetopathy	1			5		**6** (4.3)
Hydrops (immune and nonimmune)	1	2				**3** (2.2)
Significant umbilical cord abnormality/cord accident	6	4	2	15	9	**36** (25.9)
Severe placental pathology[c]	10	7	6	18	6	**47** (33.8)
Massive fetomaternal hemorrhage	2			8		**10** (7.2)
Severe maternal disease/uterine anomaly			1		3	**4** (2.9)
Undetermined	1			9	11	**21** (15.1)
Total	**23**	**14**	**10**	**57**	**35**	**139**

[a] Centers 1 to 3: University-based academic institutions; Centers 4 and 5: Community-based health care systems serving populations of more than 6 million individuals each.
[b] Includes Group B *Streptococcus*, *Enterococcus*, *Listeria*, *Toxoplasma*, parvovirus B19.
[c] Includes fetal thrombotic vasculopathy, severe maternal vascular underperfusion, diffuse chronic villitis, massive perivillous fibrin deposition, massive abruption, massive subchorial hematoma, most with intrauterine growth restriction.

ing and more intense specialized medical interventions, and assimilation of often complex clinical histories. (5) Only approximately 10% of cases resulted from spontaneous previable delivery, often the most straightforward cases diagnostically. Thus, our data reveal that, in both private and university practice settings, complex cases account for at least 89% of the perinatal/neonatal autopsy workload.

As exemplified in Table 2, the competent autopsy of the "clinically unexpected intrauterine fetal demise" most often yields clinically important diagnoses. The *Archives of Pathology & Laboratory Medicine* previously published guidelines for the examination of the apparently "normal" fetus, which by definition requires a thorough and competent assessment.[19] In many instances, a thorough autopsy reveals pathology, both anatomic and acquired, that would be missed on a cursory examination. A complete examination requires anatomic assessment of gestational age that must be matched against the clinically estimated wk GA; estimation of the period of intrauterine retention following fetal demise; assessment of adequacy of fetal growth and appropriateness of maturation for the anatomically determined GA; evaluation for the presence of structural anomalies or intrauterine infections; and collection of appropriate and viable tissues for ancillary studies. The histologic examination is extremely important in cases of stillbirth and includes more than an evaluation of tissue autolysis to derive an estimation of the duration of intrauterine retention following fetal death. Pathologists must assess age appropriateness of development of the brain and viscera and identify causal or contributory pathologic findings that explain or are linked to the fetal demise. Numerous published and electronic resources are available to the general pathologist wishing to improve his or her diagnostic acuity in perinatal/neonatal autopsy.[21]

Fetal, neonatal, and infant autopsies often have greater and farther-reaching implications for the living than do autopsies performed on hospitalized adults. Results from perinatal examination frequently contribute to decisions regarding further childbearing for the affected family, future pregnancy care and risks for the mother, and even genetic counseling and screening for heritable conditions in the parents and siblings. Providing a clinically relevant correlation with autopsy findings usually requires review of the mother's medical record, evaluation and interpretation of placental findings, and incorporation of antenatal and postmortem testing results. Because obstetricians encounter some of the highest rates of malpractice claims among physicians,[22] accurate and responsible autopsy performance and reporting, by perinatal pathologists, is often critical for fair adjudication of claims of malpractice. This medical-legal concern is reflected in the increased referral rates of such cases to pathologists with perinatal expertise.

Given our experience, which our data demonstrate (noting that many members of the SPP including the authors of this response perform autopsies on patients of all ages), we of the SPP firmly believe that the performance of fetal, neonatal, and infant autopsies requires *at least as much* professional work as completing an adult autopsy. This has been codified in the United Kingdom since 2005, based on guidelines published by The Royal College of Pathologists (RCP)—the United Kingdom's equivalent to the CAP. The RCP quantifies a pathologist's effort and time invested in performing macroscopic and microscopic analysis and producing a report for autopsies as "low," "intermediate," "high," and "very high," reflecting case complexity. According to this schema, adult hospital autopsies are allocated from 3 hours ("intermediate" input; eg, most adult cases) to 6 hours ("high" input; eg, postoperative or maternal death) of workload units, whereas perinatal and pediatric autopsies are afforded from 2 hours ("intermediate" macro/"low" micro input; eg, macerated second trimester stillbirth) to from 7 to 8 hours ("high" macro and micro input; eg, clinically unexpected intrauterine fetal demise, fetal termination for anomalies) to well over 8 hours/2 sessions ("very high" macro and micro input; eg, premature newborn deaths, NICU deaths)[23] of workload units. These figures stand in stark contrast to the conclusions by Sinard et al[1] regarding the overall low work value of the fetal/neonatal autopsy.

The SPP members, who regularly practice and promote the importance of competent fetal and neonatal autopsies, submit that Sinard and colleagues[1] have undervalued the fetal/neonatal autopsy in their analysis, and that, in so doing, they have done a disservice to the pathology profession. In cases of fetal or neonatal death, the decedents, their families, and our obstetric and neonatal colleagues deserve competent performance of postmortem examination and thoughtful synthesis of findings. The literature shows that demand for such service is steady and will probably increase. An unintended consequence of undervaluing the fetal/neonatal autopsy is that there will be unwillingness among pathologists to perform fetal/neonatal autopsies, and the consequent lack of resident education will exacerbate the shortage of pathologists who are qualified to perform such important work in our country.

We recognize that the article by Sinard et al[1] addresses a very important topic and opens the door for an informed discussion of autopsy workload. We encourage the CAP Autopsy and Forensic Pathology Committees, in alignment with the CAP Transformation initiative, as well as the ABP, to join us in support of the importance of autopsy, in general, and of the fetal/neonatal autopsy, in particular. By doing so, we can reinforce minimum standards and provide educational support for autopsy performance. A concerted effort of this type will be much more valuable, to our profession and to our patients, than promoting a value system that overly simplifies and seriously underrepresents the time and expertise that is involved in performing and reporting perinatal postmortem examinations.

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