SAFE MOTHERHOOD INITIATIVE
2007-2009 TRIENNIAL REPORT

A JOINT INITIATIVE OF:

ACOG
THE AMERICAN CONGRESS OF OBSTETRICIANS AND GYNECOLOGISTS

DOH
STATE OF NEW YORK DEPARTMENT OF HEALTH
Foreword
Executive Summary
Composite Case Scenarios

Chapter 1: Introduction
  ❖ Background of the Safe Motherhood Initiative
  ❖ The Goals and Objectives of ACOG’s Safe Motherhood Initiative

Chapter 2: The ACOG Safe Motherhood Initiative: A Maternal Mortality Surveillance System
  ❖ Identification of Pregnancy-Related Deaths
  ❖ Multidisciplinary Review Team
  ❖ Maternal Death Abstraction Form and Data Sources
  ❖ On-site Review Process
  ❖ Outreach and Awareness

Chapter 3: A Look at the Findings
  ❖ Methods
  ❖ Demographics
  ❖ Special Focus on 2007-2009 Findings
  ❖ Maternal Obesity
  ❖ Racial Disparities and Deaths among African American Women
  ❖ The Concept of Maternal Weathering
  ❖ Adequacy and Frequency of Prenatal Care
  ❖ A One Year Analysis: ACOG’s SMI and Available Statewide Data
  ❖ Causes of Death and Conditions Associated with Maternal Mortality

Chapter 4: Recommendations & Discussion

Chapter 5: Limitations

Chapter 6: Future Directions: Examining Maternal Morbidity

SPECIAL RESEARCH SECTION:
An Analysis of Selected State and Local Maternal Mortality Review Systems
  ❖ Maternal Mortality Data in the US: A Fragmented History
  ❖ Efforts by the States
  ❖ Vital Statistics vs. Self-Reporting
  ❖ One State; Many Surveillance Systems
  ❖ Results: Dissemination, Activities, and Interventions
  ❖ Trends and Emerging Issues
  ❖ The Illinois Model
  ❖ The UK Alternative: The CEMD Programme
  ❖ Conclusion

Abbreviations Used in This Report

Appendix
Safe Motherhood Initiative

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FOREWORD

The Safe Motherhood Initiative is a collaborative project of The American Congress of Obstetricians and Gynecologists, District II with the New York State Department of Health’s Bureau of Women’s Health. Established in 2001, the mission of the Initiative is to prevent pregnancy-related deaths through improved understanding of the causes and risk factors of maternal mortality. Utilizing the maternal death protocol and accompanying abstraction form developed in year one, the Safe Motherhood Initiative conducts quality assurance and quality improvement activities throughout New York State on a voluntary basis. Significant racial disparities continue to inspire the Initiative’s aim to improve trends associated with maternal mortality. The key strategies for prevention of pregnancy-related deaths in New York State include the development of a standardized system to report and review such deaths along with the provision of recommendations and training that have the direct goal of improving maternity care. This triennial report was written and compiled by Cynthia Chazotte, MD, FACOG, Sandra McCalla, MD, FACOG, Donna Montalto, MPP, Kristin Zielinski, MA, MPP, Katy Stevenson, MPP, and Tegan Culler, MPH with guidance provided by a sub-committee of maternal health experts.

It is with great regret that this is the final report from ACOG’s SMI. As an unfortunate result of New York State’s worsening economic outlook, the SMI’s annual budget supplied by NYSDOH was eliminated as a result of Governor Paterson’s 2010-11 budget. While ACOG recognizes the state’s tough financial situation, halting timely, on-site peer reviews of maternal mortality completely or reducing them to a chart audit is counterintuitive to the efforts New York State has already made to improve patient safety. Continued funding for this program and others like it is essential.

Acknowledgments

ACOG would like to express appreciation to New York State Health Commissioner, Richard F. Daines, MD for his recognition of maternal mortality as a major public health concern in New York State. Through his support and commitment, this endeavor would not have been possible during these past three years. In addition, the guidance and generous support received from the New York State Department of Health’s Bureau of Women’s Health, specifically Barbara McTague, Wendy Shaw, RN, MS, Marilyn Kacica, MD, Barbara Frankel, Rudy Lewis, Annette Johnson and Barbara Brustman, EdD, were vital to the creation of this report and the success of the Initiative.

Special appreciation is also extended to the Healthcare Association of New York State and Greater New York Hospital Association for their efforts to promote awareness of maternal mortality and quality assurance. The expertise and guidance of the planning committee and numerous sub-committees who selflessly dedicated their time to this project is deeply appreciated. Furthermore, ACOG is grateful for the opportunity to work with Cynthia Chazotte, MD, FACOG and Sandra McCalla, MD, FACOG current co-chairpersons of the SMI, and Adiel Fleischer, MD, FACOG, the former chair of the Initiative. Their vision, time, and determination have been essential to the planning and implementation of this highly successful project.

The provider volunteers who donated their time to develop and implement the Initiative, deliver medical education and grand rounds, and conduct maternal mortality reviews are invaluable as they are the cornerstone of this Initiative. SMI review team members have traveled to all corners of New York State, providing their time and expertise to improve the quality of maternity care and, ultimately helping
to prevent these tragic losses. Without provider volunteers’ diligent work, expertise, and ongoing commitment to keep mothers safe, the SMI and this report would not have been possible.

We would like to recognize John W. Choate, MD, FACOG, who helped develop and launch the Initiative. As an advocate for safe motherhood, Dr. Choate dedicated his life to improving perinatal care in New York. With his passing in 2003, the College will continue to remember Dr. Choate’s life through the promotion of safe motherhood as a social investment that advances New York State’s public health.

Finally, we would like to recognize the families and health care providers of the women who lost their lives through pregnancy-related causes. While the SMI has made numerous achievements since its inception, there is much more to be done to ensure high-quality maternity care in our state. Maternal mortality has profound and far-reaching effects and implications. ACOG continues to work diligently to reduce these devastating events.
Executive Summary

The maternal mortality rate in New York State is among the highest in the country, especially for African American women. In fact, New York State’s overall 2007 maternal mortality rate of 15.0 deaths per 100,000 live births dramatically exceeds the national Healthy People 2010 goal of 3.3 maternal deaths per 100,000 live births. These alarming statistics are worthy of further investigation. Thus, it is critical to understand the reasons why women die during childbirth or shortly thereafter. ACOG’s Safe Motherhood Initiative has conducted extensive, multidisciplinary, on-site reviews of those voluntarily reported deaths. The data gathered from such reviews assists hospitals in making protocol changes to improve patient safety and raise awareness of particular risk factors that can contribute to serious morbidity such as obesity, severe hypertension, long-standing diabetes, and pre-existing cardiac problems. In addition, the importance of recognizing early signs of sepsis and the early detection of significant hemorrhage was highlighted throughout the SMI reviews conducted between 2007 and 2009.

The existence of co-morbid conditions in a pregnant woman can present challenges to the woman’s overall health and to her obstetric team. These conditions can ultimately lead to severe complications during the labor and delivery process. The review teams have found that timely recognition and intervention in such situations could have prevented the death of a woman. Therefore, a commitment to the thorough assessment of chronic medical conditions in the preconception period and during pregnancy is imperative in order to reduce the likelihood of fatality.

The reporting of maternal mortality in New York and the United States continues to remain fractured. While the rates of pregnancy-related deaths are high, many remain unreported. As a result, neither ACOG District II nor government agencies have been able to compile an accurate number of women who die from preventable pregnancy-related complications.

In response to findings identified through the review process, the ACOG Safe Motherhood Initiative has developed a list of five (5) critical recommendations whose aim is to universalize/standardize the reporting and review system in cases of maternal death, and to generate changes in areas of care that need improvement. They are as follows:

1. Establish a statewide, standardized, mandatory, reporting and review system for pregnancy-related deaths that occur in a hospital setting or birthing center. This reporting and rapid review by a team of experts must be accomplished using a consistent tool and approach in all cases.

2. Require that all obstetrical units have in place a post-anesthesia care unit (PACU) protocol, consistent with other surgical recovery units.

3. Educate all obstetric and emergency department hospital staff about the early recognition and treatment of severe hypertension during pregnancy and the peripartum period.

4. Promote the practice of multidisciplinary care in patients with co-existing morbidities.

5. Educate all obstetrical staff about the early recognition of critical care situations – shock from sepsis, hemorrhage, thromboembolic phenomena – with knowledge of rapid response approaches to such, and prompt treatment of symptoms.
ACOG District II encourages providers, hospitals, and public health organizations to review these recommendations as they have the potential of improving case ascertainment and of improving the quality of care delivered to obstetrical patients in New York State.

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Composite Case Scenarios
(These vignettes are drawn from de-identified cases to provide context for the reader.)

Case #1: System Breakdown

A 28-year old African American married woman with two prior pregnancies presented at the hospital at 31 weeks gestation. She was obese and had a history of chronic hypertension and eclampsia-related seizures in her prior pregnancy. Upon hospital admission, she had superimposed preeclampsia with blood pressure ranging between 140/80 to 170/100. She was treated with Labetalol and underwent an emergency cesarean section by a board-certified obstetrician. A live infant was delivered and immediately taken to the neonatal intensive care unit (NICU). After delivery, she was transferred to the post-anesthesia care unit (PACU) to recover. During recovery, she was hypotensive (78/50) and tachycardic. The PACU experienced a shift change while she convalesced. One hour into the new shift, her blood pressure dropped to 48/24 and her pulse climbed to 140. The attending obstetrician called Cardiology who transferred her to the intensive care unit (ICU). Once in the ICU, she received transfusions of packed red blood cells for three hours. Her condition worsened and an emergency code was called. Upon re-opening the abdomen, a large amount of blood was found in her peritoneal cavity. Despite resuscitative efforts including aggressive blood transfusion, she was pronounced dead in the ICU due to post-partum hemorrhage. She left behind a husband and three young children, including her premature newborn.

SMI Review Team Discussion Questions:

• Had she been counseled preconceptionally about her weight and chronic hypertension?
• What “hand-off” conversations took place between the patient’s health care providers? What was specifically discussed when she was initially transferred to PACU during the staff shift change and during the patient transfer from PACU to ICU?
• Why was her low blood pressure and high pulse rate underappreciated in the PACU? What would have been the appropriate response to her vital signs?
• Why did the ICU staff not recommend that the abdomen be re-opened sooner? Why were lab values such as urine output and hematocrit not used sooner to recognize the patient’s state of shock?

