Thematic Analysis of Obstetric Anesthesia Cases From the AANA Foundation Closed Claims Database

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Maternal morbidity and mortality in the United States continues to be high. Understanding parturient complications and causes of death is critical to determine corrective actions. Analysis of closed malpractice claims evaluates patient care, identifies preventable morbidity and mortality, and offers recommendations for improvement. A review of obstetric anesthesia malpractice claims filed against nurse anesthetists (N = 21), extracted from the American Association of Nurse Anesthetists Foundation Closed Claims database, was completed. The malpractice claims included 18 maternal claims and 3 neonatal claims. The most common adverse maternal outcomes were maternal death (8/18) and nerve injury (4/18). Hemorrhage accounted for the greatest number of maternal deaths (3/8) followed by cardiovascular failure, emboli, and neuraxial opioid overdose. All neonatal claims (3/3) involved hypoxic encephalopathy resulting in 1 neonatal death and 2 cases of neonatal permanent brain injury. The majority of maternal cases were identified as nonemergent (15/18) and involved relatively healthy patients (15 identified as ASA physical status 2).

Qualitative analysis of closed claims provides the opportunity to identify patterns of injuries, precipitating events, and interventions to improve care. Themes related to poor outcomes in this study include care delays, failed communication, incomplete documentation, maternal hemorrhage, and lack of provider vigilance.

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queried for obstetric claims. The database contains quantitative and qualitative data composed of malpractice claims from the years 2003 to 2012, which are considered closed (ie, the entire litigation process was completed, and the payout, if any, was disbursed) and involved either a Certified Registered Nurse Anesthetists (CRNA) or a student registered nurse anesthetist (SRNA). A detailed description of how the closed claims database was derived is found in a separate article.7 The obstetric closed claims research team consisted of CRNAs from practice and education settings previously trained to conduct thematic analyses. The team leader is an expert in the field of obstetric anesthesia.

A manual query of the AANA Foundation Closed Claims database (N = 245) for obstetric-related events was conducted by the team leader. For this study, inclusion criteria consisted of malpractice claims involving obstetric and/or neonatal events that occurred during or immediately after delivery. Exclusion criteria were the following: nonanesthesia-related adverse outcomes, dismissal of the anesthesia provider, or insufficient evidence correlating the negative outcome to anesthesia care. This query revealed 27 claims (11% of the total claims). Team members independently reviewed the 27 claims for inclusion. After discussion of these reviews, a consensus was reached to exclude 6 of the claims from the final analysis (N = 21).

A descriptive analysis was made of the 21 obstetric closed claims, using IBM SPSS version 19 (IBM), and a qualitative analysis was conducted to identify emerging themes. A comprehensive explanation of thematic analysis can be found in a separate article written by one of the AANA Foundation Closed Claims team members.9 Table 1 outlines the steps taken to analyze the qualitative data.

Results

• Descriptive Analysis. A descriptive analysis was conducted on the 21 obstetric closed claims, which included 18 parturients and 3 newborns. Neuraxial anesthesia was administered to the maternal patient in most of the claims (n = 18), followed by general anesthesia (n = 2) and sedation (n = 1). Of those claims resulting in injury from neuraxial anesthesia, 4 claims were for temporary injury and 8 claims were for permanent injury. The mean payment for an obstetric-related claim was $230,476 (SD = 208,348), and the median payment was $202,000. The mean age of the mother was 29.5 (SD = 6) years. Most (83%) of maternal cases were identified as nonemergent (n = 15) and involved relatively healthy patients (n = 15) identified as American Society of Anesthesiologists (ASA) physical status (PS) 2; the others were classified as ASA PS 3. Delivery by cesarean delivery totaled 44% (n = 8). The anesthesia care received by the maternal patients was classified as appropriate in 50% of claims (n = 9); inappropriate, 39% (n = 7); and “unable to determine,” 11% (n = 2). Maternal claims were linked to lack of the anesthesia provider’s vigilance in 17% of the claims (n = 3; Figure 1). One claim involved an SRNA who made a medication error.

The most common adverse maternal outcome was patient death. Maternal mortality causative factors included hemorrhage, cardiac failure due to delayed treatment of hypotension or preexisting comorbidities (ie, cardiomyopathy), amniotic fluid embolus, pulmonary emboli, and neuraxial opioid overdose (Figure 2). Claims involved a variety of causes of maternal morbidity, with nerve injury being the most frequent complication (Figure 3). Causative events that led to these deaths and injuries is important. Precipitating events are identified in Table 2.

