OBSTETRICS

Assessing preventability of maternal mortality in Illinois: 2002-2012

Stacie E. Geller, PhD; Abigail R. Koch, MA; Nancy J. Martin, AA; Deborah Rosenberg, PhD; Harold R. Bigger, MD; for the Illinois Department of Public Health Maternal Mortality Review Committee Working Group

OBJECTIVE: We sought to describe the potential preventability of pregnancy-related deaths in Illinois from 2002 through 2012 as determined by perinatal centers following the Illinois maternal death review process.

STUDY DESIGN: We conducted a retrospective review of all known maternal deaths in the state from 2002 through 2012 with complete records in the Illinois Department of Public Health's Maternal Mortality Review Form database. The association between causes of death and potential preventability was analyzed for pregnancy-related deaths.

RESULTS: There were 610 maternal deaths in Illinois during the study period (31.8 per 100,000 live births). One-third of maternal deaths (n = 210) were directly or indirectly related to pregnancy, 7.0% (n = 43) were possibly related, and 52.6% (n = 321) were unrelated. Vascular causes were the most common cause of pregnancy-related death, followed by cardiac causes and hemorrhage. One-third of deaths directly or indirectly related to pregnancy were deemed potentially preventable. Hemorrhage and deaths due to psychiatric causes were most likely to be considered avoidable, while cancer and vascular-related deaths were generally not considered preventable.

CONCLUSION: This analysis of pregnancy-related deaths in Illinois, the first in >60 years, found similar causes of death and potential preventability as pregnancy-related death reviews in other states. Analyzing the causes of pregnancy-related death is a critical and necessary step in improving maternal health outcomes, particularly in decreasing potentially preventable pregnancy-related deaths. Greater attention should be directed toward intervening on the provider, systems, and patient factors contributing to preventable deaths.

Key words: maternal mortality, pregnancy-related deaths, preventability

Cite this article as: Geller SE, Koch AR, Martin NJ, et al. Assessing preventability of maternal mortality in Illinois: 2002-2012. Am J Obstet Gynecol 2014;211:698.e1-11.

After a dramatic decline in maternal mortality in the 20th century, the number of pregnancy-related deaths per 100,000 live births in the United States has nearly tripled over the last quarter century.[1-3] The reason for this increase is not fully known, however it is thought to be associated with increasing maternal age and rates of obesity resulting in more comorbidities, particularly cardiovascular disease. The most recently reported US maternal mortality ratio (MMR) was 21 deaths per 100,000 live births in 2010 compared to 7.2 in 1987.[1,2] Of the close to 650 pregnancy-related deaths that occur in the United States each year, approximately half are attributed to preventable causes, suggesting the importance of maternal mortality case review.[3-6] By tracking and reviewing cases to determine the circumstances leading to death, clinical practice and the resulting maternal outcomes can be improved.[5,7,8]

From the Department of Obstetrics and Gynecology, College of Medicine (Dr Geller), Center for Research on Women and Gender (Dr Geller and Ms Koch), and Division of Epidemiology and Biostatistics, School of Public Health (Dr Rosenberg), University of Illinois at Chicago; Perinatal Health Data Section, Center for Health Statistics, Illinois Department of Public Health (Ms Martin); and Department of Pediatrics, Rush Medical College of Rush University (Dr Bigger), Chicago, IL.

Received April 2, 2014; revised May 5, 2014; accepted June 19, 2014.

The authors report no conflict of interest.

Corresponding author: Stacie E. Geller, PhD. sgeller@uic.edu

0002-9378/$36.00 • • http://dx.doi.org/10.1016/j.ajog.2014.06.046

See related editorial, page 581

In 1986, the Centers for Disease Control and Prevention (CDC) established the Pregnancy Mortality Surveillance System as a national system for reporting pregnancy-related deaths in the United States. The CDC collects information on all pregnancy-associated deaths, defined as death that occurs during pregnancy or within 1 year of delivery or pregnancy termination, irrespective of cause. Data are collected yearly from all 50 states; New York City; and Washington, DC.[1,4] Medically trained epidemiologists review the data, assign a cause of death, and determine whether the death was pregnancy related (ie, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes). Data on deaths deemed to be pregnancy related are included in the Pregnancy Mortality Surveillance System.

The CDC conducts pregnancy-related mortality surveillance to enable and

motivate action—on the part of state and local health departments, clinicians, policy makers, and community groups—to prevent future deaths.[9] According to the CDC, surveillance is a 4-step process including identification of pregnancy-related deaths, review of medical and nonmedical causes of death, analysis and interpretation of findings, and action based on the findings. If pregnancy-related deaths are to be prevented, it is not adequate to merely count them; review and analysis must be specific and lead to dissemination and implementation of recommendations as well as evaluation of the overall surveillance process.