Case #2: Patient Education

A 29-year old, postpartum, Caucasian woman was brought to the emergency department of an obstetric hospital after suffering periods of confusion and seizures at home. She was delivered by a board-certified obstetrician at a different hospital ten days prior. She had an uncomplicated vaginal birth at 39 weeks gestation, a normal in-hospital postpartum recovery, and was discharged home on day two postpartum. On her fifth postpartum day, she began having an unbearable headache that lasted for four days and was unsuccessfully self-treated with aspirin. Her family then brought her to the nearest hospital emergency room – it was not the delivering hospital and did not have obstetric services. She was evaluated in the emergency room, found to be hypertensive, given Lasix and discharged home. Whether or not the evaluating doctor was aware of her postpartum status is unclear. The obstetrician who had delivered her nine days prior was not alerted to her condition.
Once she returned home, she started experiencing facial twitches as well as periods of confusion and seizures. The next day, she was admitted to the emergency department of a third hospital which was not the delivering hospital but had an obstetric department. Upon admission, now ten days postpartum, a head CAT scan revealed an intraventricular hemorrhage. She was immediately brought to the neurosurgical intensive care unit. There, she was found to have low oxygen desaturation and was intubated. A repeat CAT scan revealed increasing (and untreatable) intraventricular hemorrhage with brain stem herniation. Certification of brain death was made and care was withdrawn. The immediate cause of death was brain death due to intracranial hemorrhage. Eclampsia and hypertensive disorder were also associated with the cause of death. Her ten-day old newborn, as well as an older sibling, were left motherless.

SMI Review Team Discussion Questions:

- Did the delivering hospital’s discharge protocol include a discussion with the patient regarding who to contact in case her health deteriorated during the postpartum period?
- Was the emergency room staff at the second hospital aware of the patient’s postpartum status and educated on caring for postpartum hypertension?
- What system is in place for obstetric consultation in a non-obstetric hospital?

Case #3: High Risk Patient Coordination

A 41-year old Hispanic woman with history of hypertension, obesity, and cardiomegaly is admitted at 38 weeks for spontaneous rupture of membranes. Her first prenatal visit occurred at a health clinic at 20 weeks gestation. While maternal-fetal medicine specialist visits were obtained, she only went to four prenatal appointments before delivering. During the prenatal period, she was treated in an emergency department for hypertension. She also received care a second time from the hospital’s cardiology department for pneumonia. She had been on the following medications during the prenatal period: ferrous sulfate, Methyldopa, Procardia XL, and prenatal vitamins. Upon admission for delivery, her blood pressure was 163/103. A board-certified obstetrician delivered the baby. A cardiology consultation was obtained for the management of her hypertension and given the history of cardiomegaly. A live infant was born. The patient experienced hypertension in the postpartum period and was managed by both the obstetrics and cardiology departments. Two days postpartum while she was preparing for discharge, her blood pressure, pulse, and oxygen saturation began to drop dramatically. The rapid response team was immediately summoned and a code was called. Resuscitation efforts were unsuccessful. She left behind three children and two grandchildren. The local hospital performed an autopsy. Results included a dilated cardiomyopathy, pulmonary edema and congestion.

SMI Review Team Discussion Questions:

- Why was she late for entry into prenatal care? Had she accessed any gynecologic or preventive care prior to her pregnancy?
- What mechanisms are in place to track patients with high-risk conditions? How can high-risk, non-compliant patients feel more compelled to access health care?
- Why were obstetrical consultations not obtained when she was admitted to the hospital twice in the prenatal period? Was the pharmacological management of her hypertension and pneumonia optimal?
• What multi-disciplinary obstetric education is offered to hospital staff, especially regarding high-risk areas? Was she given DVT prophylaxis in the intrapartum period?
• In such patients as described above, should cardiac evaluation such as repeated EKGs/echo have taken place more frequently, including in the postpartum period?
Chapter 1:  
Introduction

Pregnancy-related deaths are devastating events with prolonged effects on the mother’s partner, her children and family, and the obstetric health care team. New York State’s 2007 maternal mortality rate of 15.0 deaths per 100,000 live births (New York City’s overall 2007 rate was 22.0) greatly exceeds the Healthy People 2010 goal of 3.3 maternal deaths per 100,000 live births. According to the National Center for Health Statistics of the Centers for Disease Control and Prevention (CDC), in 2006, the national maternal mortality rate was 13.3 deaths per 100,000 live births. Since a significant decrease in maternal mortality has not been realized for several decades, it is expected that maternal mortality will continue to remain an issue in the Healthy People 2020 goals.

Different racial demographics are also at higher risk for increased maternal mortality rates than others. African American women have a substantially higher risk of pregnancy-related death than Caucasian women. The maternal mortality rate for African American women in New York State was 34.7 deaths per 100,000 live births in 2004, roughly 3.7 times the rate of 9.3 for Caucasian women.

These trends raise certain frustrations. Reporting maternal mortality in New York and the United States continues to remain fractured. While the rate of pregnancy-related deaths is high in New York and across the country, many deaths go unreported. Furthermore, infrastructure does not exist to conduct a thorough, in-depth review of each death in New York. If a standardized process existed to link all death, birth, and termination of pregnancy (TOP) certificates, regardless of cause, one would be able to capture all deaths occurring in women who have been pregnant within a specific period of time. Such a process would enhance the ascertainment of pregnancy-associated and pregnancy-related deaths. It has previously been shown that the linkage of multiple sources, particularly the linkage of the pregnant woman’s death certificate with live birth certificates, recorded within a year of the death, may increase ascertainment of cases by 36% to 150%.

Since maternal mortality is a relatively rare event, the comprehensive review of each occurrence is essential to identify issues regarding quality that may bode useful in improving the overall care of women and in preventing future fatalities. While the SMI offers this thorough system, the voluntary nature of reporting maternal mortality to the SMI hindered its full potential. Mandatory external reviews should be proposed as the only useful alternative when accounting for all pregnancy-related deaths.

Among the data collected, racial and ethnic health disparities in maternal mortality are alarming. Ensuring that all women have access to routine primary care, preconception care, and early and continuous prenatal care will contribute to safer pregnancy outcomes. Unfortunately, universal access to prenatal care utilization continues to be a lofty goal in New York as well as in the country.

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3 New York State Department of Health.

While not all deaths are preventable, opportunities to improve the quality of maternity care exist and must be acted upon. It is important to raise awareness and disseminate recommendations gleaned from reviews of maternal death to all facilities providing obstetrical care. These include the practice of emergency drills and simulations, closed loop communication, the use of SBAR in communicating (Situation-Background-Assessment-Recommendation), multidisciplinary coordination of care, as well as appropriate escalation policies. Such “lessons learned” can only serve to improve obstetric care and quality.

**Background of the Safe Motherhood Initiative**

Since 2000, many changes in New York’s maternity care delivery system have occurred, including state implementation of mandatory, regional, perinatal care networks. Each perinatal service is designated by the New York State Department of Health (NYSDOH) as providing Level I, Level II, or Level III perinatal care or the hospital is designated as a Regional Perinatal Center (RPC). The regional perinatal structure is intended to result in greater access to more appropriate levels of care for maternity patients and newborns.

![Regional Perinatal Centers/Networks Diagram](image)

**Figure 1-1. Jacobi Medical Center/Bellevue Hospital Center (Joint RPC), Maimonides Medical Center, Montefiore Medical Center, Mount Sinai Hospital/NYU Medical Center (Joint RPC), New York Presbyterian-Columbia, New York Presbyterian-Cornell, University Hospital of Brooklyn.**

In 2001, NYSDOH and ACOG District II recognized the potential benefit of conducting in-depth, uniform reviews of maternal deaths at hospitals across the state. While NYSDOH already possessed the infrastructure to collect data and conduct reviews, the collaboration with ACOG offered a unique opportunity to obtain a richer data set by performing on-site, hospital-based, timely, in-depth reviews and providing quality improvement recommendations in a non-punitive tone.
In 2002, NYSDOH in conjunction with the CDC, the Medical Society of the State of New York (MSSNY), and ACOG concluded a three-year retrospective maternal mortality study. This study offered numerous recommendations to improve maternity care. ACOG’s SMI would help implement the 2002 recommendations as well as address publications about the underreporting of maternal deaths; maternal mortality health disparities; and a required effort to reduce and prevent pregnancy-related deaths. The 2002 study recommendations included:

- Strengthening regionalization of maternity care;
- Reducing the number of high-risk pregnancies;
- Maximizing ascertainment of maternal deaths;
- Continuing in-depth case reviews of incidents of maternal death;
- Educating community hospital staff on the maternal death review process; and,
- Educating emergency room staff on obstetrical emergencies.

The Goals and Objectives of ACOG’s Safe Motherhood Initiative

The goal of ACOG’s SMI is to reduce and prevent pregnancy-related deaths in New York State through a non-punitive and clinical review system. The SMI’s surveillance system was developed, refined, tested, and implemented in the first three years of the project. The fourth year focused solely on medical education based on SMI findings and did not include on-site hospital reviews. The objectives of the SMI for years five through seven were:

- Increase awareness of maternal mortality in New York State and educate health care professionals and women’s health advocates about the SMI review protocol utilizing periodic bulletins, grand rounds, and electronic and print communication formats;
- Perform voluntary hospital-based maternal death reviews to identify the factors contributing to maternal mortality; to offer quality assurance recommendations and provide insight into disparities among populations of maternity patients;
- Improve methods of obtaining richer maternal mortality data; and,
- Design and provide education to medical professionals geared at preventing and/or treating contributing factors to maternal death, based upon data discovered during the SMI review process.

The SMI has continued to work towards eradicating pregnancy-related deaths; however, the inability to review every maternal death in the state still exists as a result of the voluntary nature of the SMI and New York State’s maternal death reporting system in general. RPCs were neither required to submit a death notification to the SMI nor were they required to inform the SMI that a death occurred within their regional system. ACOG strongly encourages the implementation of a mandatory, external maternal mortality review system to better assess pregnancy-related deaths and their causes.

Despite these barriers, the SMI’s review process has identified several areas where improved medical knowledge and recognition of problems may have led to a non-fatal outcome for mothers. In response to this, several educational programs have been developed and disseminated.
2007

- Re-established 206(1)(j) confidentiality protections and commenced conducting reviews
- Created medical education regarding preconception care and obesity (pocket card, handbook, and pamphlet) for Fellows and the obstetric community
- Delivered ACCME-approved SMI webcast to ACOG Fellows and the larger obstetric community

2008

- Issued joint letter with the NYSDOH to all obstetric departments stating the benefits of SMI review and encouraging participation
- Created new grand rounds curriculum on critical care in obstetrics
- Convened joint SMI conferences with HANYS and GNYHA
- Conducted obstetric emergency simulation training at ACOG’s Annual Meeting

2009

- Re-issued hemorrhage poster and hemorrhage health advisory
- Created new grand rounds curriculum on hypertension and pregnancy
- Created continuing medical education (CME) podcast on obesity and hypertension in pregnancy
- Conducted obstetric emergency simulation training at ACOG’s Annual Meeting
Chapter 2:
The ACOG Safe Motherhood Initiative: A Maternal Mortality Surveillance System

Since the SMI’s inception in 2002, a strong protocol for how to conduct in-depth, non-punitive, educational reviews has been established. Learning to initiate and organize a review provides hospitals with a better understanding of mortality prevention methods. For example, the ACOG SMI standard, 90-question chart abstraction form allowed for the collection of consistent yet de-identified data on pregnancy-related deaths across the state. Unlike other hospital assessment programs, ACOG’s SMI also offered clinicians an opportunity to be candid about a case through individual on-site interviews. While these interviews revealed critical and often unforetold aspects of each cause of death to the review team, they also offered to all being interviewed an avenue for catharsis, a process that can be healing for some of those involved in the care of the deceased mother. Additionally, ACOG’s SMI process was unique in that it afforded the hospital the opportunity to gather a multi-disciplinary team of clinical experts to examine each reported death.