Table 1. Steps in Thematic Analysis of Obstetric Claims

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Team leader conducted manual query of database for obstetric claims</td>
</tr>
<tr>
<td>2</td>
<td>Team of 3 investigators reviewed claims for appropriateness of inclusion</td>
</tr>
<tr>
<td>3</td>
<td>Team met in person to code all cases and conduct thematic analysis; coded 1 case together, and consensus was reached</td>
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<tr>
<td>4</td>
<td>Team independently coded 3 claims and met again to reach consensus</td>
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<tr>
<td>5</td>
<td>Team independently coded remaining claims, met, and reached consensus</td>
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<tr>
<td>6</td>
<td>Team independently conducted thematic analysis, met, and reached consensus on final themes</td>
</tr>
<tr>
<td>7</td>
<td>Thematic analysis and data sent to independent qualitative researcher, who validated the findings of the group</td>
</tr>
</tbody>
</table>

Figure 1. Descriptive Analysis of Obstetric Closed Claims (N = 21)
All neonatal claims (n = 3) involved hypoxic encephalopathy resulting in 1 neonatal death and 2 cases of neonatal permanent brain injury. All newborns were male (n = 3).

Contributing factors to neonatal death included delayed administration of maternal anesthetic, failure to secure maternal airway in a timely manner, and maternal cardiac failure.

• **Qualitative Analysis.** Five themes emerged from the qualitative analysis (Table 3). Theme 1 related to care delays in recognition, diagnosis, and treatment of complications. Theme 2 was associated with failed communication, and theme 3 involved documentation. The fourth theme related to maternal hemorrhage, and the final theme was connected to provider vigilance. Some claims represented more than 1 theme.

• **Care Delays.** Delayed recognition and delayed diagnosis of complications led to late treatment and poor outcomes. For example, delayed recognition of a maternal spinal hematoma resulted in the development of a chronic motor deficit. The patient exhibited signs of motor dysfunction 4 hours after delivery, yet magnetic resonance imaging was not ordered until 12 hours after delivery, delaying diagnosis and treatment.

Delayed diagnosis of an epidural site infection resulted in the development of an extensive epidural abscess requiring a laminectomy. Poor outcomes due to communication failures unfolded as theme 2. For example, miscommunication of cesarean delivery status (urgent vs emergent) transpired among healthcare providers. The CRNA was accused of delaying the delivery of the neonate because of maternal neuraxial anesthesia administration rather than an emergent general anesthetic induction. Nursing staff informed the CRNA that the cesarean delivery was urgent (incision within 30 minutes of the cesarean delivery being requested), not emergent (incision as soon as possible) as the obstetrician had declared. The alleged delayed care may have led to neonatal cerebral palsy. Another case included both failed communication between anesthesia providers and the anesthesia provider and the patient. Important patient medical history gathered during the preoperative assessment, including spina bifida and a spinal tumor, was not documented in the medical record or conveyed to the CRNA placing the epidural anesthetic by the evaluating anesthesiologist or patient. The CRNA reviewed the preoperative assessment and proceeded to place an epidural block but incurred difficulty. After unsuccessful epidural placement attempts, a family member revealed the patient’s medical history of spina bifida to the CRNA, who immediately ended any further attempts. The patient vaginally delivered without anesthesia; nevertheless, the patient claimed short-term paraplegia and residual weakness on one side, for which the CRNA was found accountable.

• **Documentation.** Documentation emerged as theme 3. Conflicting documentation evidenced in a case involving the induction of general anesthesia and endotracheal intubation for an emergency cesarean delivery. Contradictory timing of maternal intubation was recorded by the nurse and CRNA. The neonate suffered cerebral palsy, and the alleged delayed maternal intubation was blamed for this poor outcome. There were other extenuating circumstances that may have led to the neonatal cerebral palsy, such as the surgeon’s decision to delay the emergency surgery and the difficulty of delivering the neonate due to uterine adhesions.
Thorough documentation may provide adequate CRNA defense in a malpractice claim. A nurse anesthetist intubated an infant in cardiorespiratory distress after the pediatric resuscitation team failed to secure the airway. Verification of correct endotracheal tube placement was documented by the CRNA and the pediatric team. Minutes after transfer of care to the hospital medical team, the neonate was cyanotic and required reintubation leading to barotrauma. Another case example included the death of a patient due to an unrecognized hemorrhage. After a surgically difficult cesarean delivery, the patient was admitted to the postanesthesia care unit (PACU). The patient experienced nausea followed by hypotension and tachycardia in the PACU. Initially, the patient was treated with an antiemetic and 1 hour later with vaspressors. After a few more hours in the PACU, the patient received packed red blood cells for treatment of a low hematocrit. Unfortunately, the patient's condition continued to deteriorate to the point of cardiovascular collapse and death.

