

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

Beth Ann Clayton, DNP, CRNA

Marjorie A. Geisz-Everson, PhD, CRNA

Bryan Wilbanks, PhD, DNP, CRNA

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.

Keywords: Errors, maternal, morbidity, mortality, preventable errors.

Maternal morbidity and mortality rates are high in the United States. The pregnancy-related maternal mortality rate increased from 7.2 deaths per 100,000 in 1987 to 17.3 deaths per 100,000 in 2013.¹ This translates to approximately 600 to 800 women dying each year of pregnancy-related complications. The US maternal mortality ratio (estimated number of maternal deaths/100,000 births) doubled between 1987 and 2013. In contrast, the World Health Organization reports that the majority of countries have decreased their maternal mortality ratios. In 2015, the United Nations ranked the United States 47th in the world for maternal mortality, behind most European countries and several Asian and Middle Eastern countries. Women in the United States are twice as likely to die of pregnancy-related complications than are women in Canada and 3 times more likely than in Japan, Germany, and Poland.² The Centers for Disease Control and Prevention estimates severe maternal morbidity rates affect more than 60,000 women in the United States annually, possibly resulting in disabilities or long-term concerns.³ This occurrence may be related to several factors, including obesity, tobacco and/or alcohol use, and comorbidities such as hypertension, asthma, diabetes, cardiac conditions and anemia.⁴ In addition,

this composite of factors may contribute to the United States' high rate of cesarean delivery (33% of births).⁵

As reported by Creanga et al,⁶ cardiovascular conditions are the leading cause of maternal death, followed by infection, hemorrhage embolism, and hypertension, with some deaths being preventable. Understanding parturient complications and causes of death is critical for a proper response and determination of corrective actions. Analysis of closed malpractice claims is a method to evaluate patient care and offer recommendations for improvement.⁷

The American Association of Nurse Anesthetists (AANA) Foundation conducted an analysis of 245 closed claims occurring between 2003 and 2012. Almost 9% of these claims involved obstetric anesthesia care.⁸ The qualitative analysis of obstetric anesthesia closed claims data affords the opportunity to identify patterns of injury and/or outcomes, precipitating events, differences in anesthesia technique, variations in infant delivery modes, and the nature of settlement payments made to the obstetric patients.⁹ Therefore, the study of these claims provides additional knowledge to develop recommendations for obstetric anesthesia care, with the intent to ultimately improve maternal care.

Materials and Methods

The AANA Foundation Closed Claims database was

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

Table 1. Steps in Thematic Analysis of Obstetric Claims

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

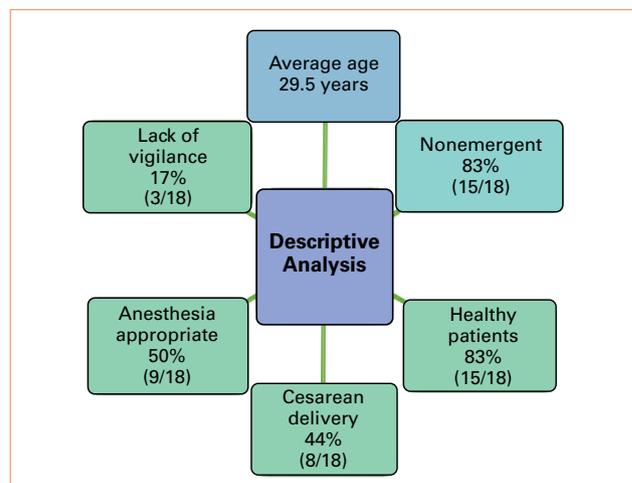


Figure 1. Descriptive Analysis of Obstetric Closed Claims (N = 21)

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.

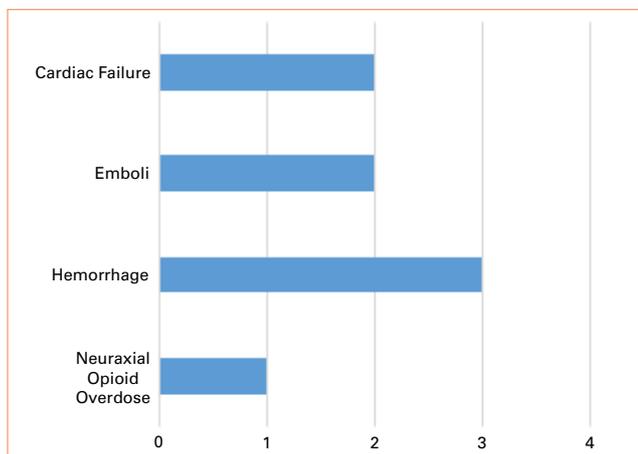


Figure 2. Causative Factors of Maternal Mortality (n = 8)

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. The patient developed lower back pain and a rash surrounding the epidural insertion site within 24 hours of placement. Five days after discharge, the patient returned with severe back pain and a fever; however, the diagnosis and treatment of the epidural abscess was not determined until 9 days later. Delayed treatment existed in a case where cardiovascular collapse occurred during labor, requiring advanced cardiac life support (ACLS) and a perimortem cesarean delivery. However, the perimortem cesarean delivery occurred 45 minutes after ACLS resuscitation efforts began. The adverse outcomes included maternal and neonatal deaths.

