Florida's Pregnancy-Associated Mortality Review
2018 Update

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May 2020

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Summary

Florida's Pregnancy-Associated Mortality Review (PAMR) is an ongoing surveillance process that involves data collection and examination of maternal deaths to promote evidence-based actions for individual behavior changes, health care system improvements, and prevention of pregnancy-related deaths (PRDs). [For additional details about the PAMR committee and process, please refer to Appendix 2].

The 2018 Update provides an overview and comparison of PRD data and trends for Florida between 2008 and 2018. Distributions of PRDs are shown by race/ethnicity, age, body mass index (BMI), timing of death, pregnancy outcome, type of delivery, cause of death, and, when applicable, pregnancy-related mortality ratios (PRMRs).

The data linkage process identified 183 Florida resident pregnancy-associated deaths (PADs) from January 1, 2018 to December 31, 2018. The PAMR case selection committee selected 50 cases to review, with priority given to those most likely to be pregnancy-related, followed by those possibly related and some not pregnancy-related. Upon full team review of the 50 PADs, the PAMR committee found that 36 (72.0%) were pregnancy-related.

The 2018 pregnancy-related mortality ratio (PRMR) in Florida was 16.3 per 100,000 live births. Although the 2018 PRMR was lower than the 2009 ratio (26.2 per 100,000 live births), the trend for the period 2008-2018 was not statistically significant.

Key findings for 2018:

- Of the 36 PRDs
  - 34.3% were non-Hispanic White women
  - 48.6% were non-Hispanic Black women
  - 14.3% were Hispanic women
  - 2.9% were non-Hispanic Other Races women
- The leading pregnancy-related causes of death in 2018 were cardiomyopathy (19.4%), hemorrhage (16.7%), thrombotic embolism and infection (11.1% each), and cardiovascular diseases and hypertensive disorder (8.3% each).
- Of the 36 PRDs, 29 (80.6%) occurred during the postpartum period
  - 25.0% of postpartum PRDs occurred prior to hospital discharge
  - 55.6% of postpartum PRDs occurred after hospital discharge
- PRDs by pregnancy outcome
  - 72.2% after a live birth delivery

    - 13.9% after a stillbirth
    - 5.6% while still pregnant (undelivered)
    - 5.6% emergency delivery
    - 2.8% after an ectopic pregnancy
- 32 PRDs (88.9%) occurred during or after delivery
    - 55.6% (20) had C-section as a delivery method
        - 27.8% were planned C-section deliveries
        - 27.8% were unplanned C-section deliveries
- 22 PRDs (61.1%) were overweight or obese women based on their BMI classifications

Identified risks and contributing factors among clinical providers, facilities, health care systems, communities, and individuals are used to form recommendations for care improvement. The leading recommendations in 2018 were classified in the following themes:

- Improve provider training
- Enforce policies and procedures
- Adopt levels of maternal care/ensure appropriate level of care determination
- Improve access to care
- Improve patient/provider communication
- Improve patient management for mental health conditions
- Improve procedures related to communication and coordination between providers
- Improve standards regarding assessment, diagnosis, and treatment decisions
- Improve policies related to patient management, communication and coordination between provider, and language translation
- Improve policies regarding prevention initiatives, including screening procedures and substance use prevention or treatment programs
- Improve access to medical records
- Improve autopsy referral and acceptance

The Florida Department of Health (Department) uses PAMR data, including contributing factors and care improvement recommendations, to prioritize areas for quality improvement changes. The Department collaborates and contracts with the Florida Perinatal Quality Collaborative (FPQC), at the University of South Florida, to develop quality improvement initiatives for Florida hospitals. This collaboration fosters the transformation of PAMR recommendations into actions.

Current FPQC quality care improvement initiatives funded by the Department include:

- The Maternal Opioid Recovery Effort (MORE) Initiative that addresses women with opioid use disorder during pregnancy.
- The Promoting Primary Vaginal Deliveries (PROVIDE) 2.0 Initiative that aims to reduce the rate of primary cesarean section (C-section) deliveries in the state.

Aggregate PAMR findings and recommendations are also disseminated to clinical partners such as the American College of Obstetricians and Gynecologists (ACOG), Association of Women's Health, Obstetric, and Neonatal Nurses, Healthy Start, etc. via Urgent Messages, Grand Round presentations, newsletters, and conferences.

Pregnancy-Associated and Related Deaths

A pregnancy-associated death (PAD) is a death of a woman from any cause, while she is pregnant or within one year of termination of pregnancy, regardless of the duration and site of the pregnancy. *A pregnancy-related death (PRD)* is a death of a woman directly attributed to pregnancy and/or childbirth. PRDs are subsets of PADs. [For PAMR processes see Appendix 2]. Florida's pregnancy-associated mortality ratios (PAR) and pregnancy-related mortality ratios (PRMR) are shown in Figure 1.

Figure 1. Pregnancy-Associated Mortality Ratios (PAR) and Pregnancy-Related Mortality Ratios (PRMR), Florida, 2008–2018

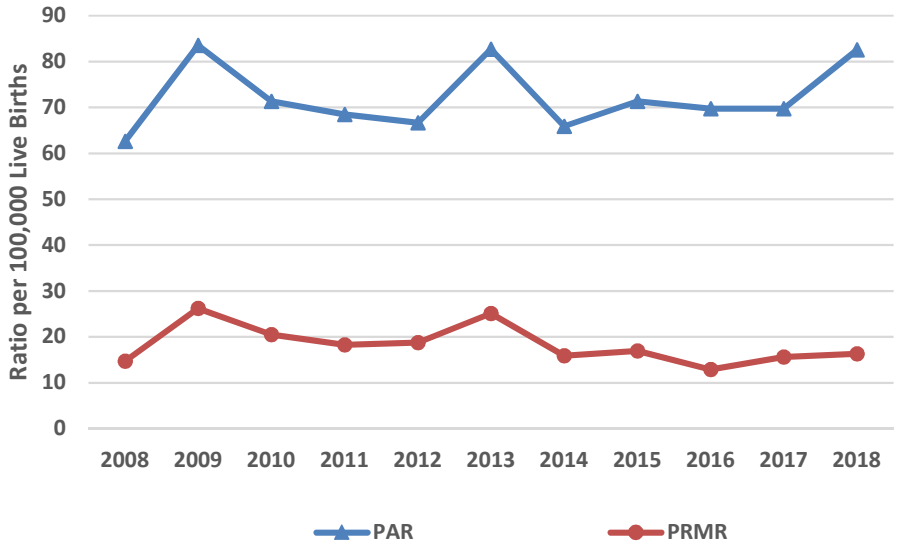


Table 1. Total Pregnancy-Associated Deaths and Pregnancy-Related Deaths, Florida, 2008–2018

Year	# PAD	# PRD	% PRD	Year	# PAD	# PRD	% PRD
2008	145	34	23.4	**2014**	145	35	24.1
2009	185	58	31.4	**2015**	160	38	24.0
2010	153	44	28.8	**2016**	157	29	18.5
2011	146	39	26.7	**2017**	156	35	22.4
2012	142	40	28.2	**2018**	183	36	19.7
2013	178	54	30.3				

- The total number of PADs in Florida ranged from 142 to 185 per year between 2008 and 2018. The number of PADs in 2018 was 183.

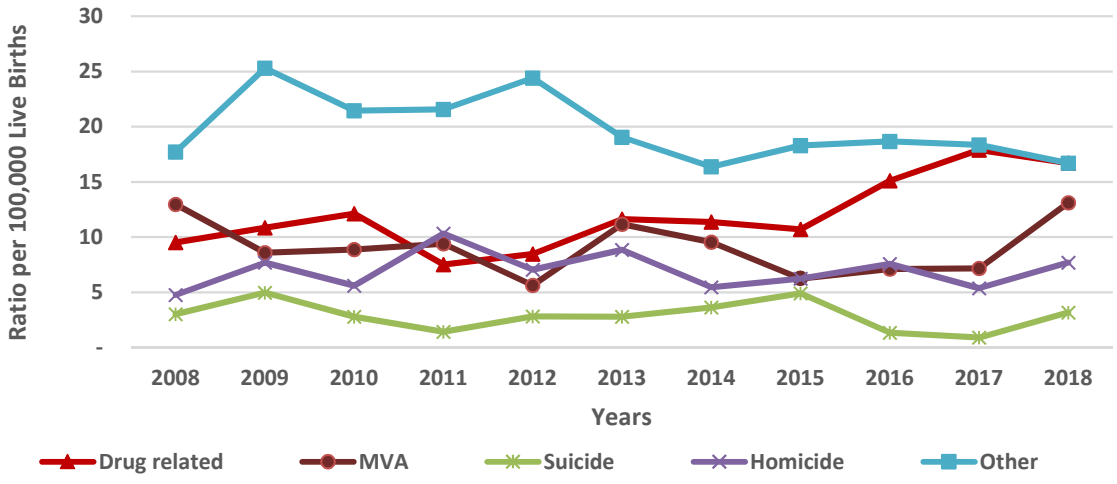
- The proportion of PADs that were pregnancy-related ranged from 18.5% to 31.4% between 2008 and 2018. In 2018, 19.7% of PADs were determined to be PRDs by the Florida PAMR committee.

The PAR did not show a statistically significant trend during the period 2008–2018.

Not-Pregnancy-Related Deaths

Not-Pregnancy-Related Deaths (NPRD) are a subset of PAD. The causes of maternal death in the NPRD ratios for 2008–2018, based on documentation in the death certificates, are shown in Figure 2. These maternal deaths were identified through the case identification process described in Appendix 2. In 2018, the NPRD death ratio due to drug related and other causes were both 16.7 per 100,000 live births, followed by motor vehicle accidents (MVA) with a ratio of 13.1, homicides with a ratio of 7.7, and suicides 3.2 per 100,000 live births, respectively.

