A Contemporary Analysis of Medicolegal Issues in Obstetric Anesthesia Between 2005 and 2015

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BACKGROUND: Detailed reviews of closed malpractice claims have provided insights into the most common events resulting in litigation and helped improve anesthesia care. In the past 10 years, there have been multiple safety advancements in the practice of obstetric anesthesia. We investigated the relationship among contributing factors, patient injuries, and legal outcome by analyzing a contemporary cohort of closed malpractice claims where obstetric anesthesiology was the principal defendant.

METHODS: The Controlled Risk Insurance Company (CRICO) is the captive medical liability insurer of the Harvard Medical Institutions that, in collaboration with other insurance companies and health care entities, contributes to the Comparative Benchmark System database for research purposes. We reviewed all (N = 106) closed malpractice cases related to obstetric anesthesia between 2005 and 2015 and compared the following classes of injury: maternal death and brain injury, neonatal death and brain injury, maternal nerve injury, and maternal major and minor injury. In addition, settled claims were compared to the cases that did not receive payment. χ^2, analysis of variance, Student *t* test, and Kruskal-Wallis tests were used for comparison between the different classes of injury.

RESULTS: The largest number of claims, 54.7%, involved maternal nerve injury; 77.6% of these claims did not receive any indemnity payment. Cases involving maternal death or brain injury comprised 15.1% of all cases and were more likely to receive payment, especially in the high range ($P = .02$). The most common causes of maternal death or brain injury were high neuraxial blocks, embolic events, and failed intubation. Claims for maternal major and minor injury were least likely to receive payment ($P = .02$) and were most commonly (34.8%) associated with only emotional injury. Compared to the dropped/denied/dismissed claims, settled claims more frequently involved general anesthesia ($P = .03$), were associated with delays in care ($P = .005$), and took longer to resolve (3.2 vs 1.3 years; $P < .0001$).

CONCLUSIONS: Obstetric anesthesia remains an area of significant malpractice liability. Opportunities for practice improvement in the area of severe maternal injury include timely recognition of high neuraxial block, availability of adequate resuscitative resources, and the use of advanced airway management techniques. Anesthesiologists should avoid delays in maternal care, establish clear communication, and follow their institutional policy regarding neonatal resuscitation. Prevention of maternal neurological injury should be directed toward performing neuraxial techniques at the lowest lumbar spine level possible and prevention/recognition of retained neuraxial devices. (Anesth Analg 2019;128:1199–207)

KEY POINTS

- **Question:** What is the nature of patient injuries, associated factors, and legal outcomes in the closed claims in which obstetric anesthesia was the primary service for the period of 2005–2015 in the Comparative Benchmark System database?
- **Findings:** The most frequent closed claims were related to maternal nerve injury, and the claims most commonly associated with patient payment were due to maternal brain damage or death.
- **Meaning:** Practice improvement initiatives should be directed toward timely recognition of high neuraxial block, availability of adequate resuscitative resources, and the use of advanced airway management techniques; also, efforts should be directed toward improving communication, team training, and avoiding delays in care.

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Closed malpractice claims provide insight into factors associated with medical litigation, allow for the study of rare complications, and offer opportunities for practice improvement. The American Society of Anesthesiologists (ASA) Closed Claims Project, the most comprehensive and long-standing database, has helped improve patient safety and decrease the risk of serious complications.[1,2] Professional societies, such as the ASA and American Congress of Obstetricians and Gynecologists, have used the lessons learned from closed claims to improve care and patient safety, for example, implementation of mandatory safety standards as recommended by the ASA.[3,4]

Among anesthesia subspecialties, obstetric anesthesia carries an especially high malpractice risk.[5–8] In a pre-1990 obstetric anesthesia closed claims analysis, the most common causes for litigation were maternal death and newborn brain damage.[9] Similarly, in the 2 most recent studies from 1990–2003 and 1980–2011, cases of newborn death/brain damage and maternal death remained the leading cause of litigation.[7,10] The payments on behalf of the anesthesiologist were higher for maternal and newborn death/brain damage and commonly were associated with substandard anesthesia care.[7,10] The most common contributing factors in newborn cases were delay in care and communication problems.[7] In the past 10 years, multiple safety initiatives such as simulation-based team training,[11,12] hemorrhage protocols,[12] early maternal warning systems,[13] and maternal cardiac arrest management[14] have been proposed and implemented in the practice of obstetric anesthesia.

We used closed claims data from the Comparative Benchmark System (CBS) database to review the most recent trends in obstetric anesthesia litigation. Several studies from this database have already been published in various disciplines.[15–17] We sought to determine types of patient injury, associated factors, and indemnity payments and litigation costs in obstetric anesthesia closed claims. Such a detailed review of the most recent data available may provide insight into common claims and injuries, and help design actionable safety protocols.