- **Failed Communication.** Poor outcomes due to com-

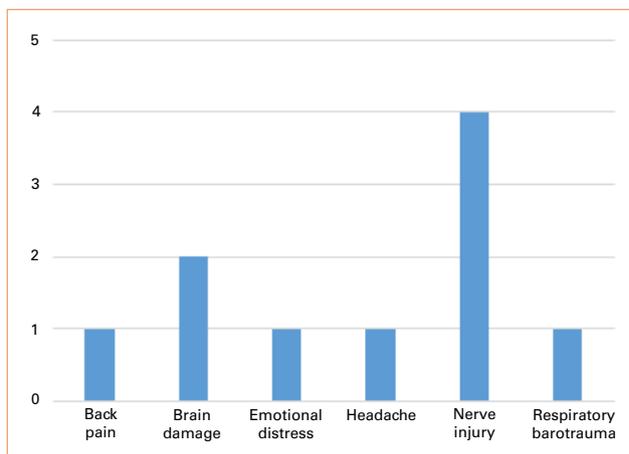


Figure 3. Maternal Morbidity (n = 10)

munication 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.

Event	Frequency	Causative factor	Outcome
Back pain	1	Epidural catheter tip retained in back	Temporary injury
Cardiac failure	2	Delayed treatment of hypotension following epidural dosing Preexisting cardiomyopathy	Death Death
Emboli	2	Amniotic fluid embolus/pulmonary embolus	Death
Emotional distress	1	Failed neuraxial anesthesia for cesarean delivery, failure to provide general anesthesia	Temporary injury
Epidural abscess	1	Possible omission of chlorhexidine for skin preparation	Permanent injury
Meningitis	1	(utilization of betadine); break in sterility	Temporary injury
Hemorrhage	3	Failure to recognize hemorrhage; failure to resuscitate in timely manner	Death
Intracranial hemorrhage	1	Patient complained of headache; determined not a result of anesthesia, but no further evaluation completed	Permanent injury
Nerve injury	1	Epidural attempted in a patient with a history of spina bifida and a spinal cord tumor	Permanent injury
Postdural puncture headache	1	Dural puncture with a Tuohy needle	Temporary injury
Respiratory complication	3	Extended time to secure maternal/neonatal airway	Permanent injury/ death
	1	Maternal right main stem intubation leading to barotrauma	Temporary injury
Spinal hematoma	1	Delayed identification and treatment	Permanent injury
Wrong medication/dose	2	Magnesium infusion via epidural catheter Neuraxial opioid overdose	Permanent injury Death

Table 2. Precipitating Events Leading to Obstetric Claims

Theme	Description
1: Care delays	Delayed recognition and delayed diagnosis lead to delayed treatment and poor outcomes
2: Communication	Failed communication could lead to a delay in appropriate treatment, multiple providers treating the same problem, or no one treating the problem, resulting in poor outcome
3: Documentation	Conflicting documentation may lead to poor outcome and/or the anesthesia provider being named in claim; good documentation demonstrates appropriate care given and/or may keep anesthesia provider from being named in claim
4: Hemorrhage	Unexpected or unrecognized hemorrhage leads to death or brain damage
5: Lack of vigilance	Lack of anesthesia provider vigilance may lead to permanent deficits or death

Table 3. Obstetric Closed Claims Themes

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. The CRNA was accused of intubating the esophagus but was not held legally liable because of the thorough documentation supporting her successful intubation.

- *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.

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 vasopressors. 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. 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.

- *Lack of Provider Vigilance.* Lack of provider vigilance 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,¹⁰ 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.¹¹ Possible contributions to newborn death were attributed to delay in anesthetic care and poor communication between the anesthesiologist and the obstetrician.¹¹

• **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.¹² 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 multi-

disciplinary 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.¹³ 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.¹⁴

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.¹⁵

• **Communication.** Communication failures also emerged as a common theme that led to suboptimal outcomes. Research reflects that ineffective communication among healthcare providers is a leading cause of errors and patient harm.¹⁶ Effective communication is an essential aspect of clinical care. Actions that improve communication include a structured method for communicating critical information, team huddles, multidisciplinary rounds, and debriefings. A standardized communication format such as an SBAR (situation, background, assessment, recommendation) facilitates thorough distribution of information. Team huddles at the beginning of each shift and multidisciplinary rounds provide the opportunity for various healthcare providers to discuss patients, including concerns and plan of care. Additionally, debriefings after emergencies provide an opportunity to learn from successes and identify areas for improvement.¹⁷

• **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 al¹⁸ 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-

formation to guide current or future patient care decisions.” Additionally, concise and consistent documentation may be a provider’s most important asset during litigation.