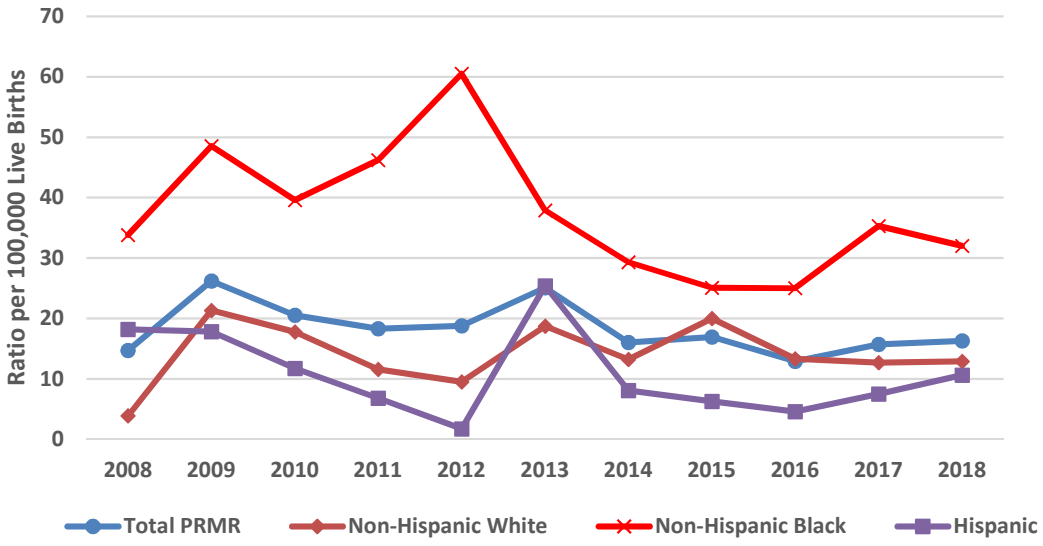
Figure 2. Not-Pregnancy-Related Death Ratios by Cause of Death, Florida, 2008–2018



Pregnancy-Related Mortality Ratios (PRMR)

A measure of PRDs is the PRMR. The PRMR is the number of PRDs per 100,000 live births. In assessing mortality, it is customary to view mortality measures over an extended period to identify increasing or decreasing trends. Figure 3 displays PRMRs for Florida between 2008 and 2018 by race and Hispanic ethnicity.

Figure 3. Pregnancy-Related Mortality Ratios (PRMRs) by Race/Ethnicity, Florida, 2008–2018



- During the period 2008–2018, the overall Florida PRMR fluctuated from 14.7 deaths per 100,000 live births in 2008 to a high of 26.2 in 2009 and a low of 12.9 in 2016. The PRMR in 2018 was 16.3 deaths per 100,000 live births.
- As evidenced in Figure 3, Florida PRMRs exhibit consistent racial disparities but the gap between non-Hispanic Blacks and non-Hispanic Whites between 2008 and 2018 decreased from 8.7 in 2008 to 2.5 in 2018. Throughout this study period, non-Hispanic Black women exhibited higher PRMRs than non-Hispanic White or Hispanic women. During 2012, the PRMR for non-Hispanic Black women was 60.5, an all-time high. In 2018, the PRMR per 100,000 live births was 32.0 for non-Hispanic Black women, 12.9 for non-Hispanic White women, and 10.6 for Hispanic women.

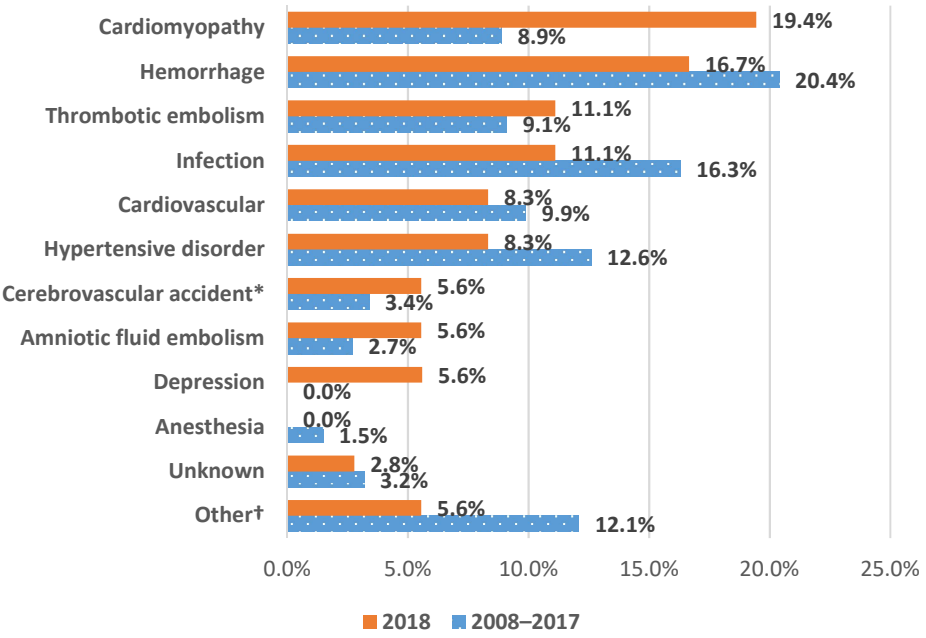
Cause of Pregnancy-Related Deaths

The PAMR committee determines a primary underlying cause of death for each PRD they review.

- In 2018, the leading underlying causes of PRDs were cardiomyopathy (19.4%), hemorrhage (16.7%), thrombotic embolism and infection (with 11.1% each), and cardiovascular diseases and hypertensive disorders (with 8.3% each).

- Figure 4 and Table 2 show how the percentage of deaths for cardiomyopathy, thrombotic embolism, cerebrovascular accident, and amniotic fluid embolism, were higher in 2018 compared with the period 2008–2017. Also, Figure 4 and Table 2 show decreases in the percentage of deaths in 2018 due to hemorrhage, infection, hypertensive disorders, cardiovascular, and other remaining causes. Depression was identified for the first time as an underlying cause of death in 2018.

Figure 4. Distribution of Pregnancy-Related Causes of Death, Florida, 2008–2017 (n=406) and 2018 (n=36)



*Cerebrovascular accident no known hypertensive disorders.
†Other is comprised of various causes of deaths not easily captured with enough numbers in a homogeneous category.

Table 2. Distribution of Causes of Pregnancy-Related Death, Florida, 2008–2017 and 2018

Causes of Deaths	2008–2017	2018	Change in Percentage
	N (%)		
Cardiomyopathy	36 (8.9)	7 (19.4)	118.0
Hemorrhage	83 (20.4)	6 (16.7)	-18.1
Infection	66 (16.3)	4 (11.1)	-31.9
Thrombotic embolism	37 (9.1)	4 (11.1)	22.0
Hypertensive disorder	51 (12.6)	3 (8.3)	-34.1
Cardiovascular	40 (9.9)	3 (8.3)	-16.2
Amniotic fluid embolism	11 (2.7)	2 (5.6)	107.4
Other†	49 (12.1)	2 (5.6)	-53.7
Depression	0 (0.0)	2 (5.6)	-
Cerebrovascular accident*	14 (3.4)	2 (5.6)	64.7
Anesthesia	6 (1.5)	0 (0.0)	-
Total	406**	36**	

†Other remaining causes include: hematopoietic, collagen vascular diseases, metabolic (pregnancy related or not related), injury, cancer, pulmonary problems, neurologic/neurovascular problems, multiple organ/system failure, gastrointestinal disorders, and other conditions.

*Cerebrovascular accident no known hypertensive disorders.

**Total includes unknowns.

Pregnancy-Related Deaths by Age

Examination of age at death can point toward the presence and types of PRD protective or risk factors among age groups, such as biological effects of the aging process. PRD distribution and PRMRs (number of PRDs per 100,000 live births) by age group are shown in Figures 5a and 5b.

- In 2018, no maternal deaths for young women less than 20 years old were observed. The highest percentage of maternal deaths (38.9%) occurred in women 35+ years old. In contrast, fewer mothers aged 20-24 and 25-29 died in 2018 compared with 2008–2017 as shown in Figure 5a.

Figure 5a. Distribution of Pregnancy-Related Deaths by Age, Florida, 2008–2017 (n=406) and 2018 (n=36)

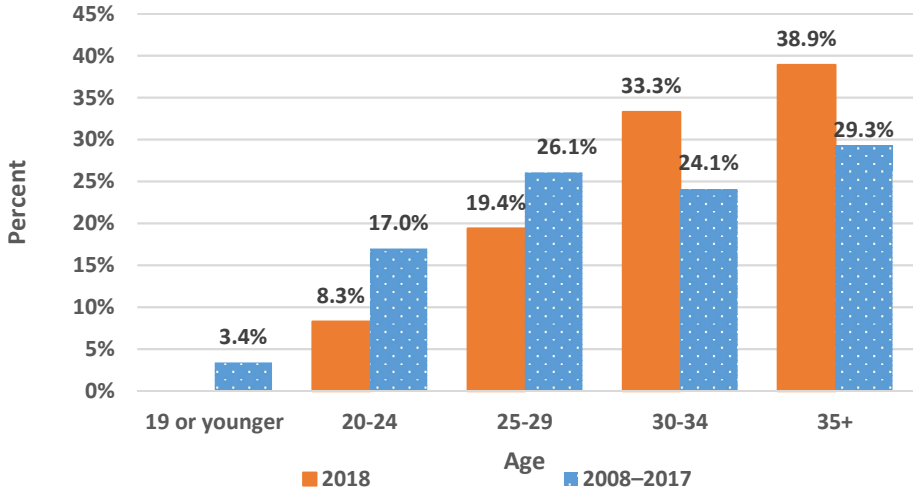
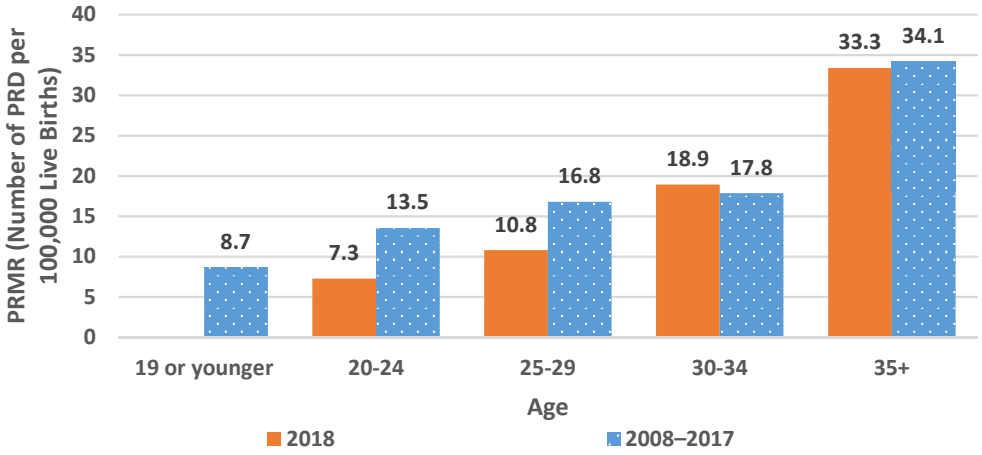


