



PAMR

Pregnancy-Associated Mortality Review

Florida Department of Health, Division of Community Health Promotion

Pregnancy-Related Deaths Due to Hemorrhage, 1999-2012

Worldwide and in the United States,¹ hemorrhage is a leading cause of pregnancy-related deaths (PRDs) before, during, or after delivery. This brief provides an overview of PRDs due to hemorrhage in Florida from 1999 to 2012, and provides evidence-based recommendations intended to reduce the risk of maternal deaths due to hemorrhage.

Florida's Pregnancy-Associated Mortality Review (PAMR) is an ongoing system of surveillance that collects and analyzes information related to maternal deaths in order to promote care and system improvements through evidence-based actions intended to lower risks for PRDs.² From 1999-2012, the Florida PAMR Review Team classified 560 cases as PRDs. Figure 1 shows the distribution of these 560 PRDs by cause of death. In this period (1999-2012), the top two leading causes of PRDs were hypertensive disorders (15.5%) and hemorrhage (15.2%).

Of the 560 PRDs, 85 (15.2%) were due to hemorrhage. Between 1999 and 2012, the pregnancy-related mortality ratio due to hemorrhage (HPRMR) rose from a rolling three-year average of 1.8 hemorrhage deaths per 100,000 live births during the 1999-2001 period to 3.4 deaths during the 2010-2012 period (see Figure 2). However, the upward trend for single-year data was not statistically significant for the 1999-2012 period.

Differences in HPRMRs were found for maternal characteristics of age, race and Hispanic ethnicity, delivery type, prenatal care, and body mass index (BMI). Women 35 years and older had a higher HPRMR of 7.9 compared with the HPRMR of women 24 years or younger at 1.2 PRDs per 100,000 live births.

Figure 1. Distribution of Pregnancy-Related Causes of Deaths, Florida, 1999-2012 (n=560)

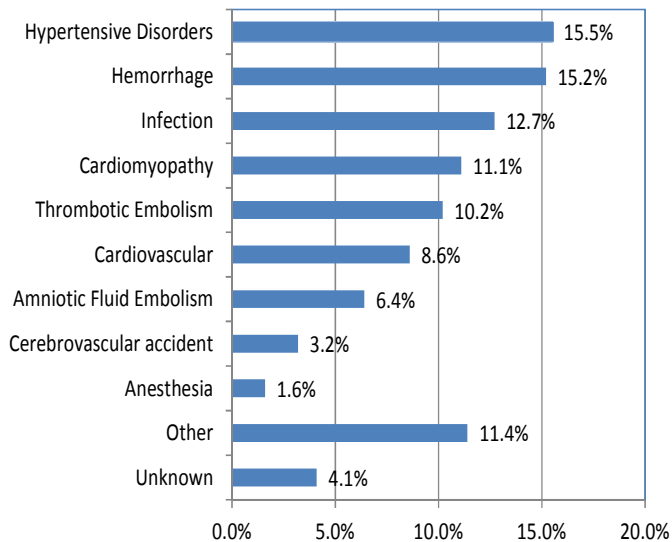
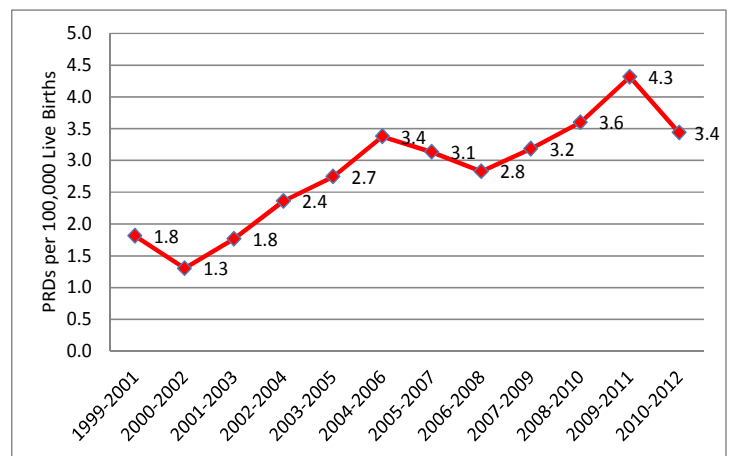