METHODS

CBS Database

The CBS database is a national database that contains nearly 400,000 open and closed malpractice claims from Harvard Medical Institutions, along with an additional 400 academic and community hospitals and physician offices totaling >165,000 physicians, representing approximately 30% of all malpractice cases in the country.[18] Using the CBS database, we identified closed claims in the period 2005–2015 in which anesthesiology was the primary responsible service.

The files in the CBS are coded by a team of registered nurses, trained independently as taxonomy specialists. Case data assembled by Controlled Risk Insurance Company (CRICO) include assessment of a standardized taxonomy of risk management contributing factors, injury severity, case disposition, indemnity amounts, and legal expenses. There is a governance committee of physicians, attorneys, and other risk management specialists who oversee the coding process. This process occurred completely independently and before the initiation of this study. This study used deidentified data, and was exempted from the consent requirement by the Institutional Review Board.

Definition of Variables

The CBS database was queried for the period January 1, 2005 to December 31, 2015 for closed claims in which obstetric anesthesia was the primary service. The primary service is defined as the clinical service of the provider most responsible for the patient's care at the time of the event. This assignment is irrespective of who is named as a defendant and is based on the information available in the medical records. All cases were included in the final analysis and reviewed by the study authors (V.P.K., E.Y.B., R.D.U.). The variables provided included the year of loss, case filing and closing, patient age, delivery mode, type of anesthesia, and class of injury using the National Association of Insurance Commissioners (NAIC) severity code. Injury type was classified based on case information available as maternal death/brain injury, neonatal death/brain injury, maternal nerve injury, and maternal major and minor injury. Maternal minor and major injury included all cases that did not belong to the prior classes of damage. There was 1 case in which there were both maternal brain damage and neonatal death, and the delivery mode, anesthesia type, case disposition, and payment from that case were analyzed in each respective class. The case disposition was classified as "dismissed," "dropped/denied," or "settled." The latter included claims settled out of court and claims that went to trial. The payment comprised the amount paid to the claimant as well as the cost of the legal services. The amount was adjusted to 2017-dollar values using the Consumer Price Index.[19] Payments were classified as high range (>$1,000,000), medium range ($5000–$1,000,000), and low range (<$5000). The time to resolve was calculated from the year the claim was asserted to the year the claim was closed. The standard of care and delay in care were determined by the coders and by the 3 authors (V.P.K., E.Y.B., R.D.U.) based on the available summary.

The severity of the injury was coded according to the NAIC scale[20] from 0 to 9, where 0 corresponds to no injury and 9 corresponds to death. The anesthesia contributing factors were defined as factors considered to have led to the injury such as poor communication, delay in care, and inadequate documentation.

Statistical Analysis

The data were analyzed using descriptive statistics. Comparisons between classes of injury were performed using the χ^2 test or Fisher exact test for categorical data, and Student *t* test and analysis of variance for continuous data. $P < .05$ was defined as the cutoff for statistical significance. The indemnity amount was not normally distributed, and thus, we summarized it as median and range; the comparison between groups was done using the Kruskal–Wallis test. The relationship among the legal expenses, indemnity, and other continuous variables was analyzed using simple linear regression. The statistical software used was Microsoft Excel for Mac, version 14.7.1 (Microsoft Corporation, Richmond, WA), and STATA, version 14.2 (StataCorp, College Station, TX).

RESULTS

Overall Analysis

Among 2891 closed claims in the period 2005–2015 in which anesthesiology was the primary responsible service, 106

closed claims were associated with obstetric anesthesiology (3.7% of all anesthesia cases). The patient characteristics are shown in Table 1. Most patients received neuraxial anesthesia, and only 8 patients (7.5%) had general anesthesia. The cases that had general anesthesia were associated with significant patient morbidity (median NAIC code 7) and incurred significant expenses (4 were settled in the high and 2 in the medium range). The average duration of all cases included in this study took 1.4 years from occurrence to assertion and 1.8 years from assertion to resolution. The cases with higher legal expenses and indemnity were associated with higher NAIC codes and took longer to close ($P < .002$ for all; Supplemental Digital Content, Tables 1–2, http://links.lww.com/AA/C355). Only 30 cases were settled and received payment. However, when payment was made, the median amount of all settled cases was $263,574 (range, $9741–$5,793,579), and 6 cases received a payment of >$1,000,000. The median legal expenses in all obstetric anesthesia cases were $4536 (range, $0–$991,378). In comparison, from the 2785 nonobstetric anesthesia cases, 1036 cases were settled, and the median amount of all settled cases was $70,722 (range, $50–$9,454,877). In this cohort of nonobstetric cases, 97 cases received a payment of ≥$1,000,000.

