Autopsy Utilization in Medicolegal Defense of Anesthesiologists

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ABSTRACT

Background: The rate of autopsy in hospital deaths has declined from more than 50% to 2.4% over the past 50 yr. To understand the role of autopsies in anesthesia malpractice claims, we examined 980 closed claims for deaths that occurred in 1990 or later in the American Society of Anesthesiologists Closed Claims Project Database.

Methods: Deaths with autopsy were compared with deaths without autopsy. Deaths with autopsy were evaluated to answer the following four questions: Did autopsy findings establish a cause of death? Did autopsy provide new information? Did autopsy identify a significant nonanesthetic contribution to death? Did autopsy help or hurt the defense of the anesthesiologist? Reliability was assessed by κ scores. Differences between groups were compared with chi-square analysis and Kolmogorov-Smirnov test with $P < 0.05$ for statistical significance.

Results: Autopsies were performed in 551 (56%) of 980 claims for death. Evaluable autopsy information was available in 288 (52%) of 551 claims with autopsy. Patients in these 288 claims were younger and healthier than those in

What We Already Know about This Topic

- Autopsy use has dramatically declined in the United States, but its use in cases involving litigation of anesthesiologists has not been described

What This Article Tells Us That Is New

- Autopsy was performed in approximately half of the nearly 1,000 cases reviewed in the closed claims database
- Autopsy results were more commonly favorable than detrimental to the defense

claims for death without autopsy ($P < 0.01$). Autopsy provided pathologic diagnoses and an unequivocal cause of death in 21% of these 288 claims ($\kappa = 0.71$). An unexpected pathologic diagnosis was found in 50% of claims with evaluable autopsy information ($\kappa = 0.59$). Autopsy identified a significant nonanesthetic contribution in 61% ($\kappa = 0.64$) of these 288 claims. Autopsy helped in the defense of the anesthesiologist in 55% of claims and harmed the defense in 27% ($\kappa = 0.58$) of claims with evaluable autopsy information.

Conclusions: Autopsy findings were more often helpful than harmful in the medicolegal defense of anesthesiologists. Autopsy identified a significant nonanesthetic contribution to death in two thirds of claims with evaluable autopsy information.

AUTOPSIES were previously regarded as the definitive method for establishing the cause of death, and rates of autopsy for in-hospital deaths were once as high as 50% in the 1950s.[1] With the increasing sophistication of imaging technology, clinical laboratory testing, and specialized pathologic techniques such as immunohistochemistry, flow cytometry, molecular diagnostics, and cytogenetics, many fatal diseases may be diagnosed before death, resulting in a declining interest in autopsy. A recent eight-state survey demonstrated a median autopsy rate of 2.4%, and attributed this very low rate to the belief that improved premortem diagnostic tools render the autopsy redundant.[2] Another factor contributing to the low rate of hospital autopsy is the

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absence of reimbursement from government and private insurers. The median cost of autopsy in the eight-state survey was $852 (average $1,275)[2] and, in the absence of reimbursement, the performing pathologist or hospital has little motivation to encourage the performance of autopsies.

Nevertheless, diagnostic technologies do not necessarily provide comprehensive substitution for preexisting methods, and studies continue to show that hospital autopsies are useful in the identification of cause of death or significant pathologic findings that were not diagnosed before death.[3–14] Because of the concern that autopsy is a valuable but underutilized investigative tool, particularly in medicolegal cases, we examined the role of autopsy in determining the cause of death and in the defense of the anesthesiologist in the American Society of Anesthesiologists Closed Claims Project Database. Deaths with autopsy were evaluated to answer the following four questions: Did autopsy findings establish a cause of death? Did autopsy provide new information? Did autopsy identify a significant nonanesthetic contribution to death? Did autopsy help or hurt the defense of the anesthesiologist?

Materials and Methods

The American Society of Anesthesiologists Closed Claims Project Database contains standardized data on anesthesia malpractice claims collected from approximately 35 professional liability insurance companies across the United States. The data collection process has been described in detail previously[15,16] and includes information on the patient, anesthetic, adverse events, injuries, standard of care, and liability outcome. Claim narratives provide information on the sequence of events, the relationship between events and injury, comments on standard of care assessments, and other details considered pertinent by the on-site anesthesiologist-reviewer of the full claim file. Claims for death include a standard data collection item to denote if an autopsy was performed or not. Any details on autopsy findings are included in the claim narrative summary at the discretion of the on-site reviewer.