Figure 5b. Pregnancy-Related Mortality Ratios (PRMRs) by Age, Florida, 2008–2017 (n=406) and 2018 (n=36)

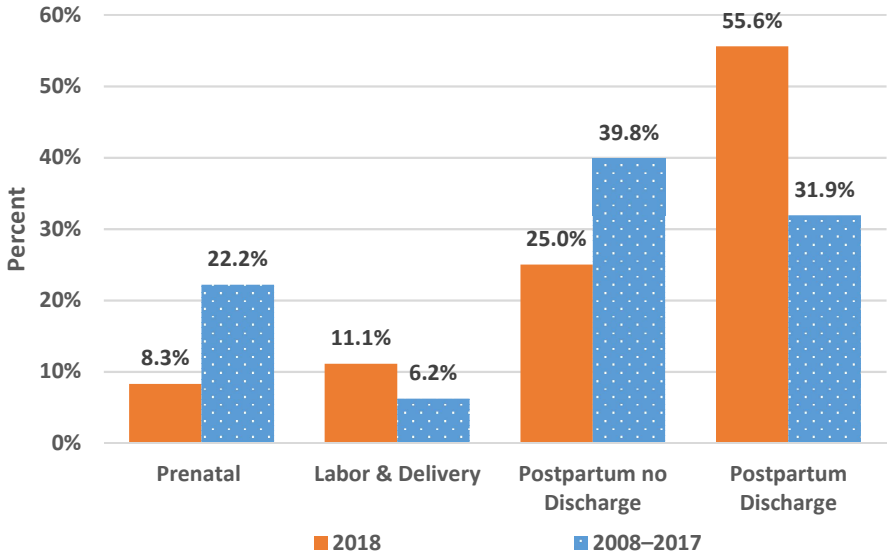


- In 2018, the PRMR of mothers age 35 or more (33.3) was almost 2 times (1.8) the PRMR of mothers 30-34 years old (18.9), shown in Figure 5b.

Pregnancy-Related Deaths by Timing of Death

The PAMR process classifies timing of death into categories defined by the three perinatal periods in which PRDs can occur: prenatal, labor and delivery, and postpartum. The postpartum period is divided into two subcategories: postpartum not discharged from the hospital and postpartum discharged from hospital. [See Appendix 1 for detailed definitions]. PRDs by timing of death between 2008–2017 and 2018 are shown in Figure 6.

Figure 6. Distribution of Pregnancy-Related Deaths by Timing of Death, Florida, 2008–2017 (n=406) and 2018 (n=36)

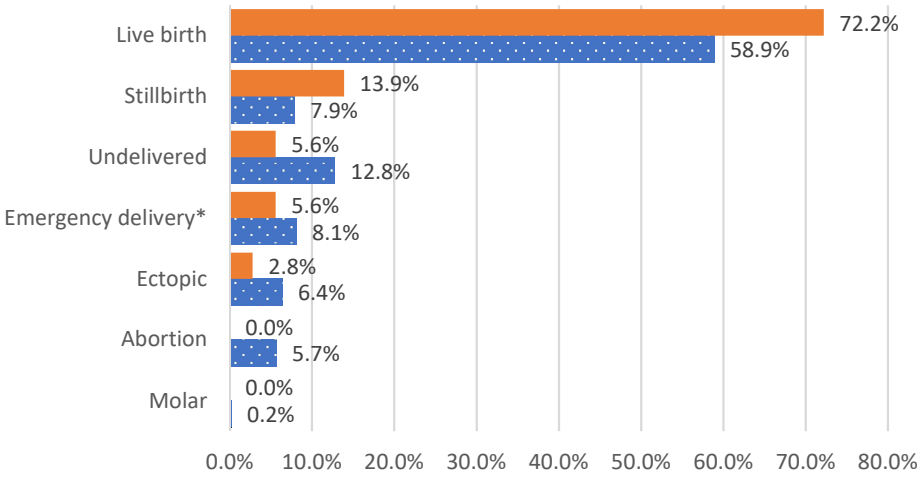


- In 2018, the percentage of deaths during labor and delivery and postpartum discharge were higher than the percentage from 2008–2017. Of special concern are the deaths occurring after discharge.
- In 2018, most PRDs (80.6%) occurred during the postpartum period. There are differences between the causes of death in the postpartum period by hospital discharge status.
    - Of the postpartum PRD cases who were not discharged from the hospital, the PRD causes were: hemorrhage, hypertensive disorder, infection, thrombotic embolism, amniotic fluid embolism, and cardiomyopathy.
    - Of the women who died after hospital discharge: the PRDs that occurred during the first six weeks postpartum were due to infection (three deaths), thrombotic embolism (two deaths), cardiomyopathy (two deaths), cerebrovascular accident (two deaths), cardiovascular problems (one death), depression (one death), other remaining causes (one death), and unknown cause of death (one death).
    - For women who died after six-weeks postpartum and were discharged from the hospital, the causes of deaths were cardiomyopathy (four deaths), hemorrhage (one death), cardiovascular problems (one death), and other remaining causes (one death).

Pregnancy-Related Deaths by Pregnancy Outcome

In the PAMR process, pregnancy outcomes are classified as live birth, emergency delivery, undelivered, ectopic, abortion, and stillbirth. [See Appendix 1 for detailed pregnancy outcome definitions]. Figure 7 below shows PRDs by pregnancy outcome in Florida for 2018 versus 2008–2017.

Figure 7. Distribution of Pregnancy-Related Deaths by Pregnancy Outcome, Florida, 2008–2017 (n=406) and 2018 (n=36)



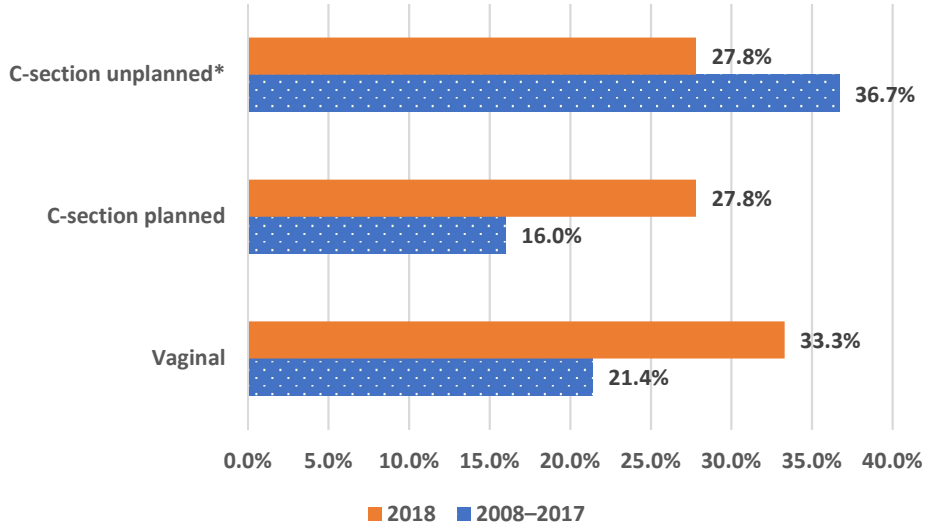
*There were two emergency deliveries in 2018, one was a live birth and one a stillbirth.

- In 2018, the majority (72.2%) of PRDs occurred after a live birth and 13.9% were stillbirth.
- In 2018, there were 69 surviving children of mothers who died of PRDs.

Pregnancy-Related Deaths by Type of Delivery

Type of delivery is classified by PAMR as either vaginal or C-section. C-section deliveries are further defined as planned and unplanned. [See Appendix 1 for type of delivery definitions]. Figure 8 illustrates the PRD distribution by type of delivery for the women who died during the labor and delivery or postpartum periods.