Unfortunately, ACOG’s SMI was just a voluntary program. Mandating and standardizing maternal mortality reporting and review would eliminate duplication experienced throughout New York State. A standardized maternal mortality quality improvement protocol would improve efficiency and greatly improve systematic data collection yielding stronger recommendations and better quality improvement activities.

With strict health privacy regulations and looming fears of liability exposure and litigation, an in-depth maternal mortality review process could raise legal questions about sharing de-identified medical information. To assuage these fears and encourage hospital participation in ACOG’s SMI, NYSDOH applied a section of the New York State Public Health Law to the SMI that authorizes the Commissioner of Health to designate representatives to conduct confidential medical studies. The findings of this research and the information received by the designees were kept confidential and could not be used as evidence in any legal action.

Section 206(1)(j) of the New York State Public Health Law states:

“The commissioner shall cause to be made such scientific studies and research which have for their purpose the reduction of morbidity and mortality and the improvement of the quality of medical care through the conduction of medical audits within the state. In conducting such studies and research, the commissioner is authorized to receive reports on forms prepared by him and the furnishing of such information to the commissioner, or his authorized representatives, shall not subject any person, hospital, sanitarium, rest home, nursing home, or other person or agency furnishing such information to any action.
for damages or other relief. Such information when received by the commissioner, or his authorized
representatives, shall be kept confidential and shall be used solely for the purposes of medical or scientific
research or the improvement of the quality of medical care through the conduction of medical audits.
Such information shall not be admissible as evidence in any action of any kind in any court or before any
other tribunal, board, agency, or person.”

To receive the Commissioner’s designation, each SMI review team member submitted to an approval
process which included signing a confidentiality agreement prior to any review participation by NYSDOH.
Once a review team member received this designation, that individual could participate in SMI reviews
and be assured that the information obtained was non-discoverable. The designation process was
complex and took up to three months to complete in some cases.

The SMI’s hospital-based review process was modeled after ACOG’s national Voluntary Review of
Quality of Care Program (VRQC) and the United Kingdom’s Confidential Enquiry into Maternal Deaths
(CEMD) review process. The ACOG SMI review was structured to provide the utmost level of reliability
and objectivity possible using principles of effective peer review. Information was analyzed using both
quantitative and qualitative approaches. Prior to the publication of this report, participation in ACOG’s
SMI was voluntary and available to all New York State obstetric hospitals with no charge to the
individual hospital.

Identification of Pregnancy-Related Deaths

It was incredibly important to conduct an in-depth review of each death at the hospital where the care
occurred to learn the details of each case and to prevent further deaths from occurring. Hospitals were
able to initiate an SMI review by completing a one-page Maternal Death Notification Form (MDNF) and
sending it to the SMI’s confidential fax line at the ACOG office. The MDNF was developed utilizing the
New York Patient Occurrence Reporting and Tracking System (NYPORTS) short form as a model for
reporting sentinel events. However, since the inception of the SMI, the format of the MDNF changed
slightly so it was not confused with the NYPORTS short form. The MDNF was subsequently reviewed by
an SMI board-certified ob-gyn and a determination was typically made to review the case. The SMI
couraged all hospitals to complete the MDNF for all maternal deaths and to fax the form to ACOG
within three days of the death’s occurrence.

Multidisciplinary Review Team

Following the identification of the pregnancy-related death, the SMI coordinated a review with the
reporting hospital and assembled a multidisciplinary review team. The composition of the review team
largely depended upon the nature of the death. While teams primarily consisted of a medical
transcriptionist, obstetricians, maternal-fetal medicine specialists, nurse midwives and nurses,
additional specialists such as anesthesiologists, cardiologists and/or critical care specialists attended if
appropriate. This multidisciplinary approach allowed all aspects of patient care to be adequately and
comprehensively reviewed.

When the maternal death occurred at an RPC, ACOG assigned review team members from non-
contiguous RPCs to review the death. The non-contiguous RPC review team was composed of the same
experts listed above.
Within six to eight weeks of notification of a maternal death, an on-site review of such death was conducted at the hospital where care was provided using the SMI standardized protocol and de-identified chart abstraction form. The review team gathered the minimum information necessary to accomplish a thorough study of each maternal death.

**Maternal Death Abstraction Form and Data Sources**

During the creation of the ACOG SMI, the SMI committee developed and standardized an abstraction form for in-hospital chart review. The abstraction form was created after a careful review of baseline assessments and in-depth analyses of national and international maternal mortality surveillance systems and projects. Special attention was given to surveillance systems from the New York City Department of Health and Mental Hygiene, Florida State Department of Health and Mental Hygiene, CEMD, and the former NYSDOH study of maternal mortality.

This 22-page SMI abstraction form captured information such as medical and social history, demographic data, past pregnancies, prenatal-intrapartum-postpartum history, psychosocial assessment, social services, coordination of care, staffing, death certificate and autopsy report, if available. The 90-question abstraction form underwent extensive revisions and the content and length reflected multiple views from state, private, and local organizations involved in its development. The purpose of the abstraction form was to enable reviewers to conduct a medical review of all pregnancy-related deaths using a standardized process.

An instruction manual was developed to: (1) accompany the maternal death abstraction form; (2) aid in the implementation of the maternal death review process; and (3) train RPC staff who will potentially adopt the SMI protocol as a method of reviewing sentinel events. Coding manuals from the National Center for Health Statistics (NCHS), NYSDOH and ACOG’s antenatal medical record were used to create the instruction manual.
On-site Review Process

At the beginning of the on-site hospital review, the SMI review team conducted a 30-minute entrance conference with the obstetric department chairperson or his/her designee. In this entrance conference, the SMI review team introduced themselves, explained the purposes of the SMI and the review process, and answered questions from the hospital administration as needed. The chairperson or his/her designee then proceeded to give a brief synopsis of the case. To increase knowledge and understanding of the SMI process, hospital staff was encouraged to attend this entrance conference whether or not they were involved in the care of the deceased patient.

After the entrance interview, the SMI review team was left alone in a private conference room to conduct a chart review for approximately one to two hours. The length of the chart review varied depending on the complexity of the case. The SMI team reviewed the patient’s records, typically the in-patient chart, prenatal records and the autopsy report if available. During the chart review, the team used the SMI abstraction form to gather consistent data on the patient.
The review team tried to identify patient-related risk factors that may have contributed to the death, in addition to clinical and systems issues. The chart review process often led to formulation of additional questions, as well as elucidated previous queries. Following this, the team interviewed providers involved in the case. These interviews were completed individually to encourage interviewee candor. Since the SMI review was an institutional review board (IRB) study, all interviewees were asked to sign a consent form prior to participation. Each interview took approximately 10 to 15 minutes.

Upon completion of interviews, the SMI review team convened privately to discuss its quality improvement recommendations for the hospital. At this time, the hospital leadership that was present during the entrance conference returned for the exit conference. The review team offered insight and recommendations to the hospital for quality improvement. In order to assuage hospitals’ fear of legal implications and increased liability that a paper trail could incite, there were no written recommendations.

Within two weeks after the on-site review the information taken from the de-identified abstraction tool was entered into a de-indentified database and the paper copy was shredded. This database was evaluated regularly to identify maternal mortality trends in New York and to help guide the SMI’s future directions. In essence, hospital participation in the SMI not only allowed the sharing and transfer of valuable knowledge to improve the facility’s systems but it also bolstered the obstetric community’s overall understanding of maternal mortality while identifying trends and developing further education and initiatives.

**Outreach and Awareness**

The SMI has utilized the data from the review to determine the content and type of educational material and activities that would best address the causes of maternal mortality and morbidity. The creation and dissemination of educational materials have raised awareness about maternal mortality as well portrayed the SMI as a readily available resource.

Education developed by the SMI includes:

- Grand Rounds Presentations:
  - Hemorrhage
  - Obesity
  - Sepsis
  - Preconception Care
  - Critical Care
  - Hypertension
  - Safe Motherhood Initiative Overview
- Webcast (SMI Overview)
- Podcast (Obesity and Hypertension in Pregnancy)
- Poster (Maternal Hemorrhage)
- Advisory (Maternal Hemorrhage and SMI Overview)
- Pamphlet (Preconception Care and Obesity)
All educational materials are posted on ACOG District II's website and are available free of charge for use by the obstetric community. Hard copies of materials can be obtained by contacting the ACOG District II office. ACOG’s SMI members have delivered numerous grand rounds and lectures since the SMI’s inception.
Chapter 3:  
A Look at the Findings

Methods

The ACOG SMI collected de-identified data from the maternal death abstraction form. Data included documentation from the on-site chart review, interviews, death certificates, and autopsy reports. From 2006 through the end of 2009, the SMI reviewed those maternal deaths that were voluntarily reported. Data was collected and collated using a system that maintained confidentiality while allowing for a comprehensive analysis of these pregnancy-related deaths.

A multi-disciplinary team composed of clinically experienced obstetrician-gynecologists, labor and delivery nurses, critical care specialists, and other physician specialists conducted the reviews. The review team determined the immediate and underlying cause of death, and the associated obstetric conditions. Upon review completion, a woman’s death was classified as pregnancy-related if it occurred during pregnancy or within one year of pregnancy and resulted from:

- complications of the pregnancy;
- pregnancy-initiated chain of events; or,
- the aggravation of an unrelated condition by the physiologic effects of the pregnancy or its management.

The CDC defines pregnancy-related death as the death of a woman while pregnant or within one year of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by her pregnancy or its management, but not from accidental or incidental causes.

Demographics

Thirty-eight maternal deaths were reported to the SMI from 2007 through 2009 and are included in this analysis. It is important to note that two of the ten cases reported in 2007 occurred in 2006 and were reviewed in the following calendar year. Of these 38 deaths, the SMI conducted 35 on-site reviews and received abstraction forms completed by hospital leadership staff for the other three. The “unknowns” in every category were assigned when the specific data point was not found in the record or the interview. However, this sheds light on a persistent problem with data collection that modern technology and our overall health care system have been unable to remedy.