Inclusion criteria for this study were claims for death that occurred in 1990 or later from the total American Society of Anesthesiologists Closed Claims Project database of 7,740 claims. Claims for death were subdivided into those with autopsy and those without autopsy. Claims with autopsy were further subdivided into those with information in the narrative describing autopsy findings *versus* those with no mention of autopsy findings. Claims with narrative descriptions of autopsy findings underwent content analysis by the authors to evaluate the usefulness of autopsy findings in contributing toward the determination of the cause of death and the usefulness of the autopsy in defense of the anesthesiologist. For content analysis, reliability between pairs of authors was measured on a sample of cases. Because reliability was found to be good to excellent on all assessments (κ range 0.58–0.72), the remainder of the cases

were distributed among pairs of authors to obtain two assessments of each claim. In the case of disagreement between the first two assessments, the third author made a tie-breaking assessment. If the third assessment did not result in agreement with at least one of the first authors to assess the case, disagreement was resolved through discussion among all three authors participating in the content analysis of that item.

To determine clinical diagnoses of the presumed cause of death that was established before autopsy, claims with evaluable autopsy findings were independently reviewed by two anesthesiologists (L.L, F.W.C.) and one pathologist (C.F.). A preautopsy clinical cause of death was considered present if it was explicitly stated in the claim narrative summary, or if the narrative described clinical events that directly implied a specific clinical diagnosis. In some claims, multiple differential clinical diagnoses were identified.

Once the preautopsy clinical diagnosis was determined, claims with evaluable autopsy findings underwent additional independent content analysis by two anesthesiologists (L.L., F.W.C.) and one pathologist (C.F.) to determine whether the autopsy findings identified an unequivocal cause of death, provided pathologic diagnoses but not an unequivocal cause of death, or ruled out specific causes of death without providing an unequivocal cause of death ($\kappa = 0.71$). Claims with autopsy findings were also evaluated to determine whether the autopsy results provided unexpected pathologic information ($\kappa = 0.59$). Unexpected pathologic information included conditions not diagnosed preoperatively or premortem such as pheochromocytoma, pulmonary embolism, surgical hemorrhage, and congenital heart defects.

Claims with autopsy findings were also independently reviewed by two anesthesiologists with medicolegal experience (L.L., F.W.C.) to assess whether the autopsy results identified a significant nonanesthetic contribution to the patient's death ($\kappa = 0.64$), and whether the results of autopsy helped or hurt the defense of the anesthesiologist. Whether the autopsy helped or hurt the defense was initially assessed using a six-point scale from 1 = strongly agree to 6 = strongly disagree for each item (helped in the defense *vs.* was harmful to the defense). This scale was then collapsed into a dichotomous assessment for each question (helped the defense $\kappa = 0.72$, hurt the defense $\kappa = 0.58$). A third anesthesiologist with medicolegal experience (K.B.D.) reviewed claims with disagreement to determine the final assessments by the majority of three anesthesiologist assessments.

Statistical Analysis

Payments were adjusted to 2009 dollar amounts using the Consumer Price Index.†† Interrater reliability for content analysis was determined by κ scores. Statistical comparison were performed using chi-square analysis for proportions and the Kolmogorov-Smirnov test to compare payment amounts, with $P < 0.05$ required for statistical significance. All statistical calculations were performed with SPSS 16.0.2 for Windows (SPSS, Inc., Chicago, IL).

Table 1. Characteristics of Cases with and without Autopsies

	P Value*	Deaths with Autopsy with Evaluable Information n (% of 288)	Deaths with Autopsy without Evaluable Information n (% of 263)	Deaths with No Autopsy Indicated n (% of 429)
Sex	0.865			
Male		142 (49)	134 (51)	204 (48)
Female		145 (50)	127 (48)	222 (52)
Unknown		1 (<.5)	2 (1)	3 (1)
Age	<0.01			
Younger than 65 yr		248 (86)	218 (83)	279 (65)
65 yr or older		39 (14)	44 (17)	147 (34)
Unknown		1 (<0.5)	1 (<0.5)	3 (1)
ASA Physical Status	<0.01			
1–2		131 (45)	93 (35)	124 (29)
3–5		121 (42)	151 (57)	261 (61)
Unknown		36 (13)	19 (7)	44 (10)
Emergency procedure†	0.07	66 (24)	78 (31)	128 (32)
Appropriateness of anesthetic care	<0.01			
Appropriate		157 (55)	102 (39)	186 (43)
Not appropriate		100 (35)	128 (49)	183 (43)
Impossible to judge		31 (11)	33 (13)	60 (14)
Payment made on behalf of anesthesiologist†	0.06			
Yes		98 (40)	101 (50)	148 (41)
No		147 (60)	100 (50)	211 (59)
Payment amount‡	0.95			
Median payment (2009 $)		$262,476	$290,700	$306,000
Range of payments		$10,875-$2,046,000	$1,608-$2,112,000	$3,350-$2,624,000

*P values by Fisher exact test (for proportions) and median test (payment amounts). †Claims with missing data excluded. ‡Payment amounts were adjusted to 2009 dollars by the consumer price index. Claims with no payment excluded.
ASA = American Society of Anesthesiologists.