Detailed Review

The characteristics of the major categories of injuries are shown in Table 2. The most common cause for litigation was maternal nerve injury, comprising 54.7% of cases. However, despite the high prevalence, payment was made in only 22.4% of the cases of maternal nerve injury. In contrast, the incidence of maternal death/brain damage and neonatal death/brain damage as a proportion of all cases was much lower, 15.1% and 9.4% of all claims, respectively, but payment was made in a significantly (χ^2 analysis) higher proportion of the cases, 62.5% and 40.0%, respectively.

Table 1. Patient Characteristics

	Number, N = 106	Percent
Age, N ± SD	29.5 ± 6.4	
Time from occurrence to assertion (y), N ± SD	1.4 ± 2.2	
Time from assertion to resolution (y), N ± SD	1.8 ± 1.8	
Delivery mode		
Vaginal	52	49.06
Cesarean	53	50.00
N/A	1	0.94
Anesthesia type		
Epidural	82	77.36
Spinal	9	8.49
CSE	1	0.94
General anesthesia	8	7.55
N/A	6	5.66
Case disposition		
Settled	30	28.30
Dismissed	31	29.25
Dropped/denied	45	42.45
Payment		
>$1,000,000	6	5.66
$5000–$1,000,000	24	26.42
None	76	67.92
Payment amount		
Median	$263,574	
Range	$9741–$5,793,579	
Legal expenses		
Median	$4536	
Range	$0–$991,378	

Abbreviations: CSE, combined spinal epidural; N/A, not applicable; SD, standard deviation.

Maternal Death and Brain Injury

The analysis of maternal death and brain injury is shown in Table 2. The majority of the cases (12 of 16) occurred in the setting of cesarean delivery, and 4 of 16 cases (25.0%) had general anesthesia. The proportion of cases with cesarean delivery and general anesthesia was higher in the maternal death/brain injury as compared to the other injury groups ($P = .01$ for both). Of the patients who had neuraxial anesthesia, 3 patients were in labor and had vaginal delivery, 5 patients were in labor and eventually received cesarean delivery, and 3 patients were not in labor and received cesarean delivery. Contributing factors were delay in care in 5 of 16 (31.2%) of the cases, inadequate documentation in 1 case, and improper management in another case. The median NAIC code was 8, and the average case took 0.9 years from occurrence to assertion and additional 2.4 years to close. Several causes of maternal death/brain damage were identified, including high neuraxial anesthesia, embolic events such as pulmonary embolism and amniotic fluid embolism, failed airway management, hemorrhage, infection, and unrecognized complications of central line placement (Figure 1A). We noted 5 cases of high neuraxial block, either during epidural placement or at the time of dosing, likely associated with unrecognized intrathecal injection. In one of these cases, however, no airway equipment was readily available. There were 3 cases of failed airway management. In the first case, an attempt to intubate a morbidly obese patient resulted in an esophageal intubation and aspiration, leading to hypoxia and anoxic brain injury. The second case involved an intubation in the setting of a code situation, where the position of the endotracheal tube could not be confirmed. The third case involved multiple unsuccessful attempts at the placement of both an endotracheal tube and laryngeal mask, resulting in an inability to ventilate and intubate requiring tracheostomy. Even though the standard of care was met in 68.7% of the cases as judged by the authors, 10 of 16 cases were settled in the high or medium range, and the median payment was $920,511 (range, $13,597–$5,665,292).

Newborn Death and Brain Injury

The data related to newborn death are summarized in Table 2. The average maternal age (available only for 4 patients) was 23.2 years ($P = .07$, comparison between neonatal death/brain injury and the remaining injury groups). In this group, there was a higher incidence of cesarean delivery, 7 of 10 cases, compared to the other classes of injury, and 6 of 10 mothers received epidural anesthesia. Anesthesia contributing factors were found in most of the cases, and 3 cases had >1 factor. The most frequently identified contributing factors were delays in care, 5 of 10 cases (50.0%); errors in newborn resuscitation, 3 of 10 cases (30.0%); and communication problems, 2 of 10 cases (20.0%). The most common cause for delays in care was the failure of the anesthesiologist to achieve adequate maternal anesthesia quickly either due