Figure 8. Distribution of Pregnancy-Related Deaths by Type of Delivery, Florida, 2008–2017 (n=406), 2018 (n=36)



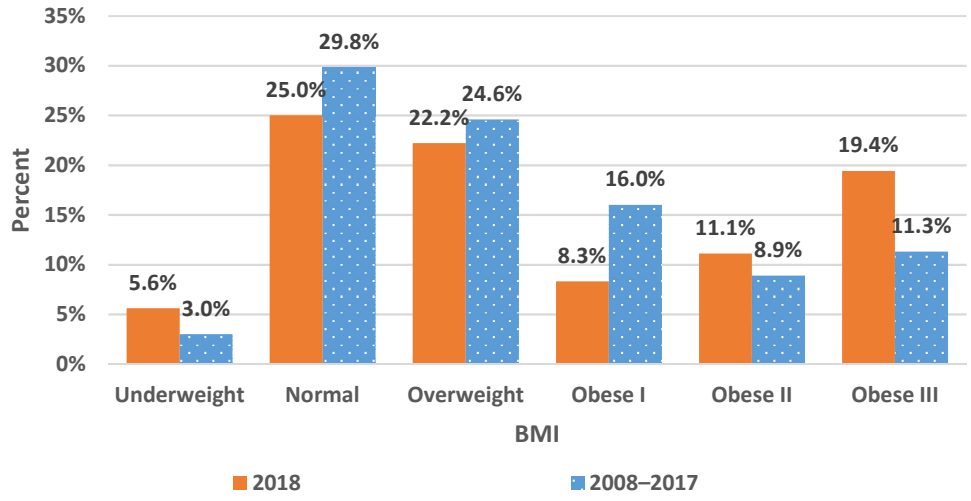
*Of 10 (27.8%) unplanned C-sections, 1 (10.0%) was an emergency delivery.

- In 2018, 55.6% of PRD cases that occurred during the labor and delivery or postpartum periods were by C-section. In comparison, 36.8% of all live births in Florida were C-section deliveries in 2018 (not shown in figure 8) [1].
- Almost 28% of the C-section deliveries among the PRD cases that occurred in 2018 were unplanned.

Pregnancy-Related Death by Pre-pregnancy Body Mass Index

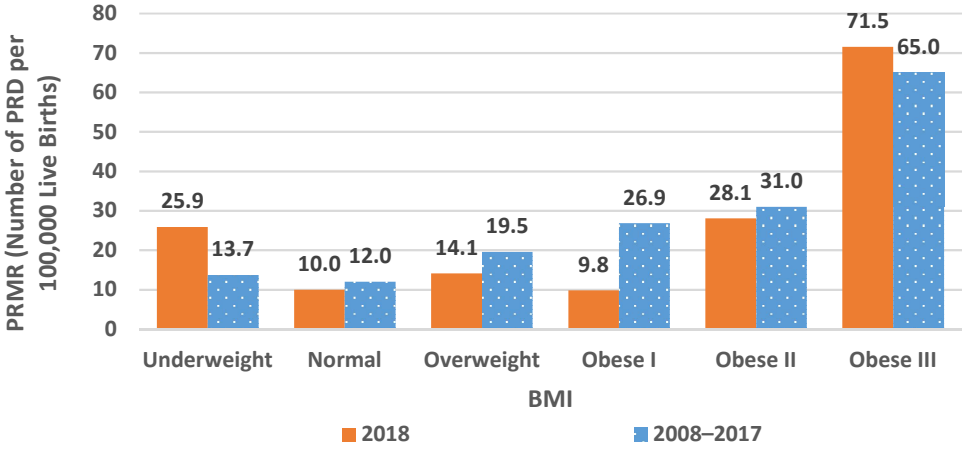
Body mass index (BMI) is a calculated measure of the relative percentage of body fat based on height and weight. PAMR uses the following six BMI categories to examine associations between weight before pregnancy and PRD: underweight, normal weight, overweight, and obese Class I, obese Class II, and obese Class III. [See Appendix 1 for detailed definitions of BMI calculations and BMI categories]. Distributions of PRDs and PRMRs by BMI category are shown in Figures 9a and 9b, respectively.

Figure 9a. Distribution of Pregnancy-Related Deaths by Pre-pregnancy BMI, Florida, 2008–2017 (n=406) and 2018 (n=36)



- In 2018, 61.0% of women who experienced a PRD had overweight/obese (overweight plus the three obese categories) pre-pregnancy BMIs (Figure 9a). Similarly, during the same year, 53.3% of all Florida women who had a live birth were in the overweight/obese pre-pregnancy category (not shown in figure 9a) [1].

Figure 9b. Pregnancy-Related Mortality Ratios (PRMRs) by Pre-pregnancy BMI, Florida, 2008–2017 (n=406) and 2018 (n=36)



- As shown in Figure 9b, in 2018, there were 25.9 maternal deaths per 100,000 live births at the underweight category. The PRMR per 100,000 live births was 10.0 with normal pre-pregnancy BMIs, 14.1 with overweight, and 9.8, 28.1, and 71.5 with obese Class I, Class II, and Class III pre-pregnancy BMIs, respectively.

Assessing Preventability of Maternal Deaths in Florida in 2018

In 2017, Florida PAMR began the transition to implementing the new Maternal Mortality Review Information Application (MMRIA) [2]. MMRIA is an electronic data system designed to support standardized data collection and help Maternal Mortality Review committees organize available data and begin the critical steps necessary to comprehensively identify, access, and abstract cases. The PAMR committee began using the new MMRIA system for PAMR case abstraction and review in 2018. MMRIA developed the following definition of preventability: a death is considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes in patient care. MMRIA allows the committee to document their decision using two approaches: 1) determining preventability as "yes" or "no," and/or 2) determining the chance to alter outcomes using a scale that indicates "no chance," "some chance," or "good chance."

- Good chance: A case with a good chance for an altered outcome would likely have one or more identified factors that contributed to the death (e.g., misdiagnosis, wrong drug, or patient action) so that if the correct diagnosis had been made (or correct drug given or patient action had been different), the fatal course would have been reversed. For a good chance to alter outcomes, there are often obvious deficiencies for which there are clear alternative actions that can be identified retrospectively. The alternative actions would likely target precipitating conditions or actions that either set in motion a cascade of unsuccessful 'catch-up 'or 'salvage' actions or were critical tipping points after which little could have been done.
- Some chance: A case with some chance for an altered outcome would have fewer or weaker contributing factors and fewer or less specific identified quality improvement areas. These cases may parallel cases of women with similar conditions who survived; in that there may be a multitude of factors and actions that *could* have been reversed. However, in these cases, it would have required actions that were beyond what could feasibly be accomplished in that setting or required an uncommon synchronization of corrective actions to have occurred. So, while there is usually something that could have been done to have improved care and possibly reversed the fatal trajectory, the specific actions and their impact are less clear.
- No chance: A case with no chance to alter outcome has no clear point of prevention or intervention identified. In such cases, no intervenable risks were presented and

there were no instances where improved care or alternative actions might have changed the outcome.

Results

Overall, in 2018, 41.7% of PRDs had a good chance to alter the outcome and 27.8% had some chance to alter the outcome for a total of 69.4% of deaths considered to be preventable (Table 3a).

In 2018, five causes of death (infection, hypertensive disorder, depression, other remaining causes, and unknown cause) were deemed to be 100% preventable (good plus some chance), they were followed by hemorrhage (83.3%), thrombotic embolism (75.0%), amniotic fluid embolism (50%), cardiomyopathy (42.9%), and cardiovascular problems (33.3%), shown in Table 3a.

Table 3a. Distribution of Preventability among Pregnancy-Related Death and Cause, Florida, 2018 (n=36)

Cause of PRDs	PRDs with Chance to Alter Outcome			Total	% Preventable
	Good	Some	None		
Cardiomyopathy	0	3	4	7	42.9%
Hemorrhage	5	0	1	6	83.3%
Intrauterine	*4*	*0*	*1*	*5*	*80.0%*
Ectopic	*1*	*0*	*0*	*1*	*100.0%*
Thrombotic embolism	0	3	1	4	75.0%
Infection	4	0	0	4	100.0%
Cardiovascular	0	1	2	3	33.3%
Hypertensive disorder	3	0	0	3	100.0%
Cerebrovascular accident	0	0	2	2	0.0%
Amniotic fluid embolism	1	0	1	2	50.0%
Depression	2	0	0	2	100.0%
Other remaining causes*	0	2	0	2	100.0%
Unknown	0	1	0	1	100.0%
Total	15	10	11	36	69.4%

*Other remaining causes is comprised of various causes of deaths not easily captured with enough numbers in a homogeneous category.

Also, deaths estimated to be preventable varied by timing of death in relation to pregnancy. Women who died during pregnancy, within 42 days, and 43 days to 1 year had 66.7%, 75.0%, and 55.5% of preventability, respectively (Table 3b).

Table 3b. Distribution of Preventability among Pregnancy-Related Death by Timing in Relation to Pregnancy, Florida 2018 (n=36)

Timing	PRDs with Chance to Alter Outcome			Total	% Preventable
	Good	Some	None		
While pregnant	1	1	1	3	66.7%
Within 42 days	9	9	6	24	75.0%
43 days to 1 year	3	2	4	9	55.6%

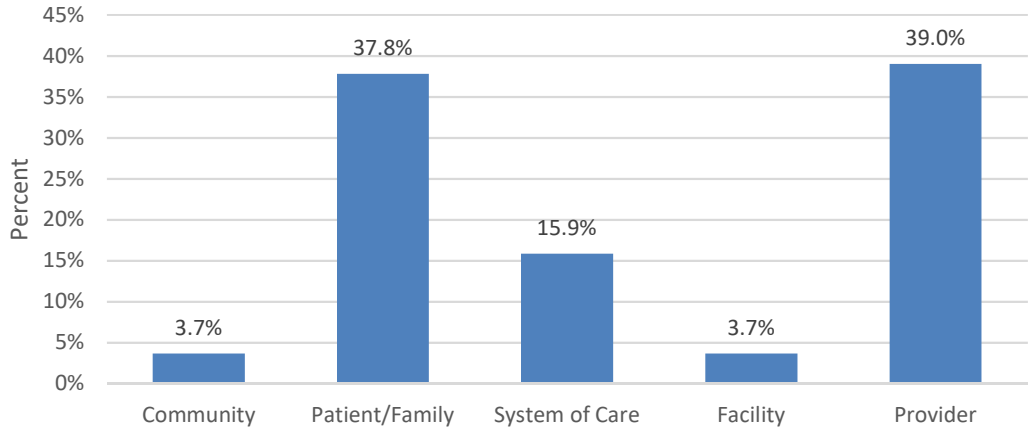
PAMR Identified Factors for PRDs

After reviewing PRD cases, the PAMR committee identifies relevant factors related to each death and makes recommendations to promote system improvements (Appendix 3). The PAMR committee identified factors that contributed to the death. These factors form the basis for the committee recommendations and are categorized into five prevention categories: Community, Patient/Family, System of Care, Facility, and Provider. The following narrative outlines how the PAMR committee used the five categories to classify the recommendations during the 2018 review. A consistent message that has been established is that a woman's health prior to her pregnancy can greatly affect the birth outcome, as well as her health status after birth.