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The autopsy revealed approximately 3,000 mL of blood and fluid in the retroperitoneal cavity and approximately 2,000 mL of blood in the abdominal cavity.

- **Maternal Hemorrhage.** Unexpected or unrecognized hemorrhage leading to death developed as the fourth theme from the analysis. An example of unexpected hemorrhage resulting in death involved a patient with diagnoses of fetal demise and placenta previa who underwent a cesarean delivery. The patient experienced a massive hemorrhage that could not be surgically controlled. Despite aggressive blood and fluid replacement, the patient eventually went into disseminated intravascular coagulopathy and died.

- **Lack of Provider Vigilance.** Lack of provider vigilance may lead to poor outcome may lead to permanent deficits or death. A patient received multiple blood products during a cesarean delivery and bilateral tubal ligation. Postoperatively, an uncontrolled postpartum hemorrhage led to a hysterectomy, during which cardiovascular collapse and death...
occurred. The CRNA claimed unawareness of blood loss during the hysterectomy because of an inability to visualize the suction canisters and blood hidden within the surgical drapes.

An additional example of lack of provider vigilance involved a claim in which an SRNA made a medication error. An epidural infusion of magnesium sulfate was administered instead of ropivacaine. This error was not recognized for several hours, and the patient was reported to have permanent neuropathic pain.

**Discussion**

The goal of this obstetric anesthesia closed claims review was to qualitatively explore maternal morbidity and mortality events for the purpose of enhancing awareness of clinical practice to mitigate poor patient outcomes. Review of these events revealed patterns of behavior that described the precipitating events and their associated adverse outcomes. Several of the identified adverse outcomes were preventable.

Geller et al, in 2006, identified similar results to this analysis, with the most common preventable events being inadequate or inappropriate diagnosis/recognition of high-risk patients, inappropriate treatment, and inadequate documentation. These same themes along with communication failures and insufficient anesthesia provider vigilance were revealed in our analysis of obstetric anesthesia closed claims. Geller et al stated that delayed diagnosis is a potential cause of inappropriate or inadequate treatment, and it may contribute to failure to treat. In addition, Geller et al noted that incomplete documentation may indicate provider indecision in both diagnosis and treatment selection.

A prior obstetric anesthesia closed claims analysis revealed that the most common causes of maternal death were difficult intubation and maternal hemorrhage. Possible contributions to newborn death were attributed to delay in anesthetic care and poor communication between the anesthesiologist and the obstetrician.

- **Care Delays.** In this review of obstetric anesthesia cases, failure to recognize and diagnose complications in a timely manner contributed to delayed treatment and negative patient outcomes. Care delays led to neurologic sequelae, cardiovascular events, and hemorrhage complications. Some of these claims may have been prevented with thorough and timely physical assessment, better communication, and adherence to standardized care, such as ACLS protocol. For example, the American Heart Association recommends a perimortem cesarean delivery 4 minutes after onset of cardiac arrest. However, in one of the claims, the perimortem cesarean delivery did not occur until 45 minutes after the start of the maternal cardiac arrest.

Many of the deaths were preceded by nonemergent conditions and therefore suggest that the death claims were at some level preventable. Recently, national multidisciplinary evidence-based guidelines and patient safety bundles have been created by the American Congress of Obstetricians and Gynecologists–convened Council on Patient Safety in Women’s Health Care to improve patient safety. Current bundles focus on maternal hemorrhage, severe hypertension, and venous thromboembolism prevention in pregnancy. Research demonstrates sentinel events were decreased after the implementation of an obstetric safety program that included obstetric team training, specific protocols, and efforts to communicate clearly and follow chain of command.

The American Association of Nurse Anesthetists (AANA) has developed practice guidelines to offer guidance for anesthesia professionals to manage the analgesia and anesthesia care of obstetric patients during labor and delivery. These guidelines present current evidence-based obstetric analgesia and anesthesia practice and safety considerations for the maternal patient such as pre-anesthesia assessment and evaluation, plan of anesthetic care and informed consent, anesthetic considerations for procedures during pregnancy, analgesia and anesthesia for labor and delivery, postcesarean delivery pain control obstetric complications, and emergency management.

- **Documentation.** Conflicting documentation may lead to a poor litigation outcome and the anesthesia provider being named in the claim, whereas good documentation provides substantial evidence of the care provided and/or may keep the anesthesia provider from being named in a claim. Comprehensive documentation affords clear communication to occur between healthcare providers. Incomplete or inconsistent documentation may lead to poor patient outcomes.

