

The Transfusion Dilemma

More, Less, or More Organized?

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FOR almost 3 decades the American Society of Anesthesiologists Closed Claims Project has been providing valuable, clinically relevant data to practicing anesthesiologists, and the article by Dutton *et al.*¹ in this month's ANESTHESIOLOGY is no exception. Originally created in 1985, the Closed Claims Project was designed to identify patterns of injury to aid in devising strategies that would improve safety and reduce harm.² Since then, the project has grown to include approximately 10,000 cases and reported on diverse causes of anesthesia-related patient injury. Closed claims investigations have three advantages over other techniques. First, the database facilitates study of rare events that may elude routine analysis. Second, because cases represent settled lawsuits, they focus on serious patient injury. Finally, because of their malpractice origins, closed claims files readily lend themselves to an analysis of what could have been done differently to avoid the adverse event in question.

From a database of 3,211 cases collected between 1995 and 2011, Dutton *et al.* compared 141 closed claims related to hemorrhage to all other surgical and obstetric claims. Data collection included demographics, risk factor assessment, procedural details, and injury-related outcome variables. The authors also evaluated each case for care appropriateness, judging the timeliness of the hemorrhage diagnosis, adequacy of the response, and the contribution of communication mishaps to the adverse outcome. Data from



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the National Anesthesia Clinical Outcomes Registry (NACOR)³—which includes over 13 million U.S. anesthetics—were used to determine whether specific case types were overrepresented in the hemorrhage-related cohort. The authors found that hemorrhage-related claims were more likely than other claims to have occurred during an obstetric anesthetic, cesarean delivery, or lumbar or thoracic spine surgery. Both obstetric and spine anesthetics were more common in the closed claims database than in the NACOR as were robotic procedures. In addition, claims for hemorrhage were associated with more severe injury than were non-hemorrhage claims, and damage awards were greater. Furthermore, in only a minority of cases accompanying hemorrhage were diagnosis (31% of claims), transfusion (14%), or return to the operating room (11%) judged to be timely. Communication lapses occurred in 60% of cases.

Methodologically, the article by Dutton *et al.* represents a subtle but important advance over previous closed claims analyses. By comparing closed claims and NACOR data, Dutton *et al.* were able to estimate whether specific cases were overrepresented in the closed claims cohort. Although NACOR does not capture all anesthetics performed in the United States, comparisons with the Nationwide Inpatient Sample reveal similar capture rates for cesarean deliveries (8.6% of Nationwide Inpatient Sample cesareans), coronary artery bypass procedures (9%),

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nephrectomies (8.6%), and small bowel resections (7%) in 2011 (Personal communication: Richard P. Dutton, Professor, Department of Anesthesia and Critical Care, University of Chicago, Chicago, IL; *via* email, April, 2014). Although basing estimates of incidence on NACOR denominators is preliminary, these data suggest that using NACOR in this way is feasible and that doing so begins to solve the incidence problem that has limited the predictive utility of previous closed claims analyses. In addition, the authors used the Manufacturer and User Facility Device Experience database to bolster their observation that robotic cases were at higher risk for hemorrhage-related legal action.

What lessons should the clinician take away from this study? Crossmatch more blood perioperatively? Transfuse sooner when bleeding is suspected? Such strategies conflict with recent calls to reduce perioperative blood usage,⁴ decrease the number of units crossmatched for surgery,⁵ and lower hemoglobin thresholds for transfusion.⁶

The obstetric hemorrhage experience provides some answers. As in the article by Dutton *et al.*, most severe morbidity and mortality due to obstetric hemorrhage is considered preventable and related to delays in diagnosis and treatment.^{7–9} Obstetric data show that error in visual estimation of blood loss increases with the amount of blood loss and can underestimate true loss by approximately 50%.¹⁰ The poor predictive value of vital signs such as tachycardia and hypotension¹¹ compounds the diagnostic challenge. With respect to therapy, delaying oxytocin administration, uterine exploration, or requests for assistance by as little as 10 to 20 min increases the magnitude of bleeding.¹² Finally, obstetric hemorrhage is often accompanied by rapid consumption of coagulation factors, especially fibrinogen,^{13,14} which if not recognized early can cause a severe coagulopathy that further worsens bleeding.

Strategies that improve recognition of and response to obstetric hemorrhage include protocol-driven team approaches that emphasize quantification of blood loss, early identification of hemodynamic derangements, early laboratory assessment of and transfusion for coagulopathy, formalized interdisciplinary communication, and staff education and drills.^{15–17} Such strategies reduce the progression of mild hemorrhage to moderate and/or severe hemorrhage and may also decrease the development of disseminated intravascular coagulopathy.¹⁷ During obstetric hemorrhage, these approaches also reduce overall transfusion rates,¹⁷ possibly by limiting disseminated intravascular coagulopathy. These data suggest that earlier recognition and treatment of coagulation abnormalities in other hemorrhage situations may also reduce transfusions.

As with many clinically relevant articles, this one raises as many questions as it answers. How available were laboratory testing and blood products in the hospitals in question? Were the obstetric cases primarily from low-volume low-resource hospitals? If so, did clear policies for risk assessment, resource acquisition, and transport to higher level hospitals exist? Such knowledge could inform public health policy.

Although these data do not provide sufficient information to evaluate such system issues, one clear lesson by Dutton *et al.* should be that developing an organized response to address bleeding events during obstetric and other high-risk procedures can improve recognition and resuscitation of life-threatening hemorrhage. Efforts by the National Partnership for Maternal Safety to introduce a “patient safety bundle” addressing hemorrhage into every U.S. delivery facility¹⁸ will help spread this message.

This review should also spur further work regarding the detection and quantification of severe hemorrhage. Why were spine cases but not cases with higher likelihood of blood loss (*e.g.*, cardiac surgery, trauma) overrepresented in the database? What were the characteristics of comparable bleeding events that did not progress to lawsuits? Are there other, nonhemodynamic clues that might alert clinicians sooner to dangerous hemorrhage? How can we know how much bleeding a patient can tolerate before transfusion? Automated, “machine learning” algorithms¹⁹ and a robust NACOR may someday provide more answers.

The authors of this article list the well-known weaknesses of closed claims research including the selection bias inherent in nonrandom sampling, that these cases represent legal, not clinical outcomes, and the lack of a denominator indicating how many cases of hemorrhage occurred overall. Also, retrospective judgments of care appropriateness require some caution. Viewed in hindsight, most bleeding is both identifiable and rescuable. Decision research tells us that cues not clearly identified prospectively become “impossible to miss” beacons in hindsight.²⁰ As demonstrated in previous closed claim research, bad outcomes also affect judgments regarding appropriateness of care.²¹

Since the origins of surgery, physicians have known about the importance of controlling bleeding. Dutton *et al.* remind us that bleeding still causes considerable preventable morbidity and mortality and challenge us to improve our ability to keep patients safe from this most basic of surgical threats. As perioperative physicians who transfuse much of the blood in the United States, anesthesiologists are ideally positioned to synthesize the lessons of closed claims analyses, large clinical databases, and evidence-based organizational strategies and lead the way in meeting this challenge.

Competing Interests

The authors are not supported by, nor maintain any financial interest in, any commercial activity that may be associated with the topic of this article.

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