Factor Results

In 2018, the PAMR committee identified 82 contributing factors among 36 PRDs; on average, two contributing factors were identified for each PRD. The largest proportion of factors were classified under the Provider category, followed by the Patient/Family category, and then Systems of Care category (Figure 10).

Figure 10. Distribution of Contributing Factors among Pregnancy-Related Deaths, Florida, 2018 (n=36)



The categories and numbers of contributing factors vary by cause of PRD (Table 4). The causes of death with the most contributing factors per death were depression, infection, and hypertensive disorders.

Table 4. Cause of Death by Contributing Factor Category, Florida, 2018 (n=36)

Cause of Death	Contributing Factors							
	Community	Patient/Family	Systems of Care	Facility	Provider	Total Factors	Pregnancy-Related Deaths	Factors per Death
Cardiomyopathy		5	1		5	11	7	1.6
Hemorrhage	1	6	3		7	17	6	2.8
Thrombotic embolism	1	2			3	6	4	1.5
Infection	1	3	3		6	13	4	3.3
Cardiovascular		5	1			6	3	2.0
Hypertensive disorder		3		3	4	10	3	3.3
Cerebrovascular accident		1			1	2	2	1.0
Amniotic fluid embolism		1			2	3	2	1.5
Depression		2	4		2	8	2	4.0
Other remaining causes*		2			2	4	2	2.0
Unknown		1	1			2	1	2.0
Total	3	31	13	3	32	82	36	2.3

*Other is comprised of various causes of deaths not easily captured with enough numbers in a homogeneous category.

For each of the leading causes of PRDs, a summary of the most common contributing factor categories and the most common contributing factor classes is presented (Appendix 3).

Cardiomyopathy

- Provider factors accounted for 45.5% of the total contributing factors for cardiomyopathy deaths. The most common class categories for Provider factors were assessment, delay of diagnosis, and delay of treatment.
- Patient/Family factors comprised 45.5% of the total contributing factors for cardiomyopathy deaths. The most common class category for Patient/Family factors was chronic disease.

Hemorrhage

- Provider factors accounted for 41.2% of the total contributing factors for hemorrhage deaths. The most common class categories for Provider contributing factors were assessments, delay of treatment, and care coordination referrals.
- Patient/Family factors comprised 35.3% of the total contributing factors for hemorrhage deaths. The most common class categories for Patient/Family contributing factors were delayed seeking care, lack of patient knowledge, and lack of social support.
- System of care factors accounted for 17.6% of the total contributing factors for hemorrhage deaths. The most common class categories for System of Care contributing factors were lack of standardized policies and procedures and lack of care coordination.

Thrombotic Embolism

- Provider factors accounted for 50% of the total contributing factors for thrombotic embolism deaths. The most common class categories for Provider contributing factors were assessment and delay of diagnosis.
- Patient/Family factors comprised 33.3% of the total contributing factors for thrombotic embolism deaths. The most common class category for Patient/Family contributing factors was significant co-morbidity.

Infection

- Provider factors accounted for 46.2% of the total contributing factors for infection deaths. The most common class categories for Provider contributing factors were assessment, delay of diagnosis, and delay of treatment.
- Patient/Family factors comprised 23.1% of the total contributing factors for infection deaths. The most common class categories for Patient/Family contributing factors were significant comorbidity and delay in seeking care.
- System of Care factors comprised 23.1% of the total contributing factors for infection deaths. The most common class categories for System of Care contributing factors were lack of patient knowledge, delay of diagnosis, and inadequate records.

Cardiovascular (Excluding Cardiomyopathy)

- Patient/Family factors comprised 83.3% of the total contributing factors for deaths due to cardiovascular problems. The most common class categories for Patient/Family contributing factors were significant comorbidity, lack of patient knowledge, and delay in seeking care.
- System of Care factors comprised 16.7% of the total contributing factors for cardiovascular deaths. The most common class category for System of Care contributing factors was lack of care coordination.

Hypertensive Disorders

- Provider factors comprised 40.0% of the total contributing factors for hypertensive disorder deaths. The most common class category for Provider contributing factors were delay of treatment, delay of diagnosis, and clinical skill.
- Patient/Family factors comprised 30.0% of the total contributing factors for hypertensive disorder deaths. The most common class categories for Patient/Family contributing factors were significant comorbidity, chronic disease, and adherence to medical recommendations.
- System of Care factors comprised 30.0% of the total contributing factors for hypertensive disorder deaths. The most common class category for System of Care contributing factors were lack of protocol and lack of standard policy for the treatment of preeclampsia.

Disclaimers:

- The purpose of identifying contributing factor categories and classes is not to assign blame but rather to identify areas where improvements can be made.
- The contributing factors decisions are largely dependent upon information abstracted from medical records. Such records lend themselves to the perspective of the Provider, Facility, and Systems of Care categories. However, the Patient/Family perspective is often interpreted through the Provider lens which limits full understanding. Future incorporation of geospatial coding can enhance our understanding of the Patient/Family and Community contexts by taking into consideration predominant social determinants of health in the community in which the woman lived and received care.

PAMR Recommendations and Actions That Address the Contributing Factors

The PAMR committee identified 63 recommendations among 36 pregnancy-related deaths; on average, almost two recommendations were identified for every PRD. This report used the themes included in the “Report from Nine Maternal Mortality Review Committees,” to address the recommendations [3]. These are the most common themes and their recommendations.

Improve Training/Education:

- Provide education to certifiers of maternal death certificates on the importance of accurately marking the pregnancy check box on death certificates.
- Promote health literacy for patients with chronic conditions and their families.
- Provide education to women on the potential complications in early pregnancy and when to seek emergency care.
- Provide education to the community to stress the importance of getting prenatal care early and often during pregnancy.
- Provide education to women to seek care immediately when experiencing unrelenting postpartum headaches.
- Providers need training in mental health conditions and pregnancy.

Enforce policies and procedures:

- Providers should follow the Maternal Early Warning System (MEWS) guidelines for early recognition of patient deterioration.
- Adopt levels of maternal care/ensure appropriate level of care determination
- Providers should follow the shared decision-making model for patients with complex health conditions.
- High-risk women should be seen within 1-2 weeks for their postpartum follow-up visit.
- Ensure care coordination and follow-up for high-risk patients.

Improve access to quality care:

- Encourage women to obtain prenatal care as soon as possible (especially if high-risk) and to keep all appointments.
- Encourage use of a prenatal passport to promote continuity of care.
- Pregnant women who are incarcerated should have an assigned Medicaid provider upon their release.
- High-risk women of reproductive age should receive preconception and inter-conception care for family planning.

Improve patient/provider communication:

- Providers need to emphasize to patients the importance of adhering to medical care and treatment recommendations.
- Providers and health services should establish alternative mechanisms for contacting patients, such as text messaging.
- Providers should establish a process for follow-up when patients miss their appointments.
- Providers should discuss all available pregnancy options with their patients.

Improve standards regarding assessment, diagnosis, and treatment decisions:

- Obstetric providers should consider a baseline echocardiogram (ECHO) in morbidly obese patients.
- Providers should have a plan to taper steroid use in the postpartum period.

- Providers should be aware of proper C-section incision placement for women with placenta previa.
- Providers should review proper cardiopulmonary resuscitation techniques for pregnant women.

Improve policies regarding prevention initiatives including screening procedures and substance use prevention or treatment programs:

- Continued support from Healthy Start services and other support services is needed for women with high postpartum depression screening score.
- Encourage women to be at their optimal weight and overall health before pregnancy.
- Encourage substance abusing women to access treatment programs especially when pregnant
- Providers should follow the American College of Obstetricians and Gynecologists (ACOG) recommendations to do depression screening and assessments on pregnant patients.
- Providers should have training in mental health conditions and pregnancy

Improve access to medical records:

- PAMR abstractor should have access to complete medical records.
- Records should be available to all providers mutually caring for patients (especially high-risk patients).

Improve autopsy referral/acceptance:

- Unexplained maternal deaths should have an autopsy performed.

Committee Recommendations Related to the Leading Causes of Death

Also outlined are the PAMR committee's specific recommendations related to six leading causes of PRD for the year 2018: cardiomyopathy, hemorrhage, thrombotic embolism, infection, hypertensive disorders, and cardiovascular problems.

The PAMR committee identified 63 recommendations among 36 pregnancy-related deaths; on average, almost two recommendations were identified for every PRD. This report used the themes included in the "Report from Nine Maternal Mortality Review Committees," to address the recommendations [3]. These are the most common themes and their recommendations.

Cardiomyopathy

Improve training:

- Providers should educate high risk women on cardiovascular warning signs.
- Providers should have heightened awareness of cardiac symptoms, syncope/short of breath, and the need for an ECHO.

Improve procedures related to communication and coordination between providers:

- Obstetric providers should refer patients with a reported cardiac condition or significant family history to a cardiologist during prenatal care and postpartum.

Hemorrhage

Improve access to care:

- All women of reproductive age should seek immediate medical care when having severe abdominal pain.