Wilbanks et al found in their 2016 closed claims review that the major consequences of poor documentation include “questioning of the quality of care provided, impeding the evaluation of patient care events to defend against allegations of malpractice, and using inaccurate in-
Maternal Hemorrhage. Maternal hemorrhage is a leading cause of maternal death worldwide. Similarly, in this study, hemorrhage contributed to the maternal mortality rate (3 of 8 maternal deaths). Hemorrhage is often a preventable complication. In this analysis, failure to recognize an ongoing hemorrhage was a missed opportunity. Anticipation, preparation, recognition, and a timely response are essential to avoid this potentially lethal event. Healthcare providers must consider hemorrhage a possibility when a patient clinically presents with signs and symptoms (hypotension, tachycardia, lack of uterine tone, blood loss greater than 500 mL for a vaginal delivery and greater than 1,000 mL for cesarean delivery, nausea, vomiting, and lethargy) after delivery.

Contemporary research demonstrates that systematic utilization of algorithms and protocols significantly reduces maternal negative outcomes related to hemorrhage. The National Partnership for Maternal Safety brought together stakeholders, inclusive of the AANA, to create national safety bundles to address the most common causes of preventable maternal death and disease, including hemorrhage, preeclampsia, and thromboembolism. These safety bundles contain concise evidence-based guidelines to assist clinicians to deliver reliable, consistent care.

The National Partnership for Maternal Safety's Patient Safety Bundle on Hemorrhage includes recommendations for readiness, recognition and prevention, response, and reporting/systems learning. Identification of patient risk factors as well as unit and personnel preparedness and proper equipment are essential. In addition, a massive transfusion protocol must be developed at each site, and activation of the protocol is essential when severe obstetric hemorrhage is suspected.

- Lack of Provider Vigilance. Vigilance is a key attribute to providing safe, high-quality anesthesia care. Failure to provide continual patient assessment, review the surgical field, anticipate and prepare for potential adverse events, or respond in a timely manner to changes in the patient’s condition may lead to catastrophic events. The National Partnership for Maternal Safety has proposed maternal early warning criteria. Use of an early warning system should assist with diagnosis and treatment and with the intent to mitigate morbidity and mortality. Suggested early warning signs include the following: systolic blood pressure below 90 mm Hg or above 160 mm Hg; diastolic blood pressure above 100 mm Hg, heart rate below 50/min or above 120/min; respiratory rate less than 10/min or more than 30/min; oxygen saturation on room air less than 95%; oliguria (< 35 mL/h) for more than 2 hours; maternal agitation, confusion, or unresponsiveness; and a patient with preeclampsia reporting an unrelenting headache or shortness of breath.

Lastly, the number of hours worked in a 24-hour period may be a contributing factor to unintentional inattentiveness. It was noted that nurse anesthetists were working long hours—greater than 16—in the reviewed cases involving lack of vigilance. Vigilance is defined as the act of being alert and watchful for potential danger or difficulties. Studies have shown that fatigue and long working hours may contribute to medical errors and adverse events, thereby potentially compromising patient safety.

Roger et al noted that the error rate increased 3 times when nurses worked shifts longer than 12.5 hours. The American Nurses Association position statement addressing Nurse Fatigue to Promote Safety and Health: Joint Responsibilities of Registered Nurses and Employers to Reduce Risks recommends to limit shifts to 12 hours or fewer; limit work weeks to 40 hours or fewer per week; promote frequent, uninterrupted rest breaks during work shifts; and establish at least 10 consecutive hours per day of protected time off duty in order for nurses to obtain 7 to 9 hours of sleep. The AANA has also published professional practice considerations regarding Patient Safety: Fatigue, Sleep, and Work Schedule Effects. Considerations for practice, policies, and educational programs include scheduling breaks and rest periods if CRNAs are scheduled to work for more than 16 consecutive hours; monitoring the number of on-call hours worked to avoid excessive hours worked in short periods; and educating individuals regarding recognition and mitigation of early symptoms of fatigue.
Conclusion
A thematic evaluation of obstetric anesthesia closed claims offers insight into the factors contributing to maternal and neonatal morbidity and mortality. Lessons learned from this analysis (Table 4) include adverse outcomes can be mitigated by identification of potential triggers, preparedness with protocols and drills, and timely recognition and treatment of clinical events. In addition, streamlined communication and thorough documentation facilitate effective care.

Anesthesia providers possess skills to manage life-threatening emergencies; thus, it is essential to protect patients and anticipate care needs. CRNAs have the responsibility to provide care aimed at improving maternal and neonatal outcomes. This study provides insight into major clinical events and steps to possibly prevent negative outcomes.

REFERENCES

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DISCLOSURES
The authors have declared no financial relationships with any commercial entity related to the content of this article. The authors did not discuss off-label use within the article.