Table 2. Analysis of Class of Injury

	Maternal Death/Brain Injury N = 16[a]		Maternal Major and Minor Injury N = 23		Maternal Nerve Injury N = 58		Newborn Death/Brain Injury N = 10[a]		Significance *P*
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	
Age	32.3 ± 7.3	…	29.1 ± 6.1	…	29.2 ± 6.2	…	23.2 ± 4.0	…	.07
Delivery mode									.01
Vaginal	4	25.00	6	26.09	40	68.97	3	30.00	
Cesarean	12	75.00	16	69.57	18	31.03	7	70.00	
N/A	0	0.00	1	4.35	0	0.00	0	0.00	
Anesthesia type									.01
Epidural	9	56.25	17	73.91	51	87.93	6	60.00	
Spinal	2	12.50	1	4.35	6	10.34	0	0.00	
CSE	0	0.00	0	0.00	1	1.72	0	0.00	
General anesthesia	4	25.00	2	8.70	0	0.00	2	20.00	
N/A	1	6.25	3	13.04	0	0.00	2	20.00	
Contributing factors									
Delay	5	31.25	3	13.04	3	5.17	5	50.00	
Documentation	1	6.25	1	4.35	5	8.62	0	0.00	
Communication	0	0.00	6	26.09	6	10.34	2	20.00	
Improper management	1	6.25	0	0.00	0	0.00	0	0.00	
Newborn resuscitation	0	0.00	0	0.00	0	0.00	3	30.00	
Medication error	0	0.00	1	4.35	0	0.00	0	0.00	
NAIC code									
Median	8	…	3	…	4	…	7	…	…
Case disposition									.02
Settled	10	62.50	4	17.39	13	22.41	4	40.00	
Dismissed	4	25.00	6	26.09	17	29.31	4	40.00	
Dropped/denied	2	12.50	13	56.52	28	48.28	2	20.00	
Time from occurrence to assertion (y), N ± SD	0.9 ± 0.8	…	0.7 ± 0.6	…	1.7 ± 2.7	…	2.3 ± 2.4	…	.12
Time from assertion to resolution (y), N ± SD	2.4 ± 2.0	…	1.6 ± 1.9	…	1.7 ± 1.7	…	2.3 ± 2.0	…	.35
Payment									.02
>$1,000,000	4	25.00	0	0.00	1	1.72	2	20.00	
$5000–$1,000,000	6	37.50	4	17.39	12	20.69	2	20.00	
None	6	37.50	19	82.61	45	77.59	6	60.00	
Payment amount									.015
Median	$920,511	…	$95,956	…	$133,784	…	$926,996	…	
Range	$13,597–$5,665,292	…	$8724–$227,468	…	$9097–$5793,579	…	$299,680–$2143,684	…	
Legal expenses									.006
Median	$38,841	…	$1188	…	$1850	…	$14,041	…	
Range	$0–$991,378	…	$0–$307,487	…	$0–$141,247	…	$0–$240,788	…	

Abbreviations: CSE, combined spinal epidural; N/A, not applicable; NAIC, National Association of Insurance Commissioners; SD, standard deviation.
[a]One case involved both maternal brain damage and neonatal death, and the pertinent factors are analyzed in the respective class.

to not being in-house or technical difficulties when performing de novo neuraxial anesthesia. Errors in newborn resuscitation were associated with esophageal intubation. Example of communication problems included a claim involving a patient who suffered hypotension after epidural placement that necessitated emergency cesarean delivery and subsequently severe neurological impairment in the neonate. The claim asserted that the risks of the epidural on the baby were not explained when informed consent was obtained. The median NAIC code was 7. Common obstetrical factors associated with newborn cases are shown in Figure 2. The average time from occurrence both to assertion and then to closure of the claim was 2.3 years. Indemnity payment was made in 4 of 10 cases of newborn death or brain injury, which all involved delays in care. In 3 of 4 cases, the anesthesiologist was involved in newborn resuscitation due to a lack of trained personnel able to assist with neonatal airway management. Regarding the indemnity associated with these cases, 2 were in the high and 2 were in the medium range, with a median payment of $926,996.

Maternal Nerve Injury

The nerve injury data are summarized in Table 2. All cases were associated with neuraxial anesthesia, and the most prevalent anesthesia type was epidural anesthesia, at 87.9%. The anesthesia contributing factors were identified as poor communication, inadequate documentation, and delay in care in 10.3%, 8.6%, and 5.2% of cases, respectively. Examples of inadequate documentation include lack of procedure note or lack of documentation about the size of the needle,