Improve standards regarding assessment, diagnosis, and treatment decisions:

- Providers should consider more aggressive management for massive hemorrhage, such as a hysterectomy.
- Providers should use an ultrasound to help guide the uterine incision for women with previous uterine surgeries.
- Providers should follow maternal early warning signs for timely assessment and diagnosis of hemorrhage.
- Providers should follow ACOG recommendations for management of postpartum hemorrhage including quick initiation of a massive transfusion protocol and progression to hysterectomy.
- Providers should consider more aggressive interventions when patients are not improving with postpartum hemorrhage treatment.

- Providers should assess response to medical treatment and perform hysterectomy if patients are not improving.
- Providers should consider an ultrasound of the uterus to perform adequate evaluation with a postpartum hemorrhage.
- Providers should consider a diagnosis of gestational trophoblastic disease in a persistent postpartum hemorrhage.

Infection

Improve training:

- Provide education to providers about Group A Streptococcal sepsis.

Enforce policies and procedures:

- Electronic medical records system should utilize hard-stop for sepsis alert.

Improve standards regarding assessment, diagnosis, and treatment decisions:

- Women should be treated within one hour when sepsis is suspected.
- Providers should assess and monitor patients for signs of sepsis during a prolonged induction.

Thrombotic Embolism

Improve standards regarding assessment, diagnosis, and treatment decisions:

- Women at high risk for deep vein thrombosis (DVT) (obesity, post-op) should receive prophylaxis treatment for DVT.
- Providers should consider DVT chemoprophylaxis in morbidly obese patients and patients with multiple risk factors, such as cesarean delivery.

Hypertensive Disorders

Enforce policies and procedures:

- Providers should adopt and adhere to hospital guidelines or Florida Perinatal Quality Collaborative hypertension in pregnancy (HIP) guidelines for hypertension crisis management and treatment.
- Providers in urgent care and emergency room (ER) settings should treat hypertensive pregnant and postpartum women within one hour.

- Urgent care facilities and ERs should have systemwide protocols in place for the management and treatment of pregnant and postpartum hypertensive patients.
- Facilities should develop protocols and policies that follow ACOG guidelines for the management of hypertension in pregnancy.
- Patients should adhere to medical advice for delivery and be aware of significance of preeclampsia.
- Providers should review ACOG guidelines for the management and treatment of women with prolonged labor and preeclampsia.

Improve procedures related to communication and coordination between providers:

- Patients with chronic hypertension and superimposed preeclampsia should have a maternal fetal specialist referral or referral to a high-level facility.

Improve standards regarding assessment, diagnosis, and treatment decisions:

- Aspirin should be utilized for preeclampsia prophylaxis during prenatal care.
- Providers should follow ACOG guidelines for management of hypertension in pregnancy, i.e., inpatient observation and management until delivery once preeclampsia is diagnosed.

Cardiovascular Problems

Improve standards regarding assessment, diagnosis, and treatment decisions:

- Women with chronic cardiac issues should follow up with a cardiologist as scheduled.

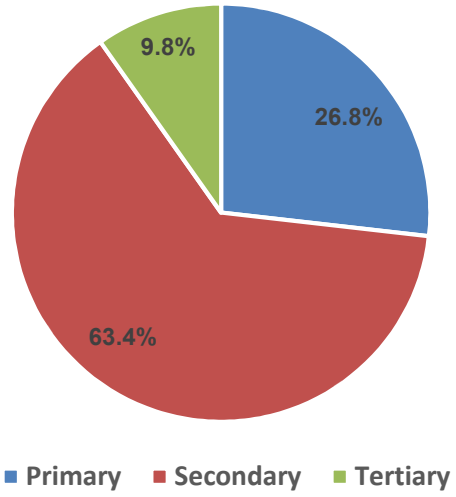
Anticipated Impact of Actions if Implemented

The PAMR committee captures information in MMRIA in two ways related to the level of impact their recommendations would reach if implemented. First, the committee assigns a specific level of prevention to each recommendation. The committee determines whether, if implemented, the action would result as primary prevention (actions that prevent the contributing factor before it occurs), secondary prevention (actions that reduce the impact of a contributing factor once it has occurred), or tertiary prevention (actions that reduce the impact or progression of what has become an ongoing contributing factor).

Second, each specific committee recommendation is assigned an expected level of impact if the recommendation was implemented, ranging from small to giant.

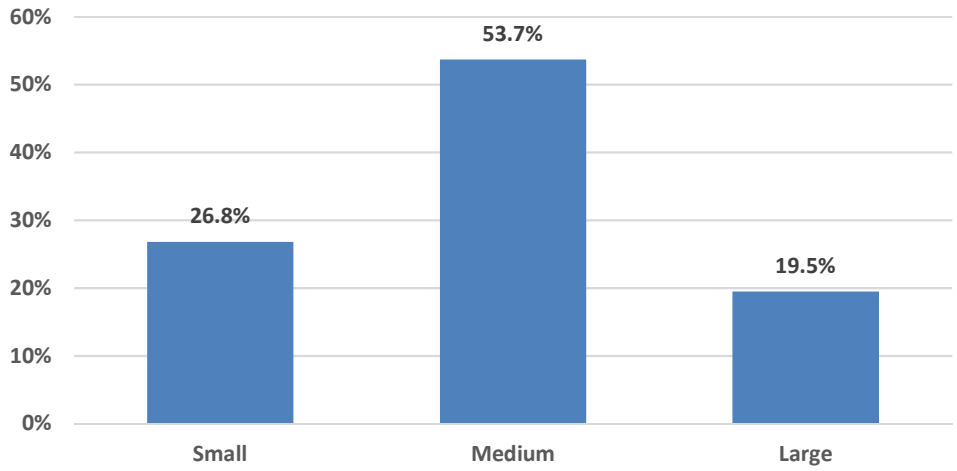
There were 41 responses related to the level of prevention, and 41 responses to the level of impact. Most of the recommendations were identified as secondary prevention (63.4%), followed by primary prevention (26.8%), and 9.8% of recommendations were identified as tertiary prevention (Figure 11).

Figure 11. Level of Prevention for Recommendations, Florida, 2018 (n=36)



The level of impact if the recommendation is implemented was estimated to be medium in 53.7% of the recommendations, 26.8% were small, and 19.5% were large. In 2018 there were no recommendations in the extra-large or giant levels of impact (Figure 12).

Figure 12. Level of Impact if Action Implemented, Florida, 2018 (n=36)



Conclusion

The death of a woman due to pregnancy is a loss to the family, community, state, and nation. Florida has been actively conducting ongoing surveillance of maternal mortality cases since 1996. To date, a multidisciplinary PAMR committee of maternal child specialists has reviewed almost 3,000 pregnancy-associated cases. The committee carefully and respectfully considers each case before they identify issues and make recommendations.

Non-Hispanic Black women were two times as likely to have PRDs compared to non-Hispanic White women. Although not statistically significant, this 2018 report shows a continuous decrease in the disparity in PRDs between non-Hispanic Black and non-Hispanic White women.

The Healthy People goal for 2020 is to reduce the rate of maternal mortality to 11.4 maternal deaths per 100,000 live births [4]. Florida's pregnancy-related ratio from 2008–2018 averaged 18.2 deaths per 100,000 live births; therefore, much work is still needed to meet the Healthy People goal.

Current Actions Implemented

Florida's PAMR findings and recommendations are proposed to address risk factors among individuals, communities, clinical, and health care systems not only to reduce

maternal deaths but to consequently improve maternal morbidity. The Department collaborates with diverse public and private organizations to pursue multifaceted approaches to moving recommendations into tangible actions.

Community, Patient/Family, Provider, and System of Care

In response to the increasing number of pregnancy-associated deaths related to substance use, the Department and the FPQC are implementing a quality improvement initiative that focuses on the maternal side of opioid use. The Maternal Opioid Recovery Effort (MORE) Initiative launched in November 2019 with 23 Florida hospitals participating. The MORE Initiative focuses on identifying women with opioid use disorder (OUD) so that comprehensive coordinated care, including linkage to medication-assisted therapy, behavioral health therapy, and contraceptive choice counselling, can be achieved as early in the pregnancy as possible. The goal of the MORE Initiative is to increase the percent of pregnant women with OUD who receive recommended screening, prevention, and treatment services. The initiative focuses on standardizing OUD screening, prevention, treatment, comprehensive discharge planning, and hospital policies and procedures. The MORE Initiative will end in June 2021.

In 2017, the FPQC, in partnership with the Department, launched the Promoting Primary Vaginal Deliveries (PROVIDE) Initiative to address the primary C-section delivery rate among nulliparous, term, singleton, vertex (NTSV) pregnancies in Florida. The PROVIDE Initiative aimed to improve maternal and newborn outcomes by applying evidence-based interventions to promote primary vaginal deliveries and reduce NTSV rates. Primary C-section deliveries are a major contributor to the large increase in C-section delivery rates over the past two decades. A C-section birth increases the risk of hemorrhage, infection, uterine rupture, abnormal placentation, cardiac events, and psychological stress. C-section deliveries are also associated with longer hospital stays, increased pain, and increased postpartum hospital re-admissions. Forty-five Florida hospitals signed up to participate in the initiative. The first round of the PROVIDE Initiative ended in June 2019. Due to overwhelming demand from the majority of participating hospitals, upcoming changes in Medicaid Managed Care Plans, and the Joint Commission’s plan to publish hospital NTSV C-section rates, the FPQC expanded the initiative and launched PROVIDE 2.0. The PROVIDE 2.0 Initiative will continue

through June 2021. There are currently 77 hospitals participating in the initiative, including over 40 hospitals from the first round.

The Department contracted with the FPQC in 2017 to implement a Postpartum Long-Acting Reversible Contraceptives (LARC) quality improvement initiative. The purpose of the initiative is to work collaboratively with maternal health care providers and hospitals to develop and implement policies to improve the use of LARC methods at delivery among postpartum women to reduce the number of unintended pregnancies. Unintended or closely spaced pregnancies can result in delayed initiation of prenatal care and poor pregnancy outcomes for mother and baby. LARCs include copper or hormonal intrauterine devices (IUDs) and the progestin arm implant. LARCs are safe and highly effective in preventing unintended pregnancies and can be given to women immediately after delivery.

