Physician Anesthesiologists and Maternal Mortality:

7 Things You and Your Institution Can Do to Save Women's Lives

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Introduction

Maternal mortality *should* be an archaic term. However, the number of women who die from pregnancy in the United States has skyrocketed, while other developed countries have experienced stable or improved maternal mortality rates. The U.S. maternal mortality rate of 17.2 deaths per 100,000 live births in 2015 is up from 7.2 deaths per 100,000 in 1987, according to the CDC.[1] A global review puts the U.S. number even higher—at 26.4 deaths per 100,000—in 2015.[2]

The World Health Organization defines maternal mortality as death during pregnancy or within 42 days of termination of the pregnancy.[3] The CDC applies a broader definition that includes deaths up to one year after delivery, meaning about 700 women per year die from pregnancy-related causes in the United States.[4] The CDC considers 60% of those deaths to be preventable.[4] Further, the rate of severe maternal morbidity increased almost 200% from 1993 to 2014, affecting approximately 50,000 women per year.[5] This leads to short- or long-term consequences, including hysterectomy and disability.

The good news is that pregnancy-related deaths from anesthesia complications have plummeted.[6] Through the American Society of Anesthesiologists (ASA), Society for Obstetric Anesthesia and Perinatology (SOAP), and other medical societies, physician anesthesiologists are working to prevent maternal deaths due to non-anesthesia factors, including cardiovascular disease, embolic disease, preeclampsia, postpartum hemorrhage and sepsis. While obstetric anesthesiologists are leading these efforts at national and state levels, physician anesthesiologists in every setting can help reduce the incidence of these catastrophic events at their institutions. As the experts in critical and emergency care, physician anesthesiologists are best equipped to seize leadership roles and help to shift the management of maternal health from being reactive to proactive by:

1. working closely with obstetricians to identify women who are at higher risk and ensure an anesthesiologist is involved in planning their care earlier in the pregnancy; and
2. leading maternity care team efforts to increase awareness regarding how to recognize the early warning signs of an impending problem and to seek help from the physician anesthesiologist to prevent a tragedy.

Most pregnant women are considered healthy, meaning signs of a developing problem often are overlooked until it's too late. Anesthesiologists have access to a number of resources that help them lead the way, and should work closely with obstetricians and other providers to underscore the importance of vigilance, enlisting all care team members to fulfill their role in reversing the egregious U.S. maternal mortality trend.

Why Are the Numbers Increasing?

The U.S. maternal mortality rate has increased steadily for the last 30 years.[1] The cause of this disturbing trend is thought to be multifactorial, although it's unclear why the maternal mortality rate has risen in the United States while remaining steady or falling in other developed countries during the same time period.

Women are waiting longer to have children; many are having babies at older ages when they are more likely to struggle with comorbidities such as diabetes, hypertension and obesity. During pregnancy, these conditions increase the risks to both the mother and baby.[1] In fact, many women focus solely on their baby's health, neglecting to manage their own, such as taking their medications as prescribed and losing weight.

Because women are waiting longer to have children, many turn to assisted reproduction to conceive, which increases their chance of multiple gestation, adding to the risks for developing health issues such as preeclampsia.[7] Further, the increased incidence of gynecologic procedures and the cesarean delivery rate—which has steadily risen to 32.8% of all births in North America—has led to an increased risk for placenta accreta.[8] Opioid use disorder, which has risen dramatically in recent years, also contributes to the risk profile.[9]

Racial disparities play a significant role. Maternal mortality among black women is more than three times higher than among white women, at 42 deaths versus 12 deaths per 100,000.[1] Latina and Native American women also fare poorly, with twice as many pregnancy-related deaths as white women. The reasons are complex, multifaceted and incompletely understood. Black women may have less access to care, and women who do not receive prenatal care are three to four times more likely to suffer a maternal-related death.[10] As is the case in a variety of health care settings, black women needing obstetric care are less likely to receive guideline-recommended medications or treatments and may be more likely to be ignored when expressing a complaint or health concern.[11]

Why Seemingly Healthy Women Die

We think of pregnant women as a generally healthy group. In fact, most people expect that when a woman enters the hospital for delivery, she *and* her baby will return home happy and healthy. But pregnancy itself is a health condition that increases the risk for morbidity and mortality. Some women are at higher risk before they become pregnant, whereas others develop problems during pregnancy or soon after giving birth despite having no known risk factors.