Maternal death surveillance in Illinois is conducted by the Illinois Department of Public Health (IDPH) and its network of regionalized perinatal venters. Since 1982, Illinois has required that maternal deaths be reported to IDPH, with maternal death defined as "a death caused by direct or indirect complications of pregnancy occurring during the prenatal period, or within 90 days after delivery or termination of pregnancy." The perinatal centers are mandated to conduct a review of the maternal deaths occurring at any hospital in their network and to assess whether the death was potentially preventable. On Jan. 1, 2002, the Illinois administrative code was amended to require the reporting and review of all deaths to women within a year of pregnancy, regardless of cause of death (administrative code 77/I.i.657).

The purpose of this paper is to describe the potential preventability of pregnancy-related deaths from 2002 through 2012 as determined by the perinatal centers following the Illinois maternal death review process.

Materials and Methods

This is a retrospective review of the maternal deaths in Illinois from 2002 through 2012 using data from the IDPH Maternal Mortality Review Form (MMRF) database. Data for 2011 through 2012 are not complete due to the length of time required for collection of records about each death and completion of the perinatal center reviews. At the time of this analysis there were 58 complete cases from 2011 through 2012 and an additional 86 cases that were in progress, either at IDPH awaiting full patient records or at the perinatal center undergoing review. The institutional review boards at IDPH, the University of Illinois at Chicago, and Rush University determined that this research did not involve human subjects as defined in 45 Code of Federal Regulations 46. 102(f).

Maternal deaths in Illinois are identified in several ways, although the most common is direct identification by the hospital where the death occurred. Hospitals are required to report any maternal death to IDPH within 24 hours. In 1989, a checkbox was added to the Illinois death certificate that asked whether the decedent had been pregnant within 3 months of death. Although Illinois administrative code was amended in 2002 to require reporting and review of all deaths that occurred within 1 year of pregnancy, the death certificate checkbox was not revised to reflect the longer time period until 2008. Additionally, for greater ascertainment, the IDPH Perinatal Quality Control Inspector (PQCI) searches for birth-death certificate matches, newspaper articles and obituaries (www.usnpl.com/state), and funeral home online obituaries.

Regardless of method of identification, once a maternal death is known, the PQCI obtains records from hospitals, health care providers, coroners and medical examiners, and police reports. The PQCI tracks and collects all records, often using records obtained from 1 source to identify further sources of relevant information. When record collection is complete, the PQCI sends the case to the appropriate perinatal center for review. Although each perinatal center is required to use the same review form, the process of these reviews varies by center. Some centers bring together a team of multidisciplinary reviewers from all hospitals involved in the death while other centers discuss the deaths during routine hospital maternal morbidity and mortality reviews. Regardless of the review process, each death must be assessed for potential preventability and if preventable was it due to patient, provider, or system factors. The perinatal center reviews the maternal death and prepares a case summary using the MMRF (Appendix).

The MMRF includes demographics, characteristics of the pregnancy and delivery/termination, determination of cause of death as related to pregnancy, and an assessment of the potential preventability of the death and identification of avoidable factors (patient, provider, or systems).[10] Deaths directly related to pregnancy are those resulting from obstetric complications of pregnancy, labor, and the puerperium or from the management of pregnancy or delivery. Deaths indirectly related to pregnancy are those resulting from previous existing disease or disease that developed during pregnancy and not due to direct obstetric causes, but aggravated by the physiologic effects of pregnancy. Both directly and indirectly related deaths are considered pregnancy-related deaths. In this context, preventability is defined as "any action or inaction on the part of the health care provider, system, or patient that may have caused or contributed to progression to more severe morbidity or death."[5] The completed MMRFs are returned to the PQCI and entered into the MMRF database (Microsoft Access; Microsoft Corp, Redmond, WA).

Timing of death was calculated by comparing the date of death with the date of delivery or other pregnancy outcome. Where date of death and date of delivery were the same, the PQCI reviewed supporting records associated with the case to make a determination. In 19 cases, we were not able to determine whether the woman died before, during, or after delivery or other pregnancy outcome. When the cause of death as related to pregnancy was categorized as "other" we reviewed the text field associated with the "other" category to determine whether it could be moved into a discrete category. In 13 cases, the death could be assigned to a category of causes, but not to a specific cause (eg, splenic artery dissection could be assigned to vascular accidents but not to any of the 6 specific vascular causes listed on the form).