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Stemming the Tide of Obstetric Morbidity: An Opportunity for the Anesthesiologist to Embrace the Role of Peridelivery Physician

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Anesthesia and analgesia for childbirth have become remarkably safe and together account for fewer than 1 maternal death per million deliveries, representing a 75% decline from the corresponding rate in 1980.^{1,2} While maternal deaths from anesthesia are rare, anesthesia-related complications persist. Based on data from 30 North American institutions over a 5-year period, approximately 1 in 3000 anesthetics for delivery results in a serious complication of anesthesia, most commonly high neuraxial blockade or difficult intubation.³ Dural puncture, considered separately, complicated 0.7% of all neuraxial anesthetics.

As with many adverse maternal outcomes, the event rates of anesthesia complications are both sufficiently rare that they are difficult to study at the clinical level, and unacceptably high from a societal perspective. While important, few population-level data are available to identify temporal trends in the complication frequency of anesthesia administered specifically for cesarean delivery. The study in this month's *Anesthesiology* by Guglielminotti and colleagues attempts to fill this gap.⁴ The investigators used administrative data from the State of New York between 2003 and 2012 to analyze adverse outcomes over time. Overall, anesthesia-related complications declined 25% over the duration of the study. Secondary analyses investigated trends stratified by anesthetic technique, and suggest a 25% decrease in risk of anesthesia related adverse events among women receiving neuraxial anesthesia without a general anesthetic, and a 21% decrease in the use of general anesthesia.

Administrative data collected primarily for the reimbursement for healthcare services, facilitates analysis of rare but important events, because this kind of data includes diagnosis and procedure codes from the International Classification of Diseases. Administrative data

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have been an important tool in studies of the epidemiology of pregnancy-related complications and are used by the United States Centers for Disease Control and Prevention (CDC) as the primary national surveillance tool for maternal morbidity.^{5,6} Anesthesia complications identified in administrative data have been proposed as a quality measure, and outlier hospitals have been identified.^{7,8} However, studying anesthesia complications with administrative data presents particular challenges. Diagnosis codes for anesthesia complications do not align directly with clinically meaningful complications. Close to 40% of analyzed events in the present study received an ICD-9 code for “other and unspecified systemic adverse events,” which could indicate a wide range of complication types, from the trivial to the catastrophic. Validation studies suggest that the coding of anesthesia-related complications in administrative data can be inaccurate.^{9,10} Nevertheless, the magnitude of the observed reduction in anesthesia-related complications by Guglielminotti and colleagues likely reflects real gains in the safety of anesthetic management, and should be welcome news for anesthesiologists.

Yet complacency must be avoided, because over the same time period, serious non-anesthetic perioperative complications increased 47% to a frequency of 1,130 per 100,000 deliveries in 2012. Complications included myocardial ischemia, venous thromboembolism, coagulopathy, sepsis, stroke, and heart, respiratory, and renal failure. Similar trends in maternal morbidity and mortality have been observed at the national level. In the United States between 1998 and 2009, severe maternal morbidity (i.e., end-organ injury) during the hospitalization for delivery increased by 75%.⁵ Likewise, the U.S. maternal mortality ratio increased an estimated 50% between 1990 and 2015, over a time when the global maternal mortality declined 25%, and only 5 countries in the world experienced an increase.¹¹ These trends have garnered the attention of public health officials and have prompted a national call to action to improve population health and health outcomes for maternal patients.^{12,13}

What can be done to stem this tide of obstetric morbidity and mortality? Several approaches show promise. New data support the effectiveness of universal thromboembolism prophylaxis protocols for women undergoing cesarean delivery, rapid antihypertensive administration protocols for women with preeclampsia, and comprehensive, intraprofessional hemorrhage protocols to reduce severe maternal morbidity.^{14–16} Based on mortality surveillance for 1.25 million deliveries between 2000 and 2006, all hospitals affiliated with the Hospital Corporation of America implemented system-wide universal pneumatic compression devices for all women undergoing cesarean delivery, and protocols for rapid antihypertensive therapy for inpatients with preeclampsia. Among the next 1.5 million births, postoperative pulmonary embolism deaths decreased seven-fold, and deaths from in-hospital intracranial hemorrhage were eliminated.¹⁷ Similarly, 29 Dignity Health System maternity units implemented comprehensive maternal hemorrhage protocols in 2011. Based on analysis of more than 20,000 deliveries before and after implementation, the total number of units of blood consumed per 1000 deliveries decreased by 26%.^{14–16}