Results

Overview: Patient/Case Characteristics and Payment Information

In 980 claims for death in 1990 or later, 551 (56%) had an autopsy noted and 429 had no autopsy indicated. Of these 551 claims with autopsy, 288 had evaluable autopsy information in the narrative, and 263 had no evaluable autopsy information (table 1). There was a higher proportion of claims in both autopsy groups with patients younger than 65 yr compared with the no autopsy group ($P < 0.05$, table 1). There was a significantly higher proportion of American Society of Anesthesiologists physical status 1–2 patients in the group with evaluable autopsy information compared with the groups without evaluable autopsy information or with no autopsy ($P < 0.05$, table 1). There were no significant differences in sex or emergency procedures between the three groups.

Care was judged as appropriate in a significantly higher proportion of claims in the group with evaluable autopsy information (55%) compared with the autopsy group without evaluable autopsy information (39%) and to the no autopsy group (43%, $P < 0.05$, table 1). There was no difference between the three groups with respect to the proportion of claims with payment made on behalf of the anesthesiologist, or to the amount of payment made (table 1).

Usefulness of Autopsy in Establishing the Cause of Death

The autopsy data provided an unequivocal cause of death in 21% of the 288 claims with evaluable autopsy information. Autopsy findings provided pathologic diagnoses, but not an unequivocal cause of death in 69% of these 288 claims. Specific causes of death were ruled out in 10% of these 288 claims, but the exact cause of death was not determined in those claims.

New Information Found at Autopsy

Overall, an autopsy provided unexpected pathologic information in 143 of 288 deaths (50%) with evaluable autopsy information and identified a significant nonanesthetic contribution to the patient's death in 175 of 288 (61%, table 2). Both unexpected findings and a significant nonanesthetic contribution were identified in 109 of 288 deaths (38%) with evaluable autopsy information (table 2). The most common of these 109 unexpected nonanesthetic factors contributing to death were cardiac disease (including myocardial infarction, significant coronary artery disease, and cardiomyopathy/hypertrophy), pulmonary emboli, and surgical complications (table 2).

Utility of Autopsy in Defense of the Anesthesiologist

For claims with evaluable autopsy information (n = 288), autopsy results were judged to be helpful in the defense of the

Table 2. New Information Found at Autopsy

Autopsy Findings	Claims	Deaths with Evaluable Autopsy Information % of 288 claims
Provided unexpected pathologic information	143	50%
Identified a significant nonanesthetic contribution to death	175	61%
Both unexpected pathologic information and a significant nonanesthetic contribution*	109*	38%
Most common new findings/nonanesthetic contributions to death (n = 109)*		
Cardiac disease	61	21%
Myocardial infarction	19	
Cardiomyopathy/cardiac hypertrophy†	16	
Significant coronary artery disease‡	13	
Congenital heart disease	5	
Other cardiac findings§	8	
Pulmonary embolism	19	7%
Fat/thrombus/amniotic fluid	17	
Air	2	
Surgical complications	15	5%
Hemorrhage	8	
Central venous access complications (by surgeon)	4	
Other surgical complications‖	3	
Medication issues	6	2%
New toxicology findings	3	
Adverse drug reaction#	3	
Stroke	5	2%
Miscellaneous findings**	3	1%

Proportions may sum to >100% due to rounding.

*These 109 claims represent overlap between the 143 claims with new unexpected pathological information and the 175 claims in which autopsy identified a significant nonanesthetic contribution to death. †This category includes cardiac dilation or hypertrophy, infiltrating myocardial disease or notation of cardiomyopathy on autopsy report. ‡Significant coronary artery disease is defined as 50% or greater stenosis in major coronary vessel or notation of coronary artery disease on autopsy report. Most of these patients had documented "severe coronary artery disease" and/or >70% stenosis of major coronary vessels on autopsy report. §Other cardiac findings included viral myocarditis (n = 2) and miscellaneous cardiovascular conditions such as bacterial endocarditis, cystic medial necrosis of the aorta, myocardial fibrosis, myxomatous degeneration of the mitral valve, ruptured aortic aneurysm, and right ventricular thrombus adherent to pulmonic valve (one each). ‖Other surgical complications included uterine perforation, aspiration of blood after tonsillectomy, and surgical error on duodenal stump closure. #Adverse drug reactions by patients with Duchenne's muscular dystrophy (n = 2), plus anaphylactic reaction (n = 1). **Miscellaneous findings included pheochromocytoma, adrenocortical adenoma, and subdural hematoma (one each).

anesthesiologist in 56% of claims. The autopsy was judged as harmful to the defense of the anesthesiologist in 26% of these claims and played a neutral role in 18%. The remaining 263 claims with autopsy without evaluable autopsy information could not be assessed with respect to claim resolution.