Figure 2. Pregnancy-Related Mortality Ratios per 100,000 Live Births due to Hemorrhage (HPRMR), Three Year Rolling Average, Florida, 1999-2012



Non-Hispanic Black women had a higher HPRMR of 6.9 compared with non-Hispanic White or Hispanic and Non-Hispanic other races at 1.4 and 2.0 PRDs per 100,000 live births. Women who delivered by cesarean had a higher HPRMR of 3.0 compared with the HPRMR of 0.8 PRDs per 100,000 live births for women who had a vaginal delivery. Women who had late or no prenatal care had a higher HPRMR of 4.0 compared with women who had prenatal care during the first trimester of pregnancy at 0.7 PRDs per 100,000 live births. Obese (BMI ≥ 30) women had higher HPRMR of 4.8 compared with 2.2 PRDs per 100,000 live births for women with a normal BMI (20-24.9) (see Table 1).

Collectively, uterine atony, uterine laceration, and placental disorders (placenta previa/accreta/increta/percreta), accounted for two thirds of the deaths in women with an intrauterine pregnancy at 20 weeks or more. Ectopic pregnancy accounted for 30.6% of all PRDs due to hemorrhage (see Table 2).

Overall characteristics of women at increased risk of PRDs due to hemorrhage were (see Table 1):

- Non-Hispanic Black
- 35-years or older
- A cesarean delivery
- Late or no prenatal care
- Obese (BMI ≥ 30)

Table 1. Pregnancy-Related Mortality due to Hemorrhage: Rates per 100,000 Live Births (HPRMRs) and Unadjusted Relative Ratios (RRs), Florida, 1999-2012 (n=85)

| Characteristics | Deaths | HPRMR | RR (95%CI) |
|---|--------|-------|-----------------|
| Age | | | |
| <25 | 13 | 1.2 | Ref. |
| 25-34 | 37 | 2.5 | 2.1* (1.1-3.9) |
| 35 + | 35 | 7.9 | 6.7* (3.5-12.6) |
| Race | | | |
| Non-Hispanic White | 20 | 1.4 | Ref. |
| Non-Hispanic Black | 46 | 6.9 | 5.0* (2.9-8.4) |
| Hispanic and Other | 19 | 2.0 | 1.5 (0.8-2.7) |
| Marital Status | | | |
| Married | 50 | 2.9 | Ref. |
| Not married | 35 | 2.7 | 0.9 (0.6-1.4) |
| Mode of Delivery | | | |
| Vaginal | 17 | 0.8 | Ref. |
| Cesarean ¹ | 31 | 3.0 | 3.6* (2.0-6.5) |
| Prenatal Care Initiation² | | | |
| First Trimester | 17 | 0.7 | Ref. |
| Second-Third or None | 22 | 4.0 | 5.4* (2.9-10.2) |
| Body Mass Index Categories³ | | | |
| Underweight (BMI <20) | 4 | 4.2 | 2.0 (0.7-5.7) |
| Normal (BMI 20-24.9) | 20 | 2.2 | Ref. |
| Overweight (BMI 25-29.9) | 15 | 3.3 | 1.5 (0.8-3.0) |
| Obese (BMI ≥30) | 18 | 4.8 | 2.2* (1.2-4.2) |

1/ Excluded two emergency cesarean deliveries. 2/ Excluded women who died during first or second trimester. 3/ Included years 2004-2012. * Statistically significant

Florida PAMR Committee Hemorrhage Recommendations for Actions:

Maternal mortality review reports from North Carolina and California found that maternal deaths due to hemorrhage had significant prevention opportunities.^{3,4} Similarly, the Florida PAMR Review Team identified the following recommendations as opportunities to reduce the risk of hemorrhage PRDs.

Clinical Factors - Clinicians should develop comprehensive hemorrhage protocols that include a hemorrhage cart with key equipment and a massive transfusion protocol in every birthing facility. Medical personnel should practice hemorrhage drills in a labor and delivery setting. It is important to provide specialized counseling to patients and family members with religious views against blood transfusions.

System Factors - Clinicians should establish protocols that state women presenting to the emergency room with abdominal pain and anemia need to be evaluated for ectopic pregnancy.

Individual and Community Factors - Providers should raise community awareness about the need for women of reproductive age who are experiencing abdominal pain to seek prompt medical attention.