Among the pregnancy-related deaths reviewed by the SMI, 50% were classified as Black, 21.1% White, and 21.1% were Hispanic. The remaining cases occurred in other groups, including those of Asian descent. Nearly 45% (17) occurred in 30-34 year olds and the majority among married (52.6%), English speaking women (73.7%).

**Figure 3-1**
Demographic characteristics of the pregnancy-related deaths, 2007-09

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n=38 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>19 (50.0)</td>
</tr>
<tr>
<td>White</td>
<td>8 (21.1)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>8 (21.1)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (5.3)</td>
</tr>
<tr>
<td>Unknown</td>
<td>1 (2.6)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>19 and younger</td>
<td>2 (5.3)</td>
</tr>
<tr>
<td>20-24</td>
<td>7 (18.4)</td>
</tr>
<tr>
<td>25-29</td>
<td>5 (13.2)</td>
</tr>
<tr>
<td>30-34</td>
<td>17 (44.7)</td>
</tr>
<tr>
<td>35-39</td>
<td>5 (13.2)</td>
</tr>
<tr>
<td>40 and older</td>
<td>2 (5.3)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>20 (52.6)</td>
</tr>
<tr>
<td>Single</td>
<td>17 (44.7)</td>
</tr>
<tr>
<td>Living w/domestic partner</td>
<td>1 (2.6)</td>
</tr>
<tr>
<td><strong>English as Primary Language</strong></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>28 (73.7)</td>
</tr>
<tr>
<td>No</td>
<td>5 (13.2)</td>
</tr>
<tr>
<td>Unknown</td>
<td>5 (13.2)</td>
</tr>
<tr>
<td><strong>Hospital Level</strong></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>2 (5.3)</td>
</tr>
<tr>
<td>II</td>
<td>7 (18.4)</td>
</tr>
<tr>
<td>III</td>
<td>6 (15.8)</td>
</tr>
<tr>
<td>IV</td>
<td>22 (57.9)</td>
</tr>
<tr>
<td>Unknown</td>
<td>1 (2.6)</td>
</tr>
<tr>
<td><strong>Method of Payment</strong></td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>20 (52.6)</td>
</tr>
<tr>
<td>Managed Care/Private</td>
<td>14 (36.9)</td>
</tr>
<tr>
<td>Uninsured/Self-Pay</td>
<td>1 (2.6)</td>
</tr>
<tr>
<td>Unknown</td>
<td>3 (7.9)</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
</tr>
<tr>
<td>Underweight (10-18.5)</td>
<td>1 (2.6)</td>
</tr>
<tr>
<td>Normal (18.6-25.0)</td>
<td>8 (21.1)</td>
</tr>
<tr>
<td>Overweight (25.1-30)</td>
<td>9 (23.7)</td>
</tr>
<tr>
<td>Obese (30.1 and over)</td>
<td>11 (28.9)</td>
</tr>
<tr>
<td>Unknown</td>
<td>9 (23.7)</td>
</tr>
</tbody>
</table>
Special Focus on 2007-2009 Findings

Among the cases of maternal deaths reviewed for the period 2007-09, Cesarean delivery was the most frequent mode of delivery (65.8% versus 23.7%), regardless of cause of death.

While the SMI cannot imply a direct relationship between Cesarean delivery and maternal death, the SMI observed in its data that births by Cesarean delivery were overrepresented. Cesarean deliveries accounted for 37% of all births across New York State in 2007 while 65% of the cases reviewed by the SMI in 2007-09 were Cesarean deliveries.

Of the 25 cesarean deliveries performed in the group reviewed, 14 were emergent due to immediate maternal or fetal threat; seven were non-emergent and non-elective due to some maternal or fetal compromise. Three cesarean deliveries were elective and one was a peri/post-mortem delivery.

Maternal Obesity

The rate of obesity in adult women across the United States is 35.3%. This is increasingly recognized as a contributor to morbidity in pregnancy. It is associated with an increased risk for gestational diabetes, pre-eclampsia, infection, cesarean delivery, and thromboembolism.6

The body mass index was included in the abstraction form when the appropriate data was present in the patient’s chart (height and weight), if absolute weight >200 lbs., and if there was any reference to obesity in the medical record. In the SMI’s data, 28.9% were classified as obese (BMI 30.0 and over) although approximately 24% of cases included unknown BMI levels.

In May 2009, the Institute of Medicine (IOM) developed new guidelines for weight gain during pregnancy. Since the publication of the original guidelines in 1990, the population of overweight and obese pregnant women has steadily risen (see Appendix).

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Many studies report that while maternal obesity can result in a variety of poor health outcomes, obesity that is complicated by the existence of co-morbidities such as hypertension and diabetes can substantially increase the risk of serious morbidity. Therefore, targeting such conditions is necessary and a patient’s prenatal compliance mandatory.\(^7\)

**Racial Disparities and Deaths among African American Women**

Despite advances in health care throughout the 20\(^{th}\) century and into the 21\(^{st}\), racial disparities continue to exist and some researchers cite numerous reasons for these inequities such as variations in socioeconomic status, prevalence of certain risk factors, and access to prenatal care.\(^8\) \(^9\) In a review of 108 pregnancy-related deaths that occurred in North Carolina from 1995-1999, the North Carolina Pregnancy-Related Mortality Review Committee concluded that among African American women, 46% of the deaths were potentially preventable, compared with 33% of the deaths among white women. Data representative of the US as a whole suggests that African American women are almost four times more likely to die from pregnancy-related circumstances than Caucasian and foreign born Hispanic women.\(^10\) Among the 38 cases reviewed by the SMI in 2007-09, 50% were African American (19/38) while Caucasian and Hispanic each comprised 21% or 8/38 respectively. The SMI’s limited data does not allow for comment on disparities in maternal mortality ratios between African Americans and their Caucasian counterparts because the SMI did not review every case of maternal death that occurred during this time frame. Thus, we cannot calculate whether the proportion of African American women among the deaths exceed the proportion of African American women giving birth to live offspring in New York State. We can only state that in the SMI’s voluntary reporting system African American women were more likely to be included.

\(^7\) Biggio, et al., 295.
\(^9\) Harper, et al.
Inferences can be made about the reason for higher rates of pregnancy-related deaths among African American women, including cultural differences and viewpoints drawn among ethnic lines, such as variations in nutrition, stress, and compliance or non-compliance with medical care. Unfortunately, we cannot make very many assumptions. The only concrete data obtainable is through NYSDOH’s Bureau of Vital Statistics who calculated that of the 249,665 births in 2008, 18.2% (45,562) were to African American women.

As recognized in the SMI’s 2007-2009 data, racial disparities continue to exist and pregnant African American women continue to die at higher rates in New York State and across the country. Many reasons may exist for such incongruities. Studies indicate that higher BMI levels occur more frequently in minority populations and in such populations there is a reported increased use of medication to control hypertension prior to pregnancy, in addition to a higher incidence of pre-gestational diabetes, particularly within the African American population. Such research demonstrates that chronic, underlying health conditions may be contributing factors to pregnancy-related deaths and need to be clinically pinpointed and assessed prior to pregnancy.

In a January 2010 “Sentinel Event Alert,” The Joint Commission (TJC) noted that there is continuing interest across the US to better ascertain pre-existing conditions and whether or not such conditions, such as heart disease and obesity, contribute to pregnancy-related deaths. This may become a challenge when the patient has received little to no prenatal care. However, whether or not a death can be prevented as a result of better prenatal and preventive care is still unknown. According to the Hospital Corporation of America (HCA), the most common preventable errors are:

- Failure to adequately control blood pressure in hypertensive women;
- Failure to adequately diagnose and treat pulmonary edema in women with pre-eclampsia;
- Failure to pay attention to vital signs following Cesarean section; and,
- Hemorrhage following Cesarean section.

The SMI has recognized these same preventable errors within its 2007-2009 data.

“For every woman who dies, there are 50 who are very ill, suffering significant complications of pregnancy, labor, and delivery.”

~ William Callaghan, MD, FACOG, Centers for Disease Control and Prevention

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11 Healy, et al.
12 Ibid.
The Concept of Maternal Weathering

Research on health deterioration over a period of time is not an entirely new concept and may assist in understanding the impact prior medical care has on preconception and prenatal care as well as maternal mortality. This hypothesis states that:

1. A decline in health status contributed to poorer reproductive outcomes as women age.
2. Social inequalities lead to an earlier and disproportionately greater decline in the health status of African American women, which results in a widening health differential between African Americans and Caucasians with advancing age.14

Studies suggest that maternal weathering, particularly among African American women, contributes to racial disparities in birth outcomes and that on average these women, typically from a less advantageous socioeconomic background,

“… experience worsening health profiles between their teens and young adulthood. The findings suggest the importance of comprehensive prevention strategies to improve the health of socioeconomically disadvantaged African American women prior to pregnancy and the reduction of social inequalities that impact health.” 15

Studies conducted using this weathering hypothesis suggest that African American women residing in high poverty urban areas experience rates of poorer health at ages 35 or 55 comparable to national averages for Caucasian women who are 55 and 75 years of age, respectively. Further, African American women are more likely to die by the age of 45 from chronic health conditions than Caucasian women who die at 65 resulting from similar conditions. 16

These hypotheses are indicative of the types of pregnancy-related deaths the SMI reviewed over a three-year period and express the overwhelming need for further comprehensive education on recommendations set forth by both the SMI and TJC, particularly in the area of hypertensive disorders.

Adequacy and Frequency of Prenatal Care

Nearly 26% of the pregnancy-related deaths reviewed by the SMI had occurred in patients who received 5-9 prenatal visits and who initiated care within the first trimester of pregnancy. According to the College’s Guidelines for Perinatal Care, 6th Edition, the following is the recommended course of care:

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“Generally, a woman with an uncomplicated pregnancy is examined every four weeks for the first 28 weeks of pregnancy, every 2-3 weeks until 36 weeks gestation, and weekly thereafter.”

**Figure 3-4. Adequacy of Prenatal Care Using the Kotelchuck Index.**

By using these ACOG guidelines, approximately 14 prenatal care visits would be recommended for an uncomplicated pregnancy. In calculating the appropriate levels of prenatal care using the Adequacy of Prenatal Care Utilization (APCU) index developed by Kotelchuck, 14 is the established baseline for the purposes of this report. Figure 3-4 demonstrates the overall level of the cumulative adequacy of prenatal care among the 38 SMI cases reviewed.

Data retrieved during the SMI review included gestation during the first prenatal care visit and the number of prenatal visits that occurred throughout the course of the pregnancy.

The adequacy of a woman’s prenatal care is based upon the Kotelchuck classifications noted in Figure 3-5.