Standardized documentation is meant to streamline patient information and improve the effectiveness of the medical record. Documenting in an accurate, clear, and reliable way can minimize errors. In addition, electronic medical records can help ensure continuity, safety, and quality of patient care by enhancing interprofessional communication. Provision of education on standardized documentation and documentation audits facilitate identification of areas for improvement.¹⁹

• **Maternal Hemorrhage.** Maternal hemorrhage is a leading cause of maternal death worldwide.²⁰ Similarly, in this study, hemorrhage contributed to the maternal mortality rate (3 of 8 maternal deaths). Hemorrhage is often a preventable complication.^{3,21} 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.²² 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.²³

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.²⁴

• **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

1. Identification of patient risks and practice of emergency readiness skill drills can improve preparedness for safe and effective delivery of care.
2. Anesthesia providers should be knowledgeable of and utilize protocols and algorithms.
3. Effective teamwork and communication can help prevent mistakes and facilitate care.
4. Identification of risk factors and situational awareness of maternal hemorrhage allows for early recognition and intervention.
5. Knowledge of common neuraxial complication manifestations may facilitate timely identification and treatment.

Table 4. Lessons Learned

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 unremitting headache or shortness of breath.²⁵

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.^{26,27}

Rogers et al²⁸ 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.²⁹ The AANA has also published professional practice considerations regarding *Patient Safety: Fatigue, Sleep, and Work Schedule Effects*.²⁶ 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.²⁶

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

- Centers for Disease Control and Prevention (CDC). Pregnancy mortality surveillance system. CDC website. <http://www.cdc.gov/reproductivehealth/maternalinfanthealth/pmss.html>. Updated August 7, 2018. Originally accessed August 3, 2016.
- World Health Organization (WHO). Sexual and reproductive health. WHO website. <http://www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2015/en/>. Accessed August 21, 2016.
- Lu MC, Highsmith K, de la Cruz D, Atrash HK. Putting the 'M' back in the Maternal and Child Health Bureau: reducing maternal mortality and morbidity. *Matern Child Health J*. 2015;19(7):1435-1439.
- D'Angelo D, Williams L, Morrow B, et al. Preconception and interconception health status of women who recently gave birth to liveborn information—Pregnancy Risk Assessment Monitoring System (PRAMS), United States, 26 Reporting Areas, 2004. *MMWR* 2017;56(SS10):1-35. <https://www.cdc.gov/mmwr/preview/mmwrhtml/ss5610a1.htm>. Accessed August 21, 2016.
- Osterman MJ, Martin JA. Changes in cesarean delivery rates by gestational age: United States, 1996-2011. *NCHS Data Brief*. 2013;124:1-8.
- Creanga AA, Berg CJ, Syverson C, Seed K, Bruce FC, Callaghan WM. Pregnancy-related mortality in the United States, 2006-2010. *Obstet Gynecol*. 2015;125(1):5-12.
- Ross BK. ASA closed claims in obstetrics: lessons learned. *Anesthesiol Clin North Am*. 2003;21(1):183-197.
- Jordan LM, Quraishi JA. The AANA Foundation Malpractice Closed Claims Study: a descriptive analysis. *AANA J*. 2015;83(5):318-323.
- Golinski M. Identifying patterns and meanings across the AANA Foundation closed claim dataset using thematic analysis methods. *AANA J*. 2018; 86(1): 27-31.
- Geller SE, Cox SM, Kilpatrick SJ. A descriptive model of preventability in maternal morbidity and mortality. *J Perinatol*. 2006;26(2):79-84.
- Davies JM, Posner KL, Lee LA, Cheney FW, Domino KB. Liability associated with obstetric anesthesia: a closed claims analysis. *Pain Med*. 2009;110(1):131-139.
- American Heart Association. Part 10: Special Circumstances of Resuscitation: American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. <https://ecguidelines.heart.org/index.php/circulation/cpr-ecg-guidelines-2/part-10-special-circumstances-of-resuscitation/>. Accessed July 30, 2017.
- Council on Patient Safety in Women's Health Care: Safe Health Care for Every Woman website. <http://safehealthcareforeverywoman.org>. Accessed April 14, 2018.
- Grunebaum A, Chrevenak F, Skupski D. Effect of a comprehensive obstetric patient safety program on compensation payments and sentinel events. *Am J Obstet Gynecol*. 2011;204(2):97-105.
- Analgesia and anesthesia for the obstetric patient: practice guidelines. AANA website. [https://www.aana.com/docs/default-source/practice-aana-com-web-documents-\(all\)/analgesia-and-anesthesia-for-the-obstetric-patient.pdf](https://www.aana.com/docs/default-source/practice-aana-com-web-documents-(all)/analgesia-and-anesthesia-for-the-obstetric-patient.pdf). Accessed April 3, 2018.

for-the-obstetric-patient.pdf. Accessed April 3, 2018.