References:

- Hogan M. et al. (2010). Maternal mortality for 181 countries, 1980-2008: A systematic analysis of progress towards Millennium Development Goal 5. *Lancet* 375: 1609-1623.
- Burch, D., Noell, D., Washington, H., Del, I. (2012). Pregnancy-Associated Mortality Review. The Florida Experience. *Seminars in Perinatology*. 36(1): 31-36.
- Berg, C. et al. (2005) Preventability of Pregnancy-Related Deaths. Results of a State-Wide Review. *Obstetrics and Gynecology* 106 (6): 1128-1234.
- The California pregnancy-associated mortality review, April 2011. From: <http://www.cdph.ca.gov>
- Florida Perinatal Quality Collaborative (2013). Florida Obstetric Hemorrhage Initiative Toolkit: A Quality Improvement Initiative for Obstetric Hemorrhage Management.

Obstetric Hemorrhage Initiative (OHI):

Under contract with the Florida Department of Health, the Florida Perinatal Quality Collaborative (FPQC), in partnership with the American Congress of Obstetricians and Gynecologists (District XII) and the OHI Advisory Group (consisting of maternal, public, and quality improvement health leaders), developed a Toolbox for Hospital Implementation. Hospitals will assemble multi-disciplinary teams and implement strategies that respond to every obstetric hemorrhage through a 2-year multi hospital collaborative.

The goal of the collaborative is to achieve improvements in maternal outcomes related to hemorrhage by implementing best practice guidelines as developed by the OHI Advisory Group, including risk assessment, application of massive transfusion policies, OB hemorrhage simulation drills and debriefing, quantification of blood loss and more. Hospitals and providers will be better prepared to assess for hemorrhage risks, prepare for and manage obstetrical hemorrhage in earlier stages, and measure their results. The FPQC will help by applying methods for organizational change, involving experienced hospital experts, and sharing participating hospital experiences, challenges, and successes.⁵

Table 2. Pregnancy – Related Deaths Due to Hemorrhage by Causes, Florida, 1999-2012 (n=85)

| Causes | Vaginal | Cesarean Delivery | N/D* | Total Deaths Number (%) |
|---|------------|-------------------|----------|-------------------------|
| Intrauterine gestations ≥ 20 weeks | | | | |
| Uterine atony/Postpartum hemorrhage ¹ | 17 | 33 | 3 | 53 (100%) |
| Placenta previa | 6 | 6 | | 12 (23%) |
| Placenta accreta, increta, percreta ² | 0 | 3 | | 3 (6%) |
| Abruption placenta ^{1,2} | 1 | 6 | 1 | 8 (15%) |
| Retained Placenta/POC ³ | 1 | 3 | 1 | 5 (9%) |
| Other (uterine artery lac, intra-abdominal & other sites of hemorrhage) | 4 | 1 | | 5 (9%) |
| Other (uterine artery lac, intra-abdominal & other sites of hemorrhage) | 2 | 5 | | 7 (13%) |
| Coagulopathies (incl. DIC) | 0 | 1 | | 1 (2%) |
| Uterine bleeding, NOS | 0 | 1 | | 1 (2%) |
| Uterine bleeding, NOS | 1 | 5 | | 6 (11%) |
| Uterine laceration/rupture spontaneous, forceps or TAB ^{2,4} | 2 | 2 | 1 | 5 (9%) |
| Unknown | 0 | 1 | | 1 (2%) |
| Intrauterine gestations <20 weeks | | | | |
| Spontaneous abortion/hemorrhage | 6 | N/A | | 6 (100%) |
| Spontaneous abortion/hemorrhage | 2 | | | 2 (33%) |
| D&E/bleeding from uterine perforation/laceration of uterine vessels | | | | |
| D&E/bleeding from uterine perforation/laceration of uterine vessels | 4 | | | 4 (67%) |
| Rupture ectopic pregnancy | N/A | N/A | | 26 (100%) |
| Total Deaths Due to Hemorrhage | 23 | 33 | 3 | 85 |

1/Three cases related to religious beliefs. 2/Two cases undelivered-diagnosis by autopsy. 3/ Two cases of home birth. 4/ Termination (abortion). * N/D Not delivered.