It is difficult to make generalizations about such data particularly when ACOG’s SMI often reviewed pregnancy-related deaths that are complicated and attributed to high-risk conditions, and chronic disease. Furthermore, ACOG’s SMI collected limited data and as such, commenting on the impact of prenatal care is virtually impossible.

<table>
<thead>
<tr>
<th>Level of Prenatal Care</th>
<th>Percentage of Recommended Prenatal Visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate Plus</td>
<td>$\geq 110%$</td>
</tr>
<tr>
<td>Adequate</td>
<td>80% to 109%</td>
</tr>
<tr>
<td>Intermediate</td>
<td>50% to 79%</td>
</tr>
<tr>
<td>Inadequate</td>
<td>$\leq 50%$</td>
</tr>
<tr>
<td>No care rendered</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

**Figure 3-5. Kotelchuck Index**

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A One-Year Analysis: ACOG’s SMI and Available Statewide Data

As noted previously, the SMI did not capture all maternal deaths that occur due to the voluntary nature of reporting. However, NYSDOH is able to acquire far more data – but less clinically rich – based upon entries into its Statewide Planning and Research Cooperative System, or SPARCS. SPARCS currently collects patient level detail on patient characteristics, diagnoses and treatments, services, and charges for every hospital discharge, ambulatory surgery patient, and emergency department admission in New York State. The availability of various diagnostic codes through SPARCS enables one to categorize such deaths as pregnancy-related or not, and to try assigning a cause.

Figure 3-6 depicts the results of the data extracted from the 2008 SPARCS database. For the purposes of this report and for comparison, cases reported and reviewed by the SMI during the same time period are also listed in this table. It is fair to assume that most, if not all cases reviewed by the SMI, are a subset of those included in the SPARCS database for that year.

These two manners of collecting data highlight several issues:

- The SMI chart review allowed for a more accurate determination of pregnancy-related versus pregnancy-associated death (the death of a woman while pregnant or within one year of termination of pregnancy, irrespective of cause); the very nature of the SPARCS database limits this possibility. Thus, while the SPARCS database may capture a greater number of cases the contribution of pregnancy and of pre-existing or new onset medical/surgical conditions to the death will be difficult to ascertain.

- The SMI on-site review gathered information that allowed for the formulation of a patient’s risk category and allowed the team to weigh the importance of various factors (clinical versus systems, societal, communication) in the course of events. It is only through this process that appropriate education and corrective action can be designed.

The majority of deaths common to both data sets occur in the 30-39 year old age group (SMI 11/17; SPARCS 28/50); the greatest percentage of deaths occurred at level IV/RPC type facilities (SMI 10/17; SPARCS 18/50). The proportion of deaths occurring in New York City versus all other counties in New York State was approximately 50% of the total number of deaths in each data set.

It is interesting to note that none of the deaths from level I facilities were reported to the SMI. By the same token, not all deaths that took place in a level IV/RPC facility were reported to the SMI. Of the 18 recorded through SPARCS, only 10 were recorded in the SMI database. The reasons for the disparity in reporting remain speculative. However, they include: limited knowledge of SMI activities in level I facilities and/or fear of being stigmatized (this applies to level I and IV facilities).

The majority of recorded maternal deaths occurred in level III and IV hospitals. Again, this probably results from the fact that high risk, sicker patients will tend to be cared for at such facilities. In addition, patients whose clinical course has deteriorated would often have been transferred to a RPC for care.

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It is yet again interesting to note that in the SMI data the majority of requests for review came from level IV hospitals (10/17). A plausible explanation may lie in the greater availability of manpower and clinical resources in a level IV facility.

While it is not included in Figure 3-6, one must report that four deaths from ectopic pregnancy were identified through the SPARCS data. This is extremely valuable information as this clinical situation in this day should be entirely preventable.

*For consistency, “Non-New York City” deaths include those that occurred in Nassau and Suffolk counties.*
Causes of Death and Factors Associated with Maternal Mortality

Causes of death reflected in Figure 3-7 were modeled after CDC categories and agreed upon by SMI team members. Causes of death were assigned by the year the death occurred.

Because of the unique nature of cardiac deaths and the breadth of illnesses they represent, deaths categorized as “cardiac-related” were further broken down into four specific classifications – peripartum cardiomyopathy, cardiac with pre-existing structural heart disease, cardiac with pre-existing co-morbidity, and cardiac – other/unexplained. The clinical definitions of these sub-categories, as developed by a team of expert physicians are included below.

Peripartum cardiomyopathy – Four criteria are necessary to meet this definition: (1) development of cardiac failure in the last month of pregnancy or within five months of delivery; (2) absence of an identifiable cause; (3) absence of recognizable heart disease prior to the last month of pregnancy; and (4) left ventricular systolic dysfunction.

Cardiac with pre-existing structural heart disease – Cardiac disease with a structural abnormality either congenital or acquired. Examples included but are not limited to: Eisenmenger’s syndrome and rheumatic heart disease.

Cardiac with pre-existing co-morbidity – Cardiac death with a pre-existing co-morbid condition that impairs cardiac function or increases the susceptibility to lethal arrhythmia. Examples include but are not limited to: obesity, hypertension, diabetes, and hyperlipidemia.

Cardiac – other/unexplained – All other cardiac deaths not fitting the above categories. Examples include but are not limited to: structurally normal heart with history of arrhythmia or medication induced arrhythmia.

Note: Cardiac arrest should not be placed in this category as a cause of death. The underlying condition, if known that caused the cardiac arrest should be considered the cause of death.
<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>2003-2005 [n=33(%)]</th>
<th>2007-2009 [n=38 (%)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac-related</td>
<td>2 (6.1)</td>
<td>12 (31.5)</td>
</tr>
<tr>
<td>Peripartum cardiomyopathy</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Cardiac with pre-existing structural heart disease</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Cardiac with pre-existing co-morbidity</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Cardiac – other/unexplained</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>Cerebral vascular accident*</td>
<td>None</td>
<td>9 (23.6)</td>
</tr>
<tr>
<td>CVA w/hypertension</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>CVA w/o hypertension</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>5 (15.2)</td>
<td>6 (15.8)</td>
</tr>
<tr>
<td>Pregnancy-induced hypertension*</td>
<td>8 (24.2)</td>
<td>None</td>
</tr>
<tr>
<td>Embolism*</td>
<td>8 (24.2)</td>
<td>3 (7.9)</td>
</tr>
<tr>
<td>Sepsis</td>
<td>5 (15.2)</td>
<td>2 (5.3)</td>
</tr>
<tr>
<td>Other</td>
<td>2 (6.1)</td>
<td>6 (15.8)</td>
</tr>
<tr>
<td>Unknown</td>
<td>3 (9.1)</td>
<td>None</td>
</tr>
</tbody>
</table>

* Of these cerebral vascular accident (CVA) cases, hypertensive disorders were shown to be contributing factors to the immediate cause of death. Six of the nine CVA deaths were associated with or a result of PIH.

+ Cause of death categorizations differed slightly between the 2003-2005 and 2007-2009 reporting periods and as a result, PIH was not indicated as a leading cause of death from 2007-2009 but hypertension and related disorders were indicated as associated factors in six CVA cases. Additionally, associated factors for several cases were either left blank or listed as “unknown” on the maternal death abstraction form and therefore, hypertensive conditions may be underrepresented.

° Of the 2007-2009 cases categorized as embolism, the cause of death in one case was defined as amniotic fluid embolism and two were defined as PE.
Figure 3-8. Causes of Death and their Frequency across ACOG SMI Reporting Periods

Figure 3-8 displays the trend in causes of death identified through the SMI’s in-depth reviews over two separate periods of time – 2003-05 and 2007-09. Cardiac disease and CVA have replaced PIH and embolism as the top two leading causes of maternal death in 2007-09.

It is worth noting that CVAs were intimately associated with PIH in six of the nine cases in 2007-09. While no cases were assigned to hypertension as a cause of death, it is evident that deaths occurred in hypertensives who developed a CVA. We would propose that these six deaths be represented in the hypertension category.

Among the cases reviewed by the SMI, death from sepsis and embolism occurred much less frequently in the 2007-09 timeframe. Sepsis represented 5% of cases versus 15% in 2003-05; embolism 8% versus 24% in 2003-05. The proportion assigned to hemorrhage remained essentially unchanged over the two time periods.
Chapter 4:
Recommendations & Discussion

The recommendations provided herein are based upon the careful consideration of the SMI sub-committee formed to assess the Initiative’s data findings of the 38 maternal mortality reviews conducted since 2007. These recommendations relate to improving systems, increasing communication, and improving the overall quality of obstetric services across the state. On-site reviews identified multiple areas for improvement and the need for improvement across the continuum of care was reinforced by the sub-committee’s careful review of each case. It is worth noting that each pregnancy-related death did not occur as the result of one isolated health factor, but rather from a sequence of failures within our health care system in general.

1. Establish a statewide, standardized, mandatory, reporting and review system for pregnancy-related deaths that occur in a hospital setting or birthing center. This reporting and rapid review by a team of experts must be accomplished using a consistent tool and approach in all cases.

In our ever-changing technologically advanced world, New York State still lacks an integrated reporting system that not only identifies all pregnancy-related deaths in all hospitals across the state but also aggregates information gathered from the numerous systems already available. Currently, pregnancy-related deaths are assessed through a variety of means and the state does not operate a comprehensive and accessible data pool that would allow for hospitals, NYSDOH, and ACOG to better understand these deaths within one year.

There is no question that ACOG’s SMI has only scratched the surface of maternal mortality across the state. While it provides a glimpse of a systemic, social, public health problem it is unable to capture the universe of data available. It is the SMI’s hope that all of the maternal mortality review processes will become more streamlined and comprehensive to benefit all women of New York State, health care practitioners, and policymakers.

2. Require that all obstetrical units have in place a post-anesthesia care unit (PACU) protocol, consistent with other surgical recovery units.

The care provided in the obstetric post-anesthesia care unit (PACU) is sometimes not consistent with other surgical recovery units. At this junction the patient should be recovering from anesthesia administered during a prior surgery such as a cesarean delivery, the most common surgical procedure performed throughout the US. Recovery after cesarean delivery can be complicated by hypotension, airway obstruction or hemorrhage as well as aggravation of pre-existing antenatal complications. Additionally, while obstetric patients tend to be young, healthy women, this generalization is changing with the rise in chronic disease, advanced maternal age, and multi-fetal pregnancy.