- Joint Commission. Sentinel event alert: preventing infant death and injury during delivery. Published July 21, 2004. https://www.joint-commission.org/assets/1/18/SEA_30.PDF. Accessed July 30, 2017.
- Lyndon A, Johnson MC, Bingham D, et al. Transforming communication and safety culture in intrapartum care: a multi-organization blueprint. *J Obstet Gynecol Neonatal Nurs*. 2015;44(3):341-348.
- Wilbanks BA, Geisz-Everson M, Boust RR. The role of documentation quality in anesthesia-related closed claims: a descriptive qualitative study. *Comput Inform Nurs*. 2016;34(9):406-412.
- Elliot L, Weil J, Dykstra E, et al. Standardizing documentation: a place for everything. *Med Surg Nurs*. 2018;27(1):32-37.
- Say L, Chou, D, Gemmill A, et al. Global causes of maternal death: a WHO systematic analysis. *Lancet Glob Health*. 2014;2(6):e323-333.
- Kilpatrick SJ. Next steps to reduce maternal morbidity and mortality in the USA. *Womens Health Lond*. 2015;11(2):193-199.
- Shields LE, Smalarz K, Reffigee L, Mugg S, Burdumy TJ, Propst M. Comprehensive maternal hemorrhage protocols improve patient safety and reduce utilization of blood products. *Am J Obstet Gynecol*. 2011;205(4):368.e1-8.
- Council on Patient Safety in Women's Health Care. Safe Health Care for Every Woman website. Overview of the National Partnership for Maternal Safety. <https://safehealthcareforeverywoman.org/safety-action-series/overview-of-the-national-partnership-for-maternal-safety/>. Originally accessed September 16, 2017. Updated link accessed October 8, 2018.
- American Congress of Obstetricians and Gynecologists (ACOG). Maternal safety bundle for obstetric hemorrhage. ACOG Safe Motherhood Initiative website. <https://www.acog.org/-/media/Districts/District-II/Public/SMI/v2/HEMSlideSetNov2015.pdf?dmc=1&ts=20180526T0204537999>. Revised November 2015. Accessed March 23, 2018.
- Mhyre JM, D'Orio R, Hameed AB, et al. The maternal early warning criteria: a proposal from the National Partnership for Maternal Safety. *Obstet Gynecol*. 2014;124(4):782-786.
- American Association of Nurse Anesthetists (AANA). *Patient Safety: Fatigue, Sleep, and Work Schedule Effects: Practice and Policy Considerations*. AANA website. [https://www.aana.com/docs/default-source/practice-aana-com-web-documents-\(all\)/patient-safety-fatigue-sleep-and-work-schedule-effects.pdf?sfvrsn=790049b1_4](https://www.aana.com/docs/default-source/practice-aana-com-web-documents-(all)/patient-safety-fatigue-sleep-and-work-schedule-effects.pdf?sfvrsn=790049b1_4). Published 2012. Revised April 2015. Originally accessed September 23, 2017. Updated link accessed October 8, 2018.
- O'Brien MJ, O'Toole RV, Newell MZ, et al. Does sleep deprivation impair orthopaedic surgeons' cognitive and psychomotor performance? *J Bone Joint Surg Am*. 2012;94(21):1975-1981.
- Rogers AE, Hwang WT, Scott LD, Aiken LH, Dinges DF. The working hours of hospital staff nurses and patient safety. *Health Aff Millwood*. 2004;23(4):202-212.
- American Nurses Association (ANA). *Addressing Nurse Fatigue to Promote Safety and Health: Joint Responsibilities of Registered Nurses and Employers to Reduce Risks* [position statement]. ANA website. <https://www.nursingworld.org/practice-policy/nursing-excellence/official-position-statements/id/addressing-nurse-fatigue-to-promote-safety-and-health/>. Published September 10, 2014. Originally accessed March 15, 2018. Updated link accessed October 8, 2018.

AUTHORS

Beth Ann Clayton, DNP, CRNA, is a Certified Registered Nurse Anesthetist and educator at the University of Cincinnati, Cincinnati, Ohio.

Marjorie A. Geisz-Everson, PhD, CRNA, is a Certified Registered Nurse Anesthetist and educator at the University of Southern Mississippi, Hattiesburg, Mississippi.

Bryan Wilbanks, PhD, DNP, CRNA, is a Certified Registered Nurse Anesthetist and educator at the University of Alabama at Birmingham, Birmingham, Alabama.

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.