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SPECIAL ARTICLE

# The 2016 Hughes Lecture What's new in maternal morbidity and mortality?

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## ABSTRACT

Each year, the Board of Directors of the Society for Obstetric Anesthesia and Perinatology selects an individual to review a given year's published obstetric anesthesiology literature. This individual then produces a syllabus of the year's most influential publications, delivers the Ostheimer Lecture at the Society's annual meeting, the Hughes Lecture at the following year's Sol Shnider meeting, and writes corresponding review articles. This 2016 Hughes Lecture review article focuses specifically on the 2014 publications that relate to maternal morbidity and mortality. It begins by discussing the 2014 research that was published on severe maternal morbidity and maternal mortality in developed countries. This is followed by a discussion of specific coexisting diseases and specific causes of severe maternal mortality. The review ends with a discussion of worldwide maternal mortality and the 2014 publications that examined the successes and the shortfalls in the work to make childbirth safe for women throughout the entire world.

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## Introduction

Each year, the Board of Directors of the Society for Obstetric Anesthesia and Perinatology (SOAP) selects an individual to review the published obstetric anesthesiology literature for a given year and create a syllabus of the top 100–200 articles (Appendix A). This individual then presents the articles that he or she deems the most influential at two separate SOAP meetings. First, the individual delivers the Gerard W. Ostheimer Lecture at the SOAP Annual Meeting. Subsequently, the individual delivers the Hughes Lecture at the Sol Shnider Obstetric Anesthesia Meeting. The Hughes Lecture is named after Samuel C. Hughes, the late and esteemed obstetric anesthesiologist from the University of California, San Francisco who edited the *International Journal of Obstetric Anesthesia* for many years with tireless excellence.

This review summarizes the obstetric anesthesiology literature published in 2014 presented in part at the

Hughes Lecture. It focuses specifically on the 2014 publications that relate to maternal morbidity and mortality. We will begin by discussing the 2014 research that was published on severe maternal morbidity and mortality in developed countries. This will be followed by a discussion of specific coexisting diseases as well as specific causes of morbidity and mortality with a focus on the quality and safety efforts that could prevent future maternal mortality in the developed world. The review will end with a discussion of worldwide maternal mortality, and the 2014 publications that examined the successes and the shortfalls in the work to make childbirth safer for women throughout the entire world.

## Severe maternal morbidity and mortality in the developed world

Data from both the USA and the UK suggest that women with more complex co-existing diseases are getting pregnant which is accounting for increases in indirect causes of maternal mortality. In 2014, the UK Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries (MBRRACE-UK) collaboration published a report on the maternal mortality data encompassing the period 2009 through 2012.<sup>1</sup> Although the report indicates a decline in obstetric causes of maternal death across the UK, maternal death from

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indirect causes rose. Women with severe co-existing disease were especially vulnerable, with cardiac disease being the most common disease associated with maternal mortality. Overall, this report emphasizes the importance of multidisciplinary care for women with co-existing disease, watching for early obstetric warning signs with rapid escalation of care when indicated, the provision of obstetric critical care for deteriorating women, and the early suspicion of sepsis.

Similar increases in indirect causes of maternal death were seen in the USA. The Division of Reproductive Health at the Centers for Disease Control and Prevention (CDC) published their report on severe maternal morbidity and mortality in 2014.<sup>2</sup> This division of the CDC collects death certificates from all states of women who die during or within one year of pregnancy. Notably, the pregnancy-related mortality ratio has increased steadily from 7.2 deaths per 100 000 live births in 1987 (when the CDC first started collecting data) to 17.8 deaths per 100 000 live births in 2009. Although there have been changes to the way the data are collected, which the authors state could account for the increasing numbers, increasing trends of severe maternal morbidity mirror the increases in maternal mortality. And, the authors postulate from this and from other studies that an increasing number of women with chronic co-existing diseases are getting pregnant which is accounting for the increasing mortality in the USA.

Working to more specifically delineate the causes of severe maternal morbidity in the USA, a group of researchers performed a secondary analysis of data from the "Assessment of Perinatal Excellence" cohort from the Eunice Kennedy Shriver National Institutes of Child Health and Human Development Maternal-Fetal Medicine Units Network.<sup>3</sup> The cohort involved 115 502 deliveries between 2008 and 2011 that occurred in 25 hospitals in the USA. The authors created a scoring system to classify severe morbidity. Overall, 332 women (2.9/1000 births, 95% CI 2.6 to 3.2) were classified as experiencing severe morbidity. The primary etiologies were determined to be as follows:

- Postpartum hemorrhage (n=158, 47.6%)
- Hypertension complications (n=68, 20.5%)
- Acute cardiopulmonary complications such as cardiomyopathy, cardiac arrest, acute respiratory distress syndrome or pulmonary edema (n=63, 19.0%)
- Infection (n=20, 6.0%)
- Preexisting maternal medical conditions (n=8, 2.4%)
- Trauma (n=4, 1.2%)
- Acute neurologic complications (n=3, 0.9%)
- Iatrogenic events (n=2, 0.6%)
- Pregnancy specific conditions such as acute fatty liver or amniotic fluid embolism (n=2, 0.6%)

Patient factors associated with severe morbidity included placenta accreta, antenatal anticoagulation, cigarette use, hypertension, diabetes, abruptio placentae, and prior cesarean delivery.

To focus more specifically on obstetric anesthesiology, the SOAP Serious Complication Repository (SCORE) Project was published in 2014.<sup>4</sup> This project worked to establish the incidences of and the risk factors for serious complications in obstetric anesthesia and incorporated 30 institutions over a five-year period during which time quality reports from each institution were sent into a central repository. The researchers captured 257 000 anesthetics and reported 157 total serious complications [incidence 1:1959 (95% CI 1675 to 2294)]; 85 of which were anesthesia-related for an incidence of 1:3021 (95% CI 2443 to 3782). Among all the complications, the incidences were as follows:

- Maternal death 1:10250 (95% CI 7180 to 15192)
- Cardiac arrest 1:7151 (95% CI 5319 to 9615)
- Myocardial infarction 1:153748 (95% CI 42562 to 1269541)
- Serious neurologic injury 1:11389 (95% CI 7828 to 17281)
- Anaphylaxis 1:61499 (95% CI 26353 to 189403)
- Respiratory arrest in the labor suite 1:8455 (95% CI 5714 to 12500)

Specifically for anesthesia-related complications, there were no maternal deaths and the following incidences were calculated:

- Cardiac arrest 1:128393 (95% CI 35544 to 1060218)
- Myocardial infarction 1:128393 (95% CI 35544 to 1060218)
- Epidural abscess/meningitis 1:62866 (95% CI 25074 to 235620)
- Epidural hematoma 1:251463 (95% CI 46090 to 10142861)
- Serious neurologic injury 1:35923 (95% CI 17805 to 91244)
- Failed intubation 1:533 (95% CI 290 to 971)
- High neuraxial block 1:4336 (95% CI 3356 to 5587)
- Respiratory arrest in the labor suite 1:10042 (95% CI 6172 to 16131)
- Unrecognized spinal catheter 1:15435 (95% CI 9176 to 25634)

Interestingly, there were no cases of aspiration reported. The authors were not able to comment on risk factors for various complications because of the low number of events. The editorial that accompanies the article authored by Bateman emphasizes the reassuringly low rates of epidural hematoma, infection or serious neurologic injury, but highlights the maternal deaths

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