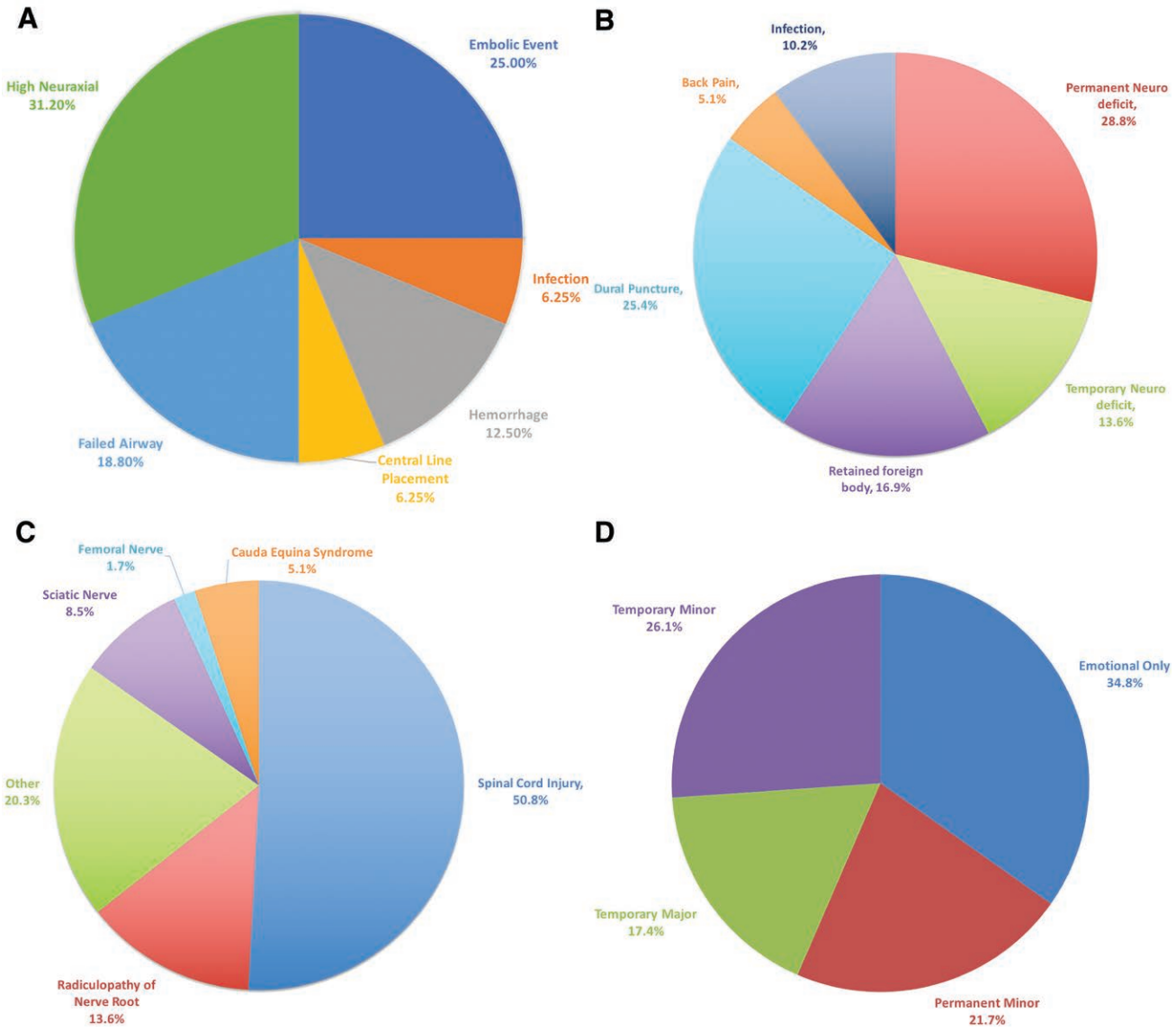

Figure 1. Analysis of type of injury. A, Causes for maternal death and brain damage, N = 16. B, Types of maternal nerve injury, N = 58. C, Anatomic location of maternal nerve injury, N = 58. D, Analysis of severity of major and minor maternal injury, N = 23.

the number of attempts, maintenance of sterile precautions, or medications given. The median NAIC code was 4. The most common injuries (Figure 1B) were associated with permanent neurological deficit, postdural puncture headache, and retained parts of the epidural needle or catheter. From the latter subgroup, half of the patients were found to have a retained foreign body in the course of imaging being performed for chronic back pain, and those cases tend to be settled against the anesthesiologist. In most of the cases in which the event was discovered and disclosed to the patient at the time it occurred, the patient decided to have the retained part surgically removed and the claim was dropped/dismissed.

Most of the injuries were associated with the spinal cord or nerve roots (Figure 1C). The average time from the incident to assertion and from assertion to case resolution was 1.7 years, and 22.4% of the cases were settled, one of which was in the high range. Three cases were dismissed but incurred legal expenses in the midrange.