ACOG’s SMI found that there is often a breakdown in communication among PACU perinatal staff, surgical staff, and the patient’s own attending physician. In fact, eight intracranial hemorrhages that the SMI reviewed occurred in the PACU itself. Care rendered in the PACU should be consistent with the care delivered in a more typical recovery atmosphere and should be consistent with other units throughout
the hospital. A joint statement from the College and the American Society of Anesthesiologists recommends that the equipment, facilities, support personnel, and care provided in the obstetric operating room and recovery areas be equivalent to services provided in a hospital’s main surgical areas.\textsuperscript{19} The Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) recommends that patients with the same health status and condition should receive a comparable level of quality care regardless of where that care is provided within the hospital.\textsuperscript{20} The Association of Women’s Health Obstetric and Neonatal Nurses (AWHONN) further states that,

“This standard ensures that obstetrical patients receiving general and regional anesthesia and having surgery are provided consistent peri-operative care. Therefore, perinatal units should maintain comparable care standards as the main hospital surgical suites/post-anesthesia care unit (PACU). Comparable care to that which is provided in the main hospital surgical department is recommended by ASA (2006) and JCAHO (2007).”\textsuperscript{21}

Regardless of hospital location or size, clear PACU protocols should be established to clearly delegate staff responsibilities for the admission, assessment, and monitoring of obstetric patients in this unit. A recurring trend the SMI found over the past three years was the inability of PACU staff to identify the provider or service responsible for patients in the obstetric PACU. The continual coordination of resources and staff, including anesthesiologists, surgeons, residents, and nurses to adequately care for the patient, particularly in the immediate postpartum care period is necessary and recommended. Further, conducting joint meetings of both the obstetrics and anesthesiology departments to ensure that protocols are being met accordingly may be helpful in care coordination.

It is preferential that training similar to Advanced Cardiac Life Support (ACLS) certification be required of all perinatal staff designated to the obstetric PACU so that immediate care can be rendered in the case of an emergency. Other models of training may include those similar to basic life support, airway management, and electrocardiograph interpretation. Encouragement of more formal escalation policies, including those that empower nurses and family members to rapidly assemble emergency providers to the patient’s bedside should be established.

Lastly, postpartum pregnancy management guidelines need to be developed for all hospitals. This may include extending postpartum hemorrhage scenarios and team drills to the PACU setting and/or customizing institutional alert lists to determine a minimum standard of care to be administered.

These recommendations serve as a tool for hospitals to establish guidelines that would directly affect the outcome of care in the PACU setting. TJC has issued similar guidelines and suggests using drills to train staff in protocols, to refine local protocols, and to identify and remedy systems problems that would prevent optimal care. The SMI supports these suggestions.

3. Educate all obstetric and emergency department hospital staff about the early recognition and treatment of severe hypertension during pregnancy and the peripartum period.

Recognizing the early signs of hypertension and related disorders and managing a patient with symptoms are essential. In fact, normal vital signs do not always indicate a patient’s stability. Oftentimes, a patient who presents to the emergency room with a cardiac condition has a hypertensive condition as well – including pre-eclampsia. It is recommended that emergency room departments undergo training on postpartum complications. This is particularly needed for patients who present at the emergency room and who have given birth within the previous month. Because 36.8% of the pregnancy-related deaths reviewed occurred from one day to one week after delivery, focus must be paid to the immediate postpartum period, particularly on the need to assess underlying chronic conditions early. The careful monitoring of a patient’s blood pressure prenatally and postpartum has the potential to reduce cases of uncontrolled hypertension, pre-eclampsia, and eclampsia in pregnancy.

4. Promote the practice of a multidisciplinary care in patients with co-existing morbidities.

Preparing a patient for pregnancy is important to ensure a healthy delivery outcome for both the patient and her baby. Unfortunately, the devastating effects that pre-existing conditions have – obesity, hypertension, diabetes, and cardiac disease – are far-reaching. Because care adherence on the part of the patient is not always optimal, providers can utilize a woman’s postpartum visit as her preconception care visit and expand it to include the evaluation of chronic medical conditions. Additionally, ob-gyns can extend their medical scope to other specialty care physicians for more unified control of co-morbidities that could prevent a healthy pregnancy and outcome. Discussing and/or co-managing the associated dangers of pregnancy under certain conditions with family physicians, cardiologists, endocrinologists, and other clinicians within the patient’s multidisciplinary care team will ensure better outcomes.

The appropriate preparation and care for an obese patient must be taken into consideration from the time a pregnant woman enters her first prenatal visit to the time of her postpartum hospital discharge. Underlying conditions need to be diagnosed early, placing the severity of a patient’s disease in context. Because obesity has become increasingly prevalent over the past several years both nationwide and in SMI-reviewed cases, it is suggested that a basic cardiac evaluation is considered if there are pre-existing cardiovascular conditions.

5. Educate all obstetrical staff about the early recognition of critical care situations – shock from sepsis, hemorrhage, thromboembolic phenomena – with knowledge of a rapid response approach for such, and prompt treatment of symptoms.

Prevention of critical illness is the best strategy in reducing maternal mortality. However, many obstetrical situations may not lend themselves to prevention. Heightened surveillance of those at risk
will lead to an earlier diagnosis. Early recognition is sometimes challenging as pregnant women are typically young and healthy. Pregnancy physiology may disguise early evidence of impairment. Patients may compensate until it is no longer possible and then have a precipitous decline. It is important to recognize and treat promptly before physiologic impairment. Critical care specialists have an important role in caring for women with critical illnesses in pregnancy; however, the obstetrician is expert in the physiologic changes in pregnancy and should be involved in diagnosis and management. Additionally, transferring critically ill patients to higher levels of care may be life-saving and should not be delayed. To effectively transfer patients, it is crucial to have knowledge of hospital system policies for a timely transfer of women to a higher level of service and/or hospital for conditions related to pre-existing chronic disease, high-risk obstetric histories and complications during pregnancy.
Chapter 5:  
Limitations

While ACOG’s Safe Motherhood Initiative has made advances in standardizing the review process for maternal mortality, limitations to the Initiative need to be recognized. The SMI Committee, comprised of 17 full-time clinicians and two NYSDOH liaisons, reviewed current protocols and identified the need for quality improvement in pregnancy-related care. However, without the cooperation and dedication from numerous stakeholders, implementing enhanced protocols can become daunting.

As a condition of participation in the SMI, ACOG required confidentiality protection for its review team members. The New York State Commissioner of Health offered ACOG clinicians confidentiality protections in accordance with New York State Public Health Law §206(1)(j). For the 2006 calendar year, only two SMI reviews were conducted despite several requests, due to a loss of confidentiality protections. NYSDOH’s own counsel questioned the relative strength of such protections for the purposes of maternal mortality reviews. The lengthy bureaucratic process to protect review team members was problematic and prevented a year of maternal mortality reviews from being conducted. Of the 38 cases reviewed from 2007-2009, 18 were conducted in 2008 once confidentiality privileges were fully restored.

While SMI data collected provided a snapshot of the causes of pregnancy-related deaths, the voluntary reporting of deaths to ACOG was arguably its most troublesome feature. Comprehensive, multi-year data extracted from other governmental sources within New York State would facilitate a greater clinical understanding of why maternal mortality occurs and why quality improvement strategies are greatly needed.

For example, the Statewide Planning and Research Cooperative System (SPARCS) is a comprehensive data reporting system that was established in New York in 1979 as a result of cooperation between the health care industry and government. Initially created to collect information on discharges from hospitals, SPARCS currently collects patient level data on patient characteristics, diagnoses and treatments, services, and charges for every hospital discharge, ambulatory surgery patient, and emergency department admission in New York State. Unfortunately, SPARCS data users are limited and maternal mortality is not habitually reviewed under this system.

Another source for data is the Bureau of Vital Records. The Bureau files certificates for births and deaths that occur in New York State outside of New York City. No matching of such certificates currently occurs for maternal mortality review purposes.

Another debilitating feature that caused the SMI’s limited scope rested within the hospital itself. In promoting cultures of safety within our existing institutional framework in New York State and across much of the US, many institutions are required to complete their own quality review, thus finding the SMI redundant and causing them to forgo ACOG’s comprehensive review provided by the SMI. Hospitals would prefer to utilize their own methods and staff without the fear of legal retribution, despite the SMI’s non-punitive highly confidential nature.
ACOG’s SMI uses a 22-page abstraction form containing 90 questions to obtain standardized, de-identified data on each maternal death. This form is completed by hospital staff and an on-site review team extracts pertinent data. Oftentimes, sections of the form are incomplete or inconsistent with the SMI’s own findings, resulting in a potentially inadequate assessment of a patient’s death. Abstracting forms should be comprehensive and complete; however, this is a task that is sometimes difficult to achieve.

The results and trends identified in this report must be interpreted with caution since hospital data included missing or unavailable information. Although the findings obtained from the 38 maternal deaths reviewed by the SMI revealed useful information related to causes and prevention of maternal death, the quality and quantity of available information was limited. ACOG’s SMI reviews discovered multiple challenges associated with the availability, access, and comprehensive nature of medical records, including:

1) absent prenatal history;
2) absent records regarding previous hospitalizations and intrapartum care;
3) sparse physician and allied health care professional documentation and;
4) absent autopsy report at the time of the review; and afterwards,
5) no death certificate.

Reporting of maternal deaths is inconsistent in New York State. Findings and recommendations from the SMI will not be robust until there is long-term collection of timely, comprehensive data available. De-identified maternal death information upon which a central statewide repository that incorporates an active and non-punitive surveillance system must be reported immediately. Accurate, long-term information can be analyzed and meaningful timely obstetric recommendations can be made. ACOG’s leadership in these reviews and its ability to collect, analyze and procure timely recommendations ensured that this review program had the support of the medical and health care community. ACOG members played a critical role in maternal mortality review team discussions by interpreting information, explaining medical issues, and identifying needed improvements while making clinical and practice changes that can improve maternity care. ACOG stands above other educational organizations in its ability to impact behavioral and clinical practice patterns for ob-gyns both in New York State and nationally.
Chapter 6:
Future Directions: Examining Maternal Morbidity

For every one woman who dies, at least ten times the number of women experience a life-threatening morbidity.\(^{22}\) Maternal morbidity is defined by the CDC as a condition that adversely affects a woman’s physical health during childbirth beyond what would be expected in a normal delivery.\(^ {23}\) Many states have embarked on identifying these cases to better ascertain why women die during pregnancy.

A noticeable trend cropping up in a number of states including California, Michigan, Illinois, and Massachusetts, plus New York City, is the examination of instances of severe morbidity or “near misses” among their populations. Near misses may hold the key to better understanding and preventing maternal mortality. Approaches to examining morbidity are still evolving, and much of the work on reviewing near-miss cases has been within institutions, rather than on a state or local system level. The difficulty with creating a statewide or national morbidity review system is the criteria that individual hospitals use for qualifying and quantifying near misses often varies from hospital to hospital. The states that are currently trying to create a more universal “near miss” review system have chosen to approach it in a range of ways. Most, however, are using a database of hospital discharge data to identify cases that would fall within this category. Several are working from specific indicators, such as hemorrhage or pre-eclampsia, or analyzing admissions to ICUs.