We don't have all the answers yet. But we do know the common causes of U.S. maternal mortality and what increases the risk in many cases[1]:

- Cardiovascular diseases and conditions, including:
  - Embolic disease, such as venous thromboembolism (VTE) or deep vein thrombosis, can lead to pulmonary embolism. Pregnancy is a hypercoagulable state,

designed to prevent hemorrhage during delivery. The tendency to clot is most likely to arise in the third trimester and last into the postpartum period. Risks include history of hyperemesis, preeclampsia, multiple pregnancies, obesity and cesarean delivery.[12] Other women may have an inherent problem with the clotting cascade that may not be apparent until they become pregnant.

- Peripartum cardiomyopathy, or heart failure associated with pregnancy, can develop from the last month of pregnancy up to five months after delivery. It is unclear why some women develop this condition.
- Complex congenital heart issues once were a death sentence, but have been reparable since the late 1960s and early 1970s. Women who have had surgeries as infants are now having babies of their own. Surgeries to create a functioning cardiovascular system do not mean a normal anatomy. Therefore, their risk for developing problems such as heart failure or fatal arrhythmias may still be increased.
- Preeclampsia is prompted by placental changes in endothelial cell development and affects up to 8% of pregnancies.[13] Symptoms can occur as early as 20 weeks of gestation, but about half of women who develop the condition do so after delivery.[13] Because they—or their care providers—may overlook or downplay symptoms, such as headache and swelling, about 75% of deaths due to preeclampsia occur after delivery, with 41% occurring more than 48 hours after delivery.[14] Risk factors include a history of preeclampsia in a previous pregnancy, nulliparity, multifetal gestation, advanced maternal age, assisted reproduction, diabetes, kidney disease, chronic hypertension and thrombophilia.[13]

- Postpartum hemorrhage is the leading cause of maternal death worldwide, and is most often due to uterine atony.[15,16] Other factors are retained placenta, placental abruption, a major laceration, abnormal placentation (e.g., previa or accreta), prior cesarean delivery or surgery, and large fibroids.[16]
- Infection and sepsis often are caused by chorioamnionitis, pneumonia or urinary tract infection. Sepsis is easy to overlook, as the vital sign changes consistent with pregnancy may mask the growing crisis until very late. Risk factors include cesarean delivery, prolonged labor, lengthy labor after membrane rupture, and viral or bacterial illness.[17]

Physician Anesthesiologists Are Solving the Problem

With their extensive critical care training and expertise in managing emergencies such as postpartum hemorrhage and preeclampsia, physician anesthesiologists are emerging as leaders in a multidisciplinary nationwide effort to reduce maternal mortality. The significant efforts include:

Maternal mortality review committees: Physician anesthesiologists joined the effort to pass the Preventing Maternal Deaths Act, which was signed into law Dec. 21, 2018. The law provides funding for states to establish and support state-level maternal mortality review committees and standardize the review process. To date, 36 states have formed such committees. The goal is for each state to review every maternal death to evaluate the causes and assess how it might be prevented in the future. Obstetric anesthesiologists sit on about half of the existing committees, including states taking the lead in improvement efforts, such as California, Georgia and New York, but clearly there's a need for greater representation from the specialty.

National quality improvement initiative: Through ASA and SOAP, physician anesthesiologists have played a key role in the Alliance for Innovation on Maternal Health (AIM), a national data-driven quality improvement effort.[18] Among other resources, AIM provides free access to maternal mortality safety bundles and tool kits, with the goal of improving outcomes. Each safety bundle features a collection of 10 to 13 best practices for improving safety in maternity care that have been vetted by experts, including anesthesiologists. Safety bundles include those for VTE, postpartum hemorrhage, opioid use disorder, preeclampsia and reduction of peripartum racial/ethnic disparities.[19]

Maternal early warning systems: AIM also provides access to maternal early warning signs criteria,[20] which involve monitoring the vital signs of women in labor for early signs of distress, such as:

- systolic blood pressure of less than 90 or greater than 160 mm Hg;
- diastolic blood pressure of greater than 100 mm Hg;
- a heart rate of less than 50 or more than 120 beats per minute;
- oxygen saturation less than 95%;
- oliguria less than 35 mL per hour × two hours;
- maternal agitation, confusion or unresponsiveness; and
- hypertensive patient reporting unremitting headache or shortness of breath.