The FPQC, with support of the Department, began the Birth Certificate Accuracy Initiative (BCI) to improve the accuracy of data reported on Florida birth certificates. Birth certificates are an invaluable source of information for assessing the risks of maternal and infant health outcomes; having complete and accurate data is necessary. The BCI quality improvement initiative launched in 2017 with nine participating hospitals. Each hospital audits 10 randomly selected charts each month to determine if 22 key birth certificate variables match the information from the hospital's medical record. The FPQC provides training materials, tools, and resources to support the hospitals in implementing best practices to improve data reporting and accuracy. The initiative ended in 2019; however, in 2020, the FPQC began offering regional birth certificate training workshops for interested hospital staff.

Community and Patient/Family

A recurring recommendation from Florida's PAMR committee is the importance of women achieving optimal health and control of chronic diseases prior to pregnancy. Florida's Healthy Start Program, administered by the Department statewide, provides support services for pregnant women, infants, and children to age three. In 2014, the Department added interconception care services (ICC) as a core component to the Healthy Start program. ICC services are provided to women who have had a pregnancy and are at high risk of having a poor birth outcome for a subsequent pregnancy.

Reasons for a high-risk determination may be a previous fetal or infant loss; a low birth weight or pre-term baby; a chronic maternal disease such as hypertension, obesity, or diabetes; previous pre-eclampsia or eclampsia; previous gestational diabetes; substance use or abuse; depression; or any other condition that could result in a poor birth outcome.

Provider

The PAMR committee formed an Action Subcommittee in September 2015 to focus on fine tuning and rapidly and widely distributing its recommended messaging for professional, clinical, and community organizations through multiple communication venues. The Action Subcommittee developed a series of Urgent Maternal Mortality Messages (UMMMs) on topics that are relevant to preventing maternal deaths. The first UMMM focused on placental disorders and hemorrhage. The second UMMM focused on risk factors, diagnosis, and treatment for peripartum cardiomyopathy (Appendix 5). The third UMMM is about the need for hospitals to implement a Maternal Early Warning System (MEWS). Deterioration of the clinical condition of a maternity patient can occur rapidly and lead to tragic consequences if adverse signs are not recognized early. Having a MEWS in place can help facilitate timely recognition, diagnosis, and treatment for women developing critical illness [5]. Recently, members of the PAMR Action Subcommittee and the FPQC developed a new UMMM on maternal opioid use. It is common for obstetric providers and hospitals to be the first and sometimes only health care contact for most mothers with OUD. The Opioid Use During Pregnancy UMMM emphasizes the need for obstetric providers to lead the effort to screen, assess, and refer women for appropriate treatment, while continuing to provide obstetrical care. The mixture of these efforts highlights the PAMR committee's emphasis on actively improving maternal outcomes through the evaluation of maternal mortality cases, the development of expert recommendations, and the innovative translation of recommendations into effective actions.

Appendix 1 – Definitions

- *Body mass index (BMI)* - a calculated measure of the relative percentage of body fat based on height and weight.
    - *Formula for BMI calculation: BMI = (weight (pounds)/height (inches)* ^{2}*) x 703*
    - *BMI Classifications and Value Ranges for Adults (ages 20 or older):*
        - Underweight: BMI <18.5
        - Normal Weight: BMI 18.5 - 24.9
        - Overweight: BMI 25.0 - 29.9
        - Obese Class I: BMI 30.0 - 34.9
        - Obese Class II: BMI 35.0 - 39.9
        - Obese Class III: BMI 40.0 or more
- *Pregnancy-associated death (PAD)* - a death of a woman from any cause, while she is pregnant or within one year of termination of pregnancy, regardless of the duration and site of pregnancy.
- *Pregnancy-related mortality ratio (PRMR)* - number of pregnancy-related deaths per 100,000 live births; a measure of maternal mortality.
- *Pregnancy-related death (PRD)* - a death of a woman that is directly attributed to pregnancy and/or childbirth.
- *Pregnancy outcome*
    - *Spontaneous abortion or miscarriage* – is the loss of a pregnancy without outside intervention before 20 weeks' gestation.
    - *Abortion* – a procedure to end a pregnancy. Medicinal and surgical methods are used to remove an embryo or fetus and placenta from the uterus [6].
    - *Ectopic* – occurs when the fertilized egg grows in an abnormal place outside the uterus, usually in the fallopian tubes [6].
    - *Emergency delivery* – an unplanned, emergency C-section delivery due to deteriorating maternal or fetal status. The outcome could be a live birth or fetal death/stillbirth [7].
    - *Postmortem/perimortem C-section* – an unplanned, emergency C-section delivery that is conducted shortly after a maternal death or during the maternal death process [8].
    - *Live birth* – the complete expulsion or extraction from the mother of a product of human conception that shows evidence of life after expulsion/extraction [7].
    - *Molar (also known as hydatidiform mole)* – a noncancerous (benign) tumor that develops in the uterus. A molar pregnancy starts when an egg is

fertilized, but instead of continuing to the stages of a viable pregnancy, the placenta develops into an abnormal mass of cysts [9].

- *Stillbirth* – death of a fetus before the complete expulsion or extraction from the mother irrespective of the duration of pregnancy; the death is indicated by the fact that after expulsion or extraction, the fetus does not show any evidence of life [6].
- *Undelivered* – a woman that dies before delivering or the extraction of her fetus [6].

- *Timing of death* - perinatal period in which PRDs occur; three main classifications:
  - *Prenatal PRD* – occurs between conception and birth.
  - *Labor and Delivery PRD* – occurs between the start of the delivery process and ends when the mother leaves the delivery room.
  - *Postpartum PRD* – occurs during the period after labor and delivery and up to one year after delivery or termination of pregnancy. The Postpartum PRD classification has two sub classifications:
    - *Postpartum – Not discharged from the Hospital/Health Facility PRD* – occurs in the postpartum period after delivery or termination of pregnancy and before discharge from the hospital/birth facility.
    - *Postpartum – Discharged from Hospital/Health Facility PRD* – occurs in the postpartum period after delivery/termination of pregnancy and after discharge from a hospital or health facility up to one year after the delivery/termination event.
- *Type of delivery*
  - *Cesarean Section (C-section)* – an assisted delivery procedure where an infant or fetus is delivered through surgical incisions made in the abdomen and the uterus [10].
  - *Vaginal* – delivery of an infant or fetus through the vaginal canal.

Appendix 2 – PAMR Case Selection Process for Committee Review

The PAMR process begins with collecting data for all Florida resident deaths associated with pregnancy. A pregnancy-associated death (PAD) is defined as a death of a woman from any cause, while she is pregnant or within one year of termination of pregnancy, regardless of the duration and site of pregnancy.

The Florida Department of Health Bureau of Family Health Services has implemented a process of data linkages to maximize the identification of PADs. This enhanced surveillance system fosters improved case identification when compared with a more limited process utilized by the Bureau of Vital Statistics also at the Department.
Cases are included in the listing of PADs if any of the following four criteria are met:

1) The response on the death certificate is “yes” to the question: “If female, was she pregnant in the past year?”
2) The International Classification of Diseases (ICD) diagnosis code indicates a death classified as being due to “Pregnancy, Childbirth, and the Puerperium.”
3) There is a matching birth or fetal death record within 365 days prior to the woman’s death.
4) There is a matching Florida universal prenatal screening tool, which is used to identify and assess pregnant women at risk for adverse birth outcomes, within 365 days prior to the woman’s death.

A pregnancy-related death (PRD) is a PAD which resulted from 1) complications of the pregnancy itself, 2) the chain of events initiated by the pregnancy that led to death, or 3) aggravation of an unrelated condition by the physiologic or pharmacologic effects of the pregnancy that subsequently caused death. A possible PRD is a PAD where determination of the death could not be conclusively classified as either related or not related to the pregnancy. PADs due to a cause deemed unrelated to pregnancy are classified as not pregnancy-related.

Quarterly, the PAMR case selection committee, composed of PAMR committee members (an obstetrician, a nurse, PAMR data manager, and a PAMR coordinator), reviews ascertained pregnancy-associated cases by cause of death and timing of the death in relation to the ending of the pregnancy, to categorize the cases as pregnancy-related, possibly pregnancy-related, or not pregnancy-related. The pregnancy-

associated cases categorized as either pregnancy-related or possibly pregnancy-related are submitted for record abstraction and subsequent review by the full PAMR committee. Abstraction and review preference is given to death cases categorized as pregnancy-related. If there are fewer than 15 PRDs in a given quarter to review, case selection, abstraction and review of “possibly pregnancy-related” and “not pregnancy-related” cases may occur.

For additional details of the PAMR case ascertainment process, see the following: Burch D, Noell D, Hill WC, Delke I. Pregnancy-associated mortality review: the Florida experience. Semin Perinatol. 2012; 36: 31-6.

Appendix 3 – Issues for the Committee Review

MMRIA — **MATERNAL MORTALITY REVIEW COMMITTEE DECISIONS FORM vi4**

COMMITTEE DETERMINATION OF PREVENTABILITY

A death is considered preventable if the committee determines that there was at least some chance of the death being averted by one or more reasonable changes to patient, family, provider, facility, system and/or community factors.

WAS THIS DEATH PREVENTABLE?	☐ YES	☐ NO
CHANCE TO ALTER OUTCOME?	☐ GOOD CHANCE ☐ NO CHANCE	☐ SOME CHANCE ☐UNABLE TO DETERMINE

CONTRIBUTING FACTORS

What were the factors that contributed to this death? Multiple contributing factors may be present at each level.