Recent national studies reviewed the most common types of morbidity in obstetric cases and the frequency of such morbidity. In a 2009 study published in Obstetrics and Gynecology, the rate of obstetric complication has not changed dramatically in the past 10 to 15 years. Researchers found that the rate of obstetric complication from 1993 to 1997 and 2001 to 2005 remained stagnant at 28.6%. However, the rate of pre-existing medical conditions at delivery has increased slightly in those two comparative time periods from 4.1% to 4.9%. Pre-existing medical conditions such as chronic hypertension, pre-eclampsia, gestational and preexisting diabetes, asthma and postpartum hemorrhage increased, whereas rates of third and fourth degree lacerations and certain types of infection decreased.\(^ {24}\)

With the increase in obesity and advanced maternal age across the country, increases in morbidities such as chronic hypertension, PIH and gestational diabetes are not surprising. A separate study focusing on the presence of hypertensive disorders as a severe obstetric morbidity in the US found a dramatic increase in the prevalence of hypertensive disorders among hospital deliveries since the mid-1990s – an increase from 67.2 per 1,000 deliveries in 1998 to 81.4 per 1,000 deliveries in 2006. If obesity and maternal age trends continue, this morbidity type will become more prevalent.\(^ {25}\)

The increase in Cesarean deliveries also may have led to a decrease in third and fourth degree lacerations. The authors of the 2009 study hypothesized about the increase of postpartum hemorrhage. Possible factors considered are changes in underlying risk profiles of women, e.g. age, parity, BMI and

\(^ {22}\) E. Kuklina, C. Ayala, W. Callaghan, MD, FACOG. “Hypertensive disorders and severe obstetric morbidity in the United States.” Obstetrics and Gynecology, 2009: 113(6), 1299-1306.
\(^ {24}\) Ibid.
\(^ {25}\) Kuklina, et al.
previous Cesarean delivery or uterine surgery, and changes in practice, such as increased labor inductions.

While these future directions certainly require long-term, consistent effort, they are vital to discovering new opportunities and methods to optimizing maternity care in New York.

These efforts will not be simple – they will require the obstetric community and the state to dedicate time and resources. However, these rare but devastating events impact families, communities and providers. Regardless of the efforts needed, the women of New York deserve better.
SPECIAL RESEARCH SECTION:
An Analysis of Selected State & Local Maternal Mortality Review Systems

Despite a focus on maternal mortality in Healthy People 2000 and Healthy People 2010, there continues to be a fragmented approach to ascertaining the true number of pregnancy-related deaths throughout the country. This special research section focuses on various mechanisms utilized by several states to tackle this overwhelming public health problem.

Maternal Mortality Data in the US: A Fragmented History

Maternal deaths are notoriously underreported worldwide, and maternal mortality data is extremely difficult to collect with completeness and accuracy. Although the US ranks 41st in the world in maternal mortality — among the poorest outcomes in the developed world — national data on maternal mortality in the US have long been especially fragmented and incomplete.

Until 1987, national-level information on maternal deaths was drawn entirely from the National Center for Health Statistics (NCHS), to which each state forwards its death certificates. However, the use of death certificates alone is not sufficient to identify all maternal deaths. Several studies have shown that reviews of death certificates fail to capture many maternal deaths. Death certificates may fail to indicate underlying causes of death that were related to pregnancy or delivery.

39 CDC, 1986.
41 Horon, 2005.
Other factors contribute to inconsistencies and inaccuracies in reporting maternal deaths. For example, states vary widely in their methods of surveillance and case identification. The professionals who are responsible for completing the death certificate differ from state to state, and as does the training they receive.\(^46\)\(^47\)\(^48\)\(^49\)

In 1987, the CDC initiated the Pregnancy Mortality Surveillance System (PMSS). This coordinated, multi-pronged approach to identifying pregnancy-associated and pregnancy-related deaths in the US aims to improve the accuracy of national maternal mortality estimates. Conducted in collaboration with the Departments of Health from the 50 states, the District of Columbia, and New York City, PMSS uses an array of methods to identify cases of maternal death, including death certificates; state vital statistics reports, which may incorporate information gleaned from autopsies, coroners’ reports, and hospital or medical records; linked death certificates and birth records, where available; media reports; and reports from individual medical providers.\(^50\)\(^51\)\(^52\)\(^53\) Nevertheless, even using these enhanced surveillance processes, the de-identified data collected by PMSS lacks the depth of demographic and clinical detail needed to design robust epidemiological studies to identify risk factors and create effective interventions at the system or provider level.\(^54\)

**Efforts by the States**

Individual states have also adopted expanded approaches to maternal mortality surveillance. One such technique—adopted by at least 32 states including New York State as of 2006, as well as New York City—is to add one or more checkboxes on the death certificate to indicate whether the decedent was pregnant at the time of death or had been pregnant within a given interval beforehand.\(^55\)\(^56\) The 2003 revision of the US Standard Certificate of Death also includes a series of such checkboxes regarding pregnancy in the year preceding death, but states are neither required to use the Standard Certificate nor must they match the questions exactly if they do. In 2006, of the states using the item, at least six different versions of the question existed.\(^57\)

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\(^{46}\) Atrash, et al., 1989.


\(^{48}\) Mackay, et al., 2000.

\(^{49}\) Heron, 2005.

\(^{50}\) Atrash, et al., 1989.

\(^{51}\) Berg, et al., 1996.


\(^{54}\) Atrash, et al., 1989.


\(^{57}\) Ibid.
Many states have also instituted committees that examine in greater detail maternal deaths and the context in which they occur. The concept of the maternal mortality review (MMR) committee is not new; New Jersey established one of the country’s first state review processes in 1932 and New York City established a maternal mortality review in 1930.58, 59 By 1988, 27 states and New York City had MMR committees in place.60 While this special research section is not a comprehensive examination of every state’s maternal mortality review system, it is likely, based on this research, that fewer maternal mortality review committees currently exist than did in 1988.

**Vital Statistics vs. Self-Reporting**

Among MMR committees in the US, New York’s State’s SMI is unique in two ways. The first is its use of voluntary reporting by hospitals as the primary means of identifying cases of pregnancy-related death. The second is its highly qualitative focus, characterized by its in-depth method of case abstraction, augmented by clinician interviews.

The fact that the SMI’s process of case identification is based on voluntary reporting may imply that in other states, medical facilities are mandated to report maternal deaths to the state. In fact, only a few states among those selected and reviewed for this report—Massachusetts and Illinois—mandate that hospitals report their deaths to the state shortly after they occur, in addition to indicating such on the death certificate.

With the exception of New York State, every state MMR system contacted for this triennial report centers its process of case identification and ascertainment around vital records. The starting point for case identification is generally the death certificate, often using codes from the ICD-10 that indicate that the death was related to an obstetric cause (codes O00-O99).

Many states also have advanced surveillance techniques in place to identify additional cases (see Appendix). Such methods include:

- a checkbox (or series of checkboxes) on the death certificate;
- electronic or manual linkage of all death certificates of women of reproductive age with birth certificates, fetal death certificates, and/or other records, including child death certificates and prenatal care records from the year preceding the woman’s death;
- manual reviews of death certificates or files on the death;
- hospital autopsy records or medical examiner reports;
- media reports; and,
- reports from individual providers

Some states review deaths in the year they occur; others, particularly those facing funding pressures or those reliant on a vital statistics system that releases data from a given year during the first quarter of the following year, complete the review process several years after deaths occur. Some states use a retroactive process to cumulatively review deaths during a given time period, especially in states with

smaller populations and/or low rates of maternal mortality.

Despite these differences, in general, the first step in each state’s MMR process is to use the aforementioned methods of case identification to identify all pregnancy-associated deaths during the period of interest. Once the MMR staff has identified as many pregnancy-associated deaths as possible, some MMR committees eliminate non-pregnancy-related deaths from their analyses; others analyze all pregnancy-associated deaths, including those from accidental or incidental causes. A few states split cases into two separate groups for review—deaths due to a medical cause and deaths due to intentional or unintentional injuries; these states are generally referred to in the tables as reviewing both pregnancy-associated deaths and pregnancy-related deaths, as they may have a different process or even a different committee for each.

To gain additional insight into each case of interest, the state MMR staff requests additional documentation, including hospital, medical, and/or autopsy records directly from hospitals, clinicians, and the office of the medical examiner (ME). In some states, depending on the case’s context, states may also request law enforcement records, child protective services records, or additional documentation from other parties. Several states have policies that require hospitals and/or other parties to comply with requests for records for surveillance purposes, but in many states, the legal context merely clarifies the MMR committee’s right to have access to the records for surveillance purposes. As a result, many state MMR coordinators report that they must frequently pursue facilities to obtain the requested records, although it is rare that hospitals refuse to comply.

Once these additional records are received, cases are abstracted and are de-identified before they are submitted to the MMR committee. All states examined for the purposes of this triennial report have confidentiality provisions in place to ensure that the MMR process complies with the privacy protections of P.L. 104-191, the Health Insurance Portability and Accountability Act of 1996 (HIPAA). The MMR committee reviews each case in the context of the available supporting data. Depending on the state, members of the MMR committee individually or jointly determine and document primary and contributing causes of death, and/or whether the death might have been preventable.

By contrast, the SMI conducts reviews within those hospitals that volunteer to participate in the SMI. The voluntary nature of the SMI allows hospitals to report the death and to provide records and contextual information.

Although the SMI only reviews a small number of deaths each year, its in-depth, qualitative review of the cases that are reported is rich in clinical detail. According to the CDC, this style of data may offer the best basis for the design of effective interventions—and especially for overcoming the persistent racial disparities in maternal mortality:

> Detailed clinical data ... [are] needed to develop effective strategies to prevent pregnancy-related mortality for all women. ... [R]eview of the medical and social circumstances of the death are necessary to understand the effects of medical care, socioeconomic status, access to and content of prenatal care, social environment, and lifestyle on the sequence of events that lead to pregnancy-related deaths.  

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Nevertheless, without a comprehensive mechanism to identify and review a greater proportion of the state’s pregnancy-related deaths, the SMI’s ability to use this information to draw broad conclusions and design effective interventions is deeply circumscribed.

**One State; Many Surveillance Systems**

In states that use a vital records-based structure for the MMR process, the MMR surveillance systems are generally housed within the state Department of Health and operated in partnership with the state’s Bureau of Vital Statistics (BVS). In some states—usually those in which the BVS is a separate entity from the state Department of Health—this partnership is explicit in the design of the review process and the BVS may even administer the review; Virginia uses such a structure in its MMR process, for example. More often, however, the partnership is assumed. Nevertheless, among all maternal mortality surveillance systems except New York State’s, the BVS is the state’s primary or sole system for monitoring maternal deaths statewide, and the MMR process is the only statewide system for analyzing possible causes and contributing factors.