Maternal Major and Minor Injury

The results are presented in Table 2 and Figure 1D. Eighteen of 23 cases were associated with neuraxial anesthesia (78.3%). The most frequent causes were poor communication (26.1%), delay in care (13.0%), medication error (4.3%), and inadequate documentation (4.3%). Nineteen of 23 cases were dropped/denied, and only 4 cases (17.4%) were settled, with none in the high range. The highest proportion of injuries, 8 of 23 (34.8%), involved emotional trauma without physical injury and did not result in payment. Examples include inadequate block causing pain during cesarean delivery (3 patients) and failure to provide epidural labor analgesia when requested due to anesthesiologist not being in-house (2 patients). In 3 cases, the patients were not satisfied with their experience due to their perception that the anesthesiologist was not addressing their pain in a timely and compassionate fashion. There was 1 claim for maternal temporary minor injury that was

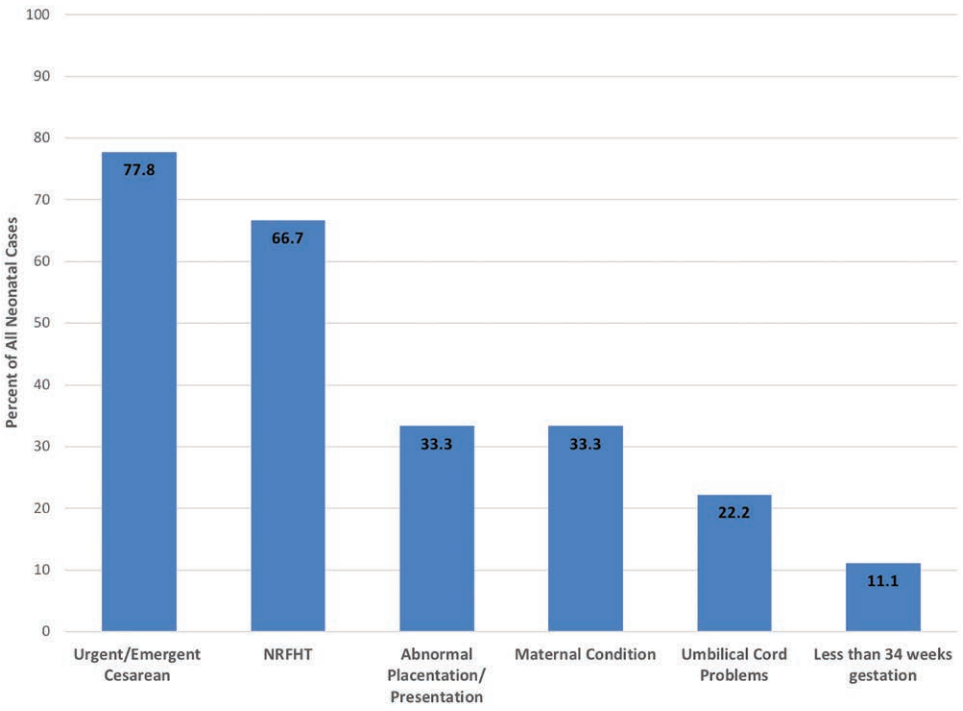

Figure 2. Factors involved in neonatal death and brain injury. *More than 1 factor was involved in each case, thus the sum of the percentages is higher than 100. NRFHT indicates nonreassuring fetal heart tracing.

settled in the middle range. The remaining 5 claims (21.7%) were associated with permanent minor injuries. Two of these claims resulted in indemnity payment.

Comparison Among Settled, Dismissed, and Dropped/Denied Cases

The results are presented in Table 3. The cases that were settled involved proportionately higher use of general anesthesia (P = .007). These cases took longer to resolve, an average of 3.2 years, compared to the dismissed and dropped/denied cases, which took an average of 1.7 and 0.9 years, respectively (P < .0001). The settled cases had higher severity of injury and median NAIC code of 6.5, while the dismissed and dropped/denied cases had median NAIC code of 5.0 and 3.0, respectively. Most common contributing factors in the settled cases were identified as delay in care (36.7%), inadequate documentation (10.0%), deficiencies in communication (6.7%), and newborn resuscitation (6.7%).

DISCUSSION

In this study, we provide a contemporary analysis of obstetric closed claims cases from the CBS database, where anesthesia was named as the primary responsible service. The highest prevalence of claims was related to maternal nerve injury, and most of these were dropped, denied, or dismissed. The highest proportion of settled cases involved maternal death and brain damage. The claims involving neonatal death and brain damage were most commonly associated with anesthesia-related factors such as delays in care, errors in newborn resuscitation, and poor communication. The claims that resulted in payment on behalf of the anesthesiologist had higher use of general anesthesia, had higher severity of injury, took longer to resolve, and were associated with delays in care.