CONTRIBUTING FACTOR LEVEL	CONTRIBUTING FACTOR AND DESCRIPTION OF ISSUE
PATIENT/FAMILY	
PROVIDER	
FACILITY	
SYSTEM	
COMMUNITY	

RECOMMENDATIONS OF THE COMMITTEE

If there was at least some chance that the death could have been averted, what were the specific and feasible actions that, if implemented or altered, might have changed the course of events?

RECOMMENDATIONS OF THE COMMITTEE	LEVEL OF PREVENTION (SEE BELOW)	LEVEL OF IMPACT (SEE BELOW)

CONTRIBUTING FACTOR KEY (DESCRIPTIONS ON PAGE 4)

- Delay
- Adherence
- Knowledge
- cultural/religious
- Environmental
- Violence
- Mental health conditions
- Substance use disorder alcohol, illicit/prescription drugs
- Tobacco use
- Chronic disease
- Childhood abuse/ trauma
- Access/financial
- Unstable housing
- Social support/ isolation
- Equipment/ technology
- Policies/procedures
- Communication
- Continuity of care/ care coordination
- Clinical skill/ quality of care
- Outreach
- Enforcement
- Assessment
- Legal
- Other

PREVENTION LEVEL

- PRIMARY: Prevents the contributing factor before it ever occurs
- SECONDARY: Reduces the impact of the contributing factor once it has occurred (i.e. treatment)
- TERTIARY: Reduces the impact or progression of an ongoing contributing factor once it has occurred (i.e. management of complications)

EXPECTED IMPACT LEVEL

- SMALL: Education/counseling (community- and/or provider-based health promotion and education activities)
- MEDIUM: Clinical intervention and coordination of care across continuum of well-woman visits through obstetrics (protocols, prescriptions)
- LARGE: Long-lasting protective intervention (improve readiness. recognition and response to obstetric emergencies/LARC)
- EXTRA LARGE: Change in context {promote environments that support healthy living/ensure available and accessible services)
- GIANT: Address social determinants of health (poverty, inequality. etc.)

Appendix 4 – Florida Pregnancy Associated Mortality Review Members, 2018

PAMR committee Co-Chairs
Shay Chapman, BSN, MBA – Chief, Bureau of Family Health Services, Title V MCH Director, DOH

Robert Yelverton, MD – Florida District XII American Congress of Obstetricians and Gynecologists (ACOG)

PAMR Coordinator
Angela Thompson, RN, BSN – Nursing Consultant, Maternal & Child Health Section, DOH, current coordinator

PAMR Lead Abstractor
Danielle Noell, ARNP, NNP, BC, MSN – PAMR Facilitator & Abstractor, DOH

PAMR committee Review Members
Sarah Beard, RN, BSN – Maternal and Child Health (MCH) Program Administrator, MCH Section, DOH

Estrellita "Lo" Berry, MA, LTFP – President, REACHUP Inc.

Deborah Burch, DNP, RN – PAMR Abstractor, DOH

Gene Burkett, M.D – Professor, University of Miami, Division of Maternal-Fetal Medicine, Department of Obstetrics and Gynecology

Anthony Clark, MD – Medical Examiner**,** KWB Pathology Associates; Medical Examiner's Commission

Mary Kaye Collins, CNM, MN, JD, FACNM – Assistant Professor, Nursing, Indian River State College; American College of Nurse-Midwives

Carol Cox, MD – University of Florida, Department of Obstetrics and Gynecology

Isaac Delke, MD – Professor and Medical Director, University of Florida, College of Medicine; ACOG

Cole Greves, MD – Clinical Perinatologist, Winnie Palmer Hospital, Orlando Health

Christine Hackshaw, CNM, ARNP – American College of Nursing-Midwives

Karen Harris, MD, **MPH** – Ob/Gyn Program Director, HCA/UCF Consortium Gainesville

Leticia Hernandez, PhD, **MS** – MCH Epidemiologist, Maternal & Child Health Section, DOH

Washington Hill, MD – Emeritus

Carolyn Holland, MD, MEd – Department of Emergency Medicine, University of Florida (UF) Health Shands

Jane Murphy, MPA – Executive Director, Healthy Start Coalition of Hillsborough County

Candace Rouse, RNC, DNP, CNS-BC – Clinical Nurse Specialist, UF Shand's Hospital

Kay Roussos-Ross, MD – Assistant Professor, Department of Obstetrics and Gynecology and Psychiatry, UF Health

William Sappenfield, MD, MPH – Professor & Chair, College of Public Health, Chair Lawton and Rhea Chiles Center/University of South Florida

Anna Varlamov, MD – Ob/Gyn Hospitalist, Winne Palmer Hospital; Maternal Mortality Committee Chair, ACOG

Appendix 5 – Urgent Maternal Mortality Messages to Providers

Hemorrhage **is the leading cause of Pregnancy-Related maternal death in Florida. (1)**

Placental disorders **(including placenta previa, accreta/increta/percreta) accounted for 21% of hemorrhage related deaths > 20 weeks gestation. (1)**

With the rising cesarean rate, **the incidence of placenta accreta has increased. (2)**

Urgent Maternal Mortality Message to Providers

Diagnosis is essential before delivery

- If placental disorder suspected, get a Maternal-Fetal Medicine consultation.
- Ultrasonography with supplemental MRI when necessary.
- No imaging modality is perfect. If you suspect an issue—transfer to tertiary facility.

Risk factors

- Discuss pregnancy and delivery risks with patient and family.
- The risk of accreta increases with repeat cesarean sections, myomectomy, presence of placenta previa, multiparity, repetitive dilation and curettages and with advanced maternal age.
- A low lying anterior placenta may be ominous with multiple prior cesarean sections.

Readiness

- Develop and discuss with the patient, family and hospital staff an individual delivery plan.
- Consider early transfer to a tertiary center for access to sufficient blood bank supply and subspecialties.
- Let patients know there is a high risk for bleeding due to placental disorders that can occur after having multiple cesarean sections.
- Contingency plan should be made for emergency delivery.
- Implementation of hemorrhage protocols in all Florida delivery hospitals is essential, and should include a massive transfusion protocol, simulation drills and hemorrhage carts. For details on implementing a hemorrhage initiative see Florida Perinatal Quality Collaborative' s Toolkit. (3)

Essential elements of delivery plan

- Preoperative counseling regarding risks.
- Timing of admission and delivery: see ACOG guidelines, may vary if patient unstable.
- Consult with neonatologist regarding corticosteroid administration, if applicable.
- Place blood bank on alert for potential massive transfusion protocol.
- When delivery is scheduled, discuss timing with a multispecialty team to optimize expert surgical and anesthesia assistance .
- Do not try to remove the placenta. Hysterectomy is usually the best option.
- If you have called for help and cannot control the bleeding surgically, compress the aorta or uterine vessels while waiting for help to arrive.

For more information, contact:
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Florida HEALTH

1. Florida Department of Health. Pregnancy-Associated Mortality Review. Pregnancy-Related Deaths Due to Hemorrhage, 1999-2012. http://www.floridahealth.gov/statistics-and-data/PAMR/_documents/Pregnancy-Related%20Deaths%20Due%20to%20Hemorrhage,%201999-2012%20Brief.pdf
2. ACOG Committee Opinion Number 529, Placenta Accreta (July 2012). Reaffirmed 2014. http://www.acog.org/Resources-And-Publications/Committee-Opinions/Committee-on-Obstetric-Practice/Placenta-Accreta
3. Florida Perinatal Quality Collaborate. Obstetric Hemorrhage Initiative Toolkit (v. 12/2014). http://health.usf.edu/NR/rdonlyres/0506A40D-E89A-4A18-AB4F-B4045F6E5FD4/0/FLDHITooliktv122014.pdf
4. Florida Pregnancy Associated Mortality Review 2013 Update.

Urgent Maternal Mortality Message to Providers

Consider echocardiogram in pregnant or postpartum patients with persistent moderate or severe respiratory symptoms. Initial presentation of PPCM can be mistaken for upper respiratory illnesses. Pregnancy Associated Mortality Review (PAMR) findings.

Florida PAMR Findings:[1,8]

1999–2017: 10.4% of pregnancy-related deaths in Florida were due to cardiomyopathy

1999–2017: 75.5% of pregnancy-related deaths occurred during the postpartum period

From 2009–2017:

- The percent of pregnancy-related deaths due to cardiomyopathy for non-Hispanic black women was 62.8% versus 26.9% for non-Hispanic white women
- 80.6% of women who died from pregnancy-related cardiomyopathy were either overweight or obese (BMI > 25)

Providers:

Peripartum cardiomyopathy is the development of heart failure in the last month of pregnancy or within 5 months postpartum in the absence of prior heart heart failure with no identifiable cause and echocardiogram indicative of left ventricular(LV) dysfunction.[2]

SIGNS/SYMPTOMS–ONSET CAN BE EASILY MISSED[3]

- Marked limitation of physical activity; comfortable at rest; less than ordinary activity causes **fatigue, palpitation or dyspnea**[4]
- Unable to carry on any physical activity without symptoms of heart failure at rest; if any physical activity is undertaken, discomfort increases[4]
- Arrhythmia/Cardiac Arrest
- Women with PPCM most commonly have dyspnea, dizziness, chest pain, cough, neck vein distention, fatigue and peripheral edema[3]

PPCM CRITERIA[5]

- Idiopathic (no other cause) heart failure characterized by left ventricular (LV) systolic dysfunction
- At the end of pregnancy or during the postpartum period (spectrum of timing)
- Diagnosis of exclusion
- Ejection fraction (EF) generally below 45%
- Left ventricular (LV) dilation not required

RISK FACTORS[1,4,7]

- **Social**: Advanced maternal age, smoking, malnutrition, increased risk for African-American race
- **Medical**: Hypertension, diabetes, family history, sleep apnea, obesity
- **Obstetric**: Gravidity and parity, number of children, labor inducing medications, multiple gestation, family history