By contrast, the SMI was designed in such a way that it operates independently of the New York State Bureau of Vital Statistics. But New York State has several other systems that, although not designed expressly to track maternal mortality, may capture some such deaths. Statewide, pregnancy-related deaths can potentially be tracked through five different systems:

- Bureau of Vital Statistics (BVS) for the collection of general information
- Statewide Planning and Research Cooperative System (SPARCS) for the collection of hospital and ambulatory care discharge data
- New York Patient Occurrence and Tracking System (NYPORTS) for adverse event reporting
- Statewide Perinatal Database System (SPDS) for the collection of infant and maternal outcome and risk factor data
- SMI

In addition, RPCs, the New York City Health and Hospitals Corporation (HHC), and other private hospital groups, each conduct their own reviews of maternal deaths that occur within their systems. Despite the number of systems that track maternal deaths in New York State, in the absence of a coordinated approach and/or universal participation in the SMI, the amount of useful data currently available to be used as the basis for effective interventions is limited.

**Results: Dissemination, Activities, and Interventions**

The ways in which states disseminate the findings from their MMR committees and the extent to which they use these findings to create interventions and other activities varies from state to state (see Appendix).

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62 New York State.
Nearly all MMR committees author and publish reports on their findings. Such reports are generally distributed to policymakers and hospitals and/or professional associations and in many states, are made public.

Among states that review all pregnancy-associated deaths or both pregnancy-associated and pregnancy-related deaths, some states have implemented broad public service campaigns geared toward educating pregnant women and their loved ones about issues such as the importance of seatbelt use, warning signs for domestic violence, or signs of postpartum depression. Some of these states have also offered clinical training on these selected topics to ob-gyns.

Both Massachusetts and Michigan divide deaths in their state according to whether they were primarily due to a medical issue or an injury, and a separate team reviews each type of death. The teams create distinct recommendations and interventions for each category.

**Trends and Emerging Issues**

In looking at the MMR processes of the selected states, several trends emerge. One important trend is that many states have incorporated into their review process the notion that pregnancy-related deaths can and often do occur beyond the boundaries of the 42 days postpartum specified by the traditional definition of “maternal death.”

States must frequently surmount substantial obstacles to complete the review process and take action on the committee’s conclusions. For example, in many states, the surveillance policies and/or legal protections that allow the MMR committees to have access to medical records do not extend to law enforcement records, behavioral health records, child protective service records, or other documentation that would hasten and clarify the abstraction process. Very few states require hospital or medical examiner autopsies in cases of maternal death, and even where autopsies exist, training varies widely among coroners and records may not be complete. Often, no infrastructure exists to obtain records from several facilities that treated the decedent beyond the one where the death occurred. States also report that they cannot review deaths of residents who expire outside their state, due to difficulties in obtaining records across jurisdictions. Many states also report that they lack the funding and the infrastructure to comprehensively address the complex issues that their reviews reveal, such as substance abuse, interpersonal violence, and chronic disease.

As states face extreme economic hardships and competing demands, their MMR committees are not unaffected. Both New Mexico and Georgia have discontinued their MMR work in recent years due to a lack of staff and funding.

Other states that have not disbanded their committees describe a slowing of, or in some cases, a hiatus in the review process—ostensibly until the funding situation improves. In many states, coordinators describe the difficulty of completing the review process with extremely limited staff, often a single full-time equivalent (FTE) of whose time only a portion is allotted to the MMR process, if the process is funded at all. Even the CDC is, at the time of this publication, unable to devote the staff or funding it previously dedicated to tracking MMR committee activity among states.
**The Illinois Model**

In the US, the state with an MMR process that most closely approximates that of the United Kingdom’s maternal mortality review process is Illinois. Illinois mandates that facilities report all maternal deaths to the state within 24 hours and facilities are required to remit all pertinent records to the state within 30 days.

All obstetric hospitals in Illinois are affiliated with a perinatal network; higher-level perinatal facilities receive records from the state and perform the initial review of any death that occurs within their network. The state’s maternal mortality committee then reviews all obstetric deaths, all deaths designated by the first-level review as “preventable” or “possible preventable,” and certain other deaths.

In addition, Illinois is also studying the contribution of severe maternal morbidity to its obstetric burden, reviewing all cases in which a currently or recently pregnant woman is admitted to an ICU or receives three or more units of blood. Because this process allows for the identification of such a large proportion of cases, great potential exists for identifying clinical needs and improving processes for meeting them. For example, Illinois recently completed a two-year training initiative in which all clinical personnel who work in labor and delivery units – 45,000 people in all – were trained to prevent, identify, and manage obstetric hemorrhage.

Despite these strong advances, however, the Illinois system experiences many of the same obstacles that similarly constrain the efforts of New York State and others. For example, Illinois’ statute on reviews does not mandate a joint facility review in the event that a patient is treated at multiple facilities in the period immediately preceding her death. It also does not mandate participation by professionals from other sectors, such as social work or law enforcement, that may have knowledge about individual cases, nor are these other sectors required to provide their records to the review committee. Further, as is the case in most states, autopsies are not mandated for cases of maternal death.

Nevertheless, the combination of a mandatory reporting process, a coordinated bi-level review, and “near miss” surveillance is a powerful tool for identifying and analyzing a large proportion of maternal deaths.

**The UK Alternative: The CEMD Programme**

Given the variety and fragmentation between states’ MMR processes, it is worth considering a surveillance system that operates in a far less fragmented fashion than many systems in the US – the United Kingdom’s Confidential Enquiry into Maternal Death (CEMD) Programme, one system after which the SMI was modeled, is the longest running review of maternal deaths in the world. Its advisory board is comprised of members of the eight professional organizations most involved in maternity care: the Royal College of Obstetricians and Gynaecologists, the Faculty of Public Health of the Royal College of Physicians, the Royal College of Anaesthetists, the Royal College of General Practitioners, the Royal College of Midwives, Royal College of Paediatrics and Child Health, the Royal College of Pathologists, and the Royal College of Psychiatrists.
Although the program benefits from existing in a country with nationalized—and therefore, to some degree standardized—health insurance, CEMD nevertheless has several facets that make it a robust program for analyzing maternal deaths and designing effective programs to address them.

First, in the UK, it is expected of and accepted by clinicians to report deaths soon after they occur. Because the review process is both entirely confidential and non-punitive, compliance and participation in subsequent reviews is virtually complete. Next, to aid in case identification, the UK has a standardized death certificate and the professionals responsible for completing it all receive standardized training in how to do so. This minimizes reporting errors resulting from the inconsistent use of the death certificate. Finally, in 2005 the UK implemented the United Kingdom Obstetric Surveillance System, a comprehensive system for tracking and responding to severe morbidity and near miss events.64

**Conclusion**

In the US, maternal death is severely underreported and, as this preliminary search for states with active MMR committees demonstrates, most likely under-examined in more states than not. Jurisdictions that review maternal deaths approach this work in many ways. Regardless of their processes, review committees benefit from being able to identify as many cases as possible within the parameters in which they work, and from an infrastructure that facilitates coordination and access to information, both across hospital systems and with other sectors. This research also demonstrates that much remains to be studied.

The Special Research Section, “An Analysis of Selected State and Local Maternal Mortality Review Systems” was researched and written by Tegan Culler, MPH. Information in this section regarding individual states is current through March 2010.

Research for this special section was conducted via phone with the MMR Coordinator in each state between October 2009 and January 2010 (except Maryland, as previously noted). In some cases, other members of the MMR team, including those from collaborating agencies, took part in the initial call or were reached in separate calls.

The full list of MMR Coordinators contacted for this special section is as follows: Judith Woehrle, New Jersey, October 14, 2009; Debra Kimball, MSN, RN, Michigan, October 14, 2009; Deborah Burch, RN, Florida, October 28, 2009; Victoria Kavanaugh, Virginia, October 28, 2009; Tamisha Johnson, MD, New York City, October 30, 2009; Kathy Cummons, West Virginia, November 9, 2009; Margaret Harper, MD, North Carolina, November 14, 2009; Christine Mandl, Colorado, November 20, 2009; Susan Nalder, New Mexico, November 20, 2009; Angela Nannini, MD, Massachusetts, November 24, 2009; Lois Bloebaum, BSN, MPA, Utah, December 2, 2009; Polly Taylor, CNM, MPH, ARNP, and Cathy Wasserman, PhD, Washington, January 12, 2010; Michael Valiquette, Alaska, January 14, 2010; Charlene Wells, Illinois, January 20, 2010; Nancy Martin, Illinois, January 20, 2010; Elizabeth Lawton, MSH, and Connie Mitchell, MD, California, January 23, 2010; Patricia Prentice, MBA, RN, Illinois, January 31, 2010.

### Abbreviations Used in This Report

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>ACOG</td>
<td>The American Congress of Obstetricians and Gynecologists</td>
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<td>APCU</td>
<td>Adequacy of Prenatal Care Utilization</td>
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<td>BMI</td>
<td>Body Mass Index</td>
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<td>CDC</td>
<td>The Centers for Disease Control and Prevention</td>
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<td>CEMD</td>
<td>Confidential Enquiries into Maternal Deaths</td>
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<td>CVA</td>
<td>Cerebral Vascular Accident</td>
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<td>DVT</td>
<td>Deep Vein Thrombosis</td>
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<td>EKG</td>
<td>Electrocardiography</td>
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<td>FACOG</td>
<td>Fellow of the American Congress of Obstetricians and Gynecologists</td>
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<td>ICU</td>
<td>Intensive Care Unit</td>
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<td>IOM</td>
<td>Institute of Medicine</td>
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<td>IPRO</td>
<td>Island Peer Review Organization</td>
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<td>IRB</td>
<td>Institutional Review Board</td>
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<td>MDNF</td>
<td>Maternal Death Notification Form</td>
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<td>MMR</td>
<td>Maternal Mortality Review</td>
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<td>NCHS</td>
<td>National Center for Health Statistics</td>
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<td>NYSDOH</td>
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<td>NYCDOHMH</td>
<td>New York City Department of Health and Mental Hygiene</td>
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<td>New York Patient Occurrence and Tracking System</td>
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<td>Post-Anesthesia Care Unit</td>
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<td>PHL</td>
<td>Public Health Law</td>
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<td>PIH</td>
<td>Pregnancy-Induced Hypertension</td>
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<td>PPH</td>
<td>Postpartum Hemorrhage</td>
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<td>RPC</td>
<td>Regional Perinatal Center</td>
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<td>SBAR</td>
<td>Situation-Background-Assessment-Recommendation</td>
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<td>SMI</td>
<td>Safe Motherhood Initiative</td>
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<tr>
<td>SPARCS</td>
<td>Statewide Planning and Research Cooperative System</td>
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<td>TOP</td>
<td>Termination of Pregnancy</td>
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<tr>
<td>VRQC</td>
<td>Voluntary Review of Quality of Care Program</td>
</tr>
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