Efforts in California have shown that implementation of these approaches can even result in a substantial reduction in maternal death. Mortality trends in California increased annually, and paralleled those of the United States between 1999 and 2008.¹⁸ In 2006, the California Maternity Quality Care Collaborative (CMQCC) was founded in response to findings from

the California Pregnancy-Associated Mortality Review Committee.¹⁹ The CMQCC has since developed resources and toolkits for delivery units to implement comprehensive systems to reduce the likelihood of maternal morbidity and mortality, focusing first on hemorrhage and preeclampsia.¹⁹ A state-wide Maternal Data Center offers rapid-cycle performance metrics to support local quality improvement activities.¹⁹ Surveillance data now suggests the maternal mortality trend in California began to diverge from that of the United States in 2009. By 2013, the California MMR had declined 50% to 7 per 100,000 live births,¹⁸ presumably as a consequence of the efforts of the CMQCC.

There is a movement to translate the California results nationwide. The Council for Patient Safety on Women's Healthcare is a consortium of professional organizations, whose members provide care for parturients, including the American Society of Anesthesiologists and the Society of Obstetric Anesthesia and Perinatology.²⁰ The Council is sponsoring development of a series of maternal patient safety bundles focused on hemorrhage, venous thromboembolism, and hypertensive disorders. Each bundle includes a list of protocols and tools that should be implemented in every delivery unit in the U.S.

In addition to these protocols, facility-based review of severe maternal morbidity has recently been recommended by the CDC and leaders in obstetrics.^{21,22} In February 2015, the Joint Commission added intrapartum severe maternal morbidity to the list of sentinel events that indicate root cause analysis.²³ A simplified review process proposed by the Council recommends that facilities screen all pregnant and recently delivered women for intensive care unit admission or transfusion of four or more units of erythrocytes.^{21,22} For each woman who meets either criterion, her case should be reviewed by a multidisciplinary facility-based committee to first determine if the case was complicated by any preventable harm, and if so, to identify opportunities for systems-based improvement. Structured review forms are available to guide case abstraction and committee discussion.²⁰

Finally, designated levels of maternal care have been proposed, modeled on traditional levels of neonatal care, to promote the integration of regional maternal health networks to target risk-appropriate care across a spectrum of maternal health conditions.²⁴ Although serious complications of birth can develop in any parturient, risk for severe maternal morbidity is concentrated in women with significant antenatal medical comorbidities and obstetric complications.^{25,26} The newly proposed levels of maternal care include 5 categories that range from birth centers (with no anesthesia services) all the way to comprehensive services for the most critically ill women at Level IV Regional Perinatal Health Centers. Each level is characterized by increasingly comprehensive anesthesia, perioperative, and critical care services.

In a new era of value-based payments, health systems will encounter mounting financial pressure to improve patient-centered perioperative and peri-delivery outcomes. The observation by Giagliomotti and colleagues that anesthesia-related complications are declining while non-anesthetic perioperative complications are increasing suggests the need for members of our specialty to look beyond the delivery of safe anesthesia and to embrace the role of the "perioperative and peridelivery physician."^{27,28} Although optimal perioperative medicine by the individual physician anesthesiologist may improve birth

outcomes for individual patients, experience from the Hospital Corporation of America and from the State of California indicates that intraprofessional collaboration and systems optimization will be necessary to ensure high quality and safe delivery experiences for all childbearing women. Perioperative and peridelivery physicians who engage with intraprofessional teams to implement the new maternal safety bundles, severe maternal morbidity reviews and levels of maternal care will maximize both individual and institutional capacity to optimize birth-related outcomes for the sickest mothers, to improve the experience of care for the childbearing population, and to ensure that the care delivered is efficient, effective and equitable.²⁹

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The observation that anesthesia-related complications are declining while non-anesthetic perioperative complications are increasing suggests *we* need to look beyond the delivery of safe anesthesia and to *that of* peridelivery physician.

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Figure.