Additionally, these signs can be used to screen women before active labor to determine whether they are at higher risk for a negative outcome.

Levels of maternal care: In 2015, the American College of Obstetricians and Gynecologists published guidelines for Levels of Maternal Care, which determines safe and appropriate care for pregnant women

according to a center's capabilities.[21] It ranges from birth centers and Level I centers (care of uncomplicated pregnancies) to Level III and IV centers for women with serious obstetric and/or medical conditions. The higher-level centers ensure that board-certified physician anesthesiologists with special training or experience in obstetrics are in charge of obstetric anesthesia services. The guidelines provide direction regarding where pregnant women should be treated based on their risk factors as well as delineate necessary resources. A newer version is in print for release soon. Both the ASA and SOAP have contributed to this updated version.

Because the document lacks guidance regarding specific characteristics that may affect the quality of anesthetic services, SOAP implemented a process to designate Centers of Excellence for obstetric anesthesia care.[22] The designation is designed to "recognize institutions and programs that demonstrate excellence in obstetric anesthesia care, to set a benchmark level of expected care to improve the standards nationally, and to provide a broad surrogate quality metric of institutions providing obstetric anesthesia care." In 2018, 39 institutions were awarded the Center of Excellence designation (Table).[23]

Guide to pain management: The Department of Health and Human Services recently released the "Pain Management Best Practices Inter-Agency Task Force Report."[24] Chaired by an anesthesiologist, the report details multimodal techniques that can be used to manage pain in laboring women—especially those with opioid use disorder—including nonopioid analgesics, nerve blocks and physical therapy.

What You and Your Institution Can Do

Unfortunately, our country's health care safety and improvement efforts are not employed in a consistent manner. It is up to states and institutions to identify and implement lifesaving measures. Room for improvement exists at nearly every institution, especially those in states with particularly high maternal mortality rates, such as Georgia, Louisiana, New Jersey and Texas.[25-30]

Table. Recipients of the Society for Obstetric Anesthesia and Perinatology's Center of Excellence Designation

Albany Medical Center	Ochsner Hospital
Beth Israel Deaconess Medical Center	Overlook Medical Center
Brigham and Women's Hospital	Penn Medicine Princeton Health
Cedars-Sinai Medical Center	Regional One Health
Colorado Fetal Care Center, Children's Hospital Colorado	Saddleback Memorial Medical Center
Duke University	Sharp Mary Birch Hospital for Women and Newborns
Hospital e Maternidade Santa Joana	Sparrow Hospital
Icahn School of Medicine at Mount Sinai	Stanford University
Johns Hopkins Hospital	Texas Children's Hospital - Pavilion for Women
Juntendo University Hospital	Tufts Medical Center
Magee-Womens Hospital of UPMC	University of California San Francisco
Massachusetts General Hospital	University of Minnesota
MedStar Washington Hospital Center	University of New Mexico
Mercy Hospital St. Louis	University of North Carolina at Chapel Hill
Mount Sinai West	University of Washington
NewYork-Presbyterian/Columbia University Medical Center	Victoria Hospital
NewYork-Presbyterian/Weill Cornell	Wake Forest University Health Sciences
North Shore University Hospital	Washington University School of Medicine
Northwestern University Feinberg School of Medicine	Zuckerberg San Francisco General Hospital and Trauma Center
NYU Langone - Tisch Hospital	

Here are seven ways you can help improve maternal care at your institution:

1. **Speak up:** Communicate with obstetricians and your institution to help them understand the benefits of involving the physician anesthesiologist early in care, even when the woman does not want pain management during labor. This includes:
   - Consulting with women at significant risk in the late second or early third trimester. When meeting with these women, it's vital to ensure they understand how important it is that they take care of themselves—not only for their own health but that of the baby—including maintaining a healthy weight and taking their medications as prescribed. Talk to them about the warning signs of complications and who they should call if they have concerns or develop troubling symptoms. Develop a multidisciplinary plan for delivery that addresses their concerns and those of the specialists involved.
   - Instituting a protocol that an anesthesiologist should see every woman upon admission to the labor and delivery unit to assess risk factors and listen to their concerns.
   - Being called to consult on a developing situation sooner rather than later. For example, physician anesthesiologists are the leading experts in the management of postpartum hemorrhage. They are aware that oxytocin—the drug most often chosen to treat uterine atony—may be less effective for that indication in women who have already received oxytocin to induce labor or strengthen contractions. They can urge obstetricians to switch to another uterotonic faster, and recommend which are or are not appropriate depending on the woman's comorbidities, such as hypertension and asthma. They can also recommend when it's time to consider other measures, such as the Bakri balloon, embolization or surgery.
2. **Take charge:** The CDC notes care coordination, cross-communication and collaboration at institutions are vital to effectively address maternal mortality.[5] You can become a leader in ensuring safe care, such as by bringing together all who are involved in maternal care—even if only in high-risk or emergency situations—from obstetricians and nurses to hematologists and cardiologists. This includes:
   - Working with obstetricians to develop and place color-coded maternal early warning sign placards throughout all labor and delivery areas that list vital signs indicating increased risk, for quick and easy access for all caregivers. For example, a systolic blood pressure of less than 110 mm Hg would be green, 110 to 120 mm Hg would be yellow, and 130 mm Hg or above would be red. Install a protocol that if a woman reaches the yellow level, a physician anesthesiologist should be called to consult as soon as possible, and if she reaches red, the anesthesiologist should be called immediately.
   - Organizing simulations of catastrophic events such as postpartum hemorrhage or preeclampsia that involve the whole team to help them understand the role they should play to address the issue efficiently and effectively.
3. **Take advantage of the free resources** that are available (the following are all from safehealthcareforeverywoman.org), including:
   - Safety bundles[20] such as:
     - VTE
     - Obstetric hemorrhage
     - Severe hypertension in pregnancy
     - Reduction of peripartum racial/ethnic disparities
     - Obstetric care for women with opioid use disorder
   - Tools such as:
     - Maternal early warning signs protocol[31]
     - Severe maternal morbidity review[32] to track events and, whatever the outcome, determine what worked, what could be done better, and what lessons can be learned.
4. **Seek peer support:** Implementing safety bundles and other quality assurance improvements can be a challenge at some institutions. Joining an organization that offers support, such as ASA, AIM or SOAP, provides access to a community of experts who have experience in achieving successful outreach to obstetricians and obtaining institutional support. These groups offer resources, meetings, simulations and on-site speaker support to facilitate implementation.
5. **Become familiar with the Levels of Maternal Care[21]:** If you identify a woman who is at high risk and yours is a Level I or II institution, ensure she is transferred to the appropriate facility.
6. **Inquire about joining your state's maternal mortality review committee:** Learn more about your state's maternal mortality review committee and the resources it provides (see reviewtoaction.org/content/mmr-map).[33] At a minimum, hold maternal morbidity and mortality review meetings at your institution and track and benchmark progress to determine what you're doing well, what you can improve upon, and what you can learn from your experiences.
7. **Listen to patients:** There's something to be said for mother's intuition. If a woman says something doesn't feel right—before, during or after the birth—listen to her concerns and check them out. There are too many stories of women whose complaints—from severe headache to just not feeling right—were dismissed and who ultimately died.

Physician anesthesiologists are leading the charge to reduce the high rate of maternal mortality in the United States at national, state and local levels. But these efforts are for naught if the tools and resources that are available are not employed in every hospital and birthing center throughout the country. That's why it's vital that anesthesiologists across the country step up to lead the way in providing the safest and most effective care to all women receiving pregnancy, childbirth and postpartum care at their institutions.

For More Information and Resources for Reducing Maternal Mortality:

- Safehealthcareforeverywoman.org
- Reviewtoaction.org
- SOAP Provider Education
- California Maternal Quality Care Collaborative

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