Maternal Death/Brain Injury

Overall, death and brain injury represented a small percentage of the total claims in our study, consistent with the historically observed trend of improved safety in anesthesia[21] and, more specifically, obstetric anesthesia. Similar to previous studies,[7,9,10] we found that maternal death/brain injury resulted in higher indemnity payments. The etiology of maternal mortality and morbidity is similar to both national[22,23] and international[24] retrospective reviews. Specifically, the most common cause of maternal death or brain injury in our database was related to high neuraxial block and delay in the initiation of maternal resuscitation. The higher incidence of this complication likely reflects current widespread use of neuraxial anesthesia.[25] Claims involving maternal pulmonary embolism were associated with catastrophic sequelae that required intensive resuscitation and extensive resource utilization. In most of these cases, payment was made against the anesthesiologist due to unclear diagnosis, lapses in management, or inadequate documentation. The most recent practice guidelines for obstetric anesthesia compiled by the ASA Task Force on Obstetric Anesthesia and the Society for Obstetric Anesthesia and Perinatology recommend the need for adequate resources to manage obstetric emergencies.[26] Of note, the third most common etiology of injury in our database was failed airway management. Even though all airway-related cases occurred between 2005 and 2015, the documentation did not mention the use of video laryngoscopy or other advanced airway devices. In 2 of the 3 cases, the patient was morbidly obese, which may have been a contributing factor. Despite the predominant use of neuraxial anesthesia for cesarean delivery nationwide, 1 study found that 5.8% of all cesarean deliveries necessitate general anesthesia and endotracheal intubation.[27] The difficulty with intubating pregnant patients is well known. There have been multiple recent advancements from the obstetric anesthesia community to increase the safety of challenging

Table 3. Comparison Among Settled, Dropped, and Denied/Dismissed Cases

	Settled Cases N = 30		Dismissed Cases N = 31		Dropped/Denied Cases N = 45		Significance *P*
	Number	Percent	Number	Percent	Number	Percent	
Age	29.6 ± 6.9	…	29.1 ± 6.3	…	29.7 ± 6.3	…	.9
Delivery mode							.4
Vaginal	12	40.00	16	51.61	25	55.56	
Cesarean	17	56.67	15	48.39	20	44.44	
N/A	1	3.33	0	0.00	0	0.00	
Anesthesia type							.007
Epidural	19	63.33	21	67.74	42	93.33	
Spinal	2	6.67	6	19.35	1	2.22	
CSE	1	3.33	0	0.00	0	0.00	
General anesthesia	5	16.67	2	6.45	1	2.22	
N/A	3	10.00	2	6.45	1	2.22	
Contributing factors							
Delay	11	36.67	3	9.68	1	2.22	
Documentation	3	10.00	3	9.68	2	4.44	
Communication	2	6.67	6	19.35	6	13.33	
Improper management	0	0.00	1	3.23	0	0.00	
Newborn resuscitation	2	6.67	1	3.23	0	0.00	
Medication error	0	0.00	0	0.00	1	2.22	
None	15	50.00	20	64.52	35	77.78	
NAIC code							
Median	6.5	…	5.0	…	3.0	…	…
Time from assertion to resolution (y), N ± SD	3.2 ± 2.2	…	1.7 ± 1.5	…	0.9 ± 1.0	…	<.0001
Time from occurrence to assertion (y), N ± SD	1.1 ± 1.6	…	2.4 ± 3.6	…	0.9 ± 0.7	…	.01
Legal expenses							
Median	$55,558	…	$20,247	…	$39	…	.0001
Range	$0–$991,378	…	$32–$307,487	…	$0–$81,147	…	

Abbreviations: CSE, combined spinal epidural; N/A, not applicable; NAIC, National Association of Insurance Commissioners; SD, standard deviation.

airways.[24,26,28] These claims suggest that further efforts should be directed at early identification and aggressive management of unintended high neuraxial block, developing protocols for escalation of care and mobilization of anesthesia and surgical resources, and deploying advanced airway equipment in the obstetric surgical suite, despite anticipated infrequency of use.

Newborn Death/Brain Injury

Similar to previous reports,[7,9,10] we found that a lower proportion of the claims involving newborn death and brain injury compared to the claims for maternal death/brain injury were settled on behalf of the anesthesiologist. Newborn death and brain injury claims from the ASA Closed Claims Project were settled against the anesthesiologist in 18.7%[7] and 32% of cases[10] for the periods 1990–2005 and 2000–2011, respectively. This is consistent with the findings that most newborn death/brain injury are due to complex factors, many of which are not preventable, and causality is hard to determine.[7,9,29] Similar to the previous closed claims analyses, we report that the major anesthesia-related factors in claims involving newborn death/brain injury were delays in care and inadequate communication.[7,10] The prevalence of delays in intervention and inadequate communication suggests that significant improvements in care can be achieved through simulation of neonatal resuscitation, by improving interprovider communication and identifying and eliminating institution-specific barriers.[11] An additional common pattern in the settled cases was the involvement of the anesthesiologist in newborn resuscitation due to lack of adequately trained personnel. These cases emphasize the need for a team-based approach to neonatal resuscitation and appropriate training of the staff involved.