Discussion

A significant limitation of this study was our dependence on narrative data that was not prospectively designed to capture autopsy information in a standardized manner. In the absence of standardized data collection, we suspect that underreporting may have occurred when reviewers encountered unremarkable autopsy results or results that did not contribute to determining the cause of death. The difference in appropriateness of care between the two autopsy groups with and without evaluable information in table 1 is consistent with this supposition. This may explain why only half of the claims with autopsy provided evaluable information in the narrative. Consequently, overinterpretation of the results

may have occurred by comparing deaths with evaluable autopsy information (n = 288) to deaths without autopsy. Because we did not have access to original autopsy reports for this study, we could not assess the overall quality or completeness of the postmortem examinations.

In the United States, autopsy is not a consistent feature of the investigation of deaths during anesthesia and surgical procedures. In some areas, criteria have been established for the types of hospital deaths that require investigation by a medical examiner, coroner, or designated pathologist. A more structured and standardized approach to the investigation of anesthesia-surgical deaths has been proposed, including anesthesiologist consultants to evaluate the anesthesia issues, the use of special autopsy procedures to evaluate unique issues, and appropriate toxicologic assessment.[17,18] Adoption of more uniform medical and pathologic investigative procedures for anesthesia-surgical deaths would likely improve the quality of the objective pathologic information and the death investigation.

Despite the limitations of our data, we found that autopsy was able to establish an unequivocal cause of death in 21% of claims with evaluable autopsy information. We also found that autopsy frequently resulted in unexpected pathologic information, an observation that has been reported for other medical specialties[3–12] and in a small study of malpractice claims for postoperative deaths in France.[13] A recent international review suggests that the rate of discordance between the clinical diagnosis and the pathologic diagnosis of death in the United States is approximately 24%, and that major diagnoses are undetected clinically in at least 8% of hospital deaths in the United States.[14]

Some clinical scenarios – such as cardiac arrest associated with difficult intubation, high spinal anesthesia, or unintended intravascular injection of local anesthetic – seem so fundamentally linked to anesthetic care and technique that the value of autopsy may be overlooked. Yet, identification of comorbidities may influence the interpretation of clinical events leading to death. For example, undiagnosed congenital or coronary artery disease could play an important role in the patient's ability to tolerate an unexpected complication that was managed in a prompt and appropriate manner. In our study, autopsy findings revealed undiagnosed nonanesthetic conditions that contributed to death in 38% of claims with evaluable autopsy information. Cardiac disease was the most common undiagnosed factor that contributed to death.

It is important to emphasize that the defendant anesthesiologist is not the sole beneficiary of postmortem findings. A more accurate understanding of adverse events is important for other reasons. It allows the medical profession to make better decisions about preventive strategies by minimizing "outcome bias" (the belief that bad outcomes are simply the result of bad care).[19] It provides families with objective explanations that facilitate the process of grieving and closure, and it supports the basic social and legal goal of pursuing the truth.

Fear of litigation is often cited as a reason that physicians do not request consent for autopsy.[20] In our study, autopsy results from claims with evaluable autopsy information strengthened the defense of the anesthesia care in more than half of the claims. This is consistent with a review of appellate court cases performed by the Autopsy Committee of the College of American Pathologists.[20] In the appellate cases, decisions about medical negligence were based on standard-of-care issues, and autopsy findings did not play a critical harmful role to the defendant.[20] Despite the beneficial role of autopsy in defense of the anesthesiologist in our study, the lack of differences in payment factors between the claims with evaluable autopsy information and the claims without autopsy in table 2 highlights the multitude of nonmedical factors involved in successfully defending malpractice claims.

Conclusion

This study of malpractice claims found that autopsy findings are more often helpful than harmful in the defense of anesthesia care. Anesthesiologists should consider the utility of autopsy, particularly when a perioperative death is unexpected or has an ambiguous cause, and should encourage performance of an autopsy in those settings.

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