Maternal Nerve Injury

More than half of the claims in our sample involved maternal neurological injury, likely related to the frequent use of neuraxial anesthesia over the past 10 years. This trend can be found in earlier studies.[7,9,21] The most common maternal nerve injuries involved the spinal cord and were associated with permanent neurological deficit.[30,31] Ultrasound can improve the precision of correct identification of the desired lumbar level[31] and should be considered in cases of difficult anatomy. Of concern, in our study, is a relatively high number of retained foreign body (mostly fragments of the epidural catheter or needle) claims, which were associated with subsequent pain and patient distress. Currently, the sheared epidural catheter is generally considered sterile and poses a low risk for infection or other sequelae. Thus, it is recommended that the catheter be left in place after appropriate counseling of the patient.[32] Similar to previous reports,[32] most patients decided to have the foreign body removed even in the absence of symptoms. Based on our findings, prompt detection, disclosure, and patient counseling are critical in ensuring satisfaction and avoiding litigation.

Maternal Major and Minor Injury

A significant proportion of the claims for maternal injury were filed due to emotional trauma. In those cases, the behavior of the anesthesiologist was claimed to be unprofessional or the pain relief was inadequate. This pattern has been present in prior malpractice studies[9] and reflects the unique patient connection challenges that obstetric anesthesiologists face. Recently, studies have shown that maternal satisfaction does not necessarily correlate with the onset and degree of pain control; inadequate pain control during

cesarean delivery can lead to posttraumatic stress disorder.[33,34] The importance of early preanesthesia consultation and good communication with the patient and the rest of the care team is emphasized in the newest Practice Guidelines for Obstetric Anesthesia.[26] In contrast to our results, Davies and Stephens[10] found decreasing incidence of minor injuries in the 2000s compared to 1990s. A possible explanation for this difference may be the different definitions of injury, small sample size, and the nature of closed claims data. The next most common categories involved temporary major and minor injuries. Even though only 1 claim resulted in a payment, a common theme in these claims is the patient's perception of the anesthesiologist's duties and actions. Thus, future work should focus on shared decision making, creating a culture of respect, and taking patient's complaints of disrespect seriously from the health systems perspective.[34]

Settled Versus Dropped/Denied/Dismissed Claims

The settled claims took, on average, 3.2 years to close, significantly longer than the claims that did not receive payment. In comparison, the average of duration for malpractice claims from all medical specialties was 5 years.[35] The lengthy litigation process results in the high total incurred costs, emotional toll on the providers, and long wait for the plaintiffs.

Study Limitations

The limitations of the present study are similar to those of other closed claims studies.[21] The cases tend to be biased toward more severe injuries because these injuries have a higher likelihood of an indemnity payment. The frequency of adverse events cannot be estimated due to the lack of precise information of the total number of cases done (denominator) and due to complications not resulting in claims. Further, national estimates cannot be made from the claims data, limiting the assessment of event frequency over time. There was no control group for comparison. In addition, causation can only be inferred but not established. Limitations specific to the CRICO CBS database include proprietary entry and coding of the cases, categorization done by nurses trained in risk management, and limited/missing claim information. In addition, the cases were initially reviewed by trained registered nurses at CRICO rather than anesthesiologists. Therefore, the study lacks independent reliability assessments by board-certified anesthesiologists who were practicing at the time. The authors (V.P.K, E.Y.B., and R.D.U.) reviewed all case summaries included in this study.

Despite these limitations, the current case series spanning over 10 years provides a contemporary analysis of rare events and overall trends in obstetric anesthesia liability. Because the CBS database includes claims from both academic and community hospitals, our results are applicable to wide range of medical institutions.

CONCLUSIONS

Based on our study results, claims involving maternal death and brain damage represented a small percentage of the total cases, yet had the highest severity and received the highest indemnity payment. Actionable points involve recognition and treatment of high neuraxial block and difficult airway management. Claims for newborn death/brain damage suggest that institutions should formalize a team-based approach to neonatal resuscitation and assure adequate training of the staff involved. Maternal nerve injury comprised the highest proportion of liability claims in the Controlled Risk Insurance Company CBS database. Attention should be directed to ensure prevention and adequate management of broken neuraxial needles and catheters. To avoid spinal cord injury, the spinal and combined spinal epidural techniques should be performed in the lowest lumbar segments possible. Overall, contributing factors like delay in care and inadequate communication suggest that institutions should implement adequate staffing, protocols for managing emergencies, and initiatives for education and simulation practice of trainees and practicing anesthesiologists to address both common and rare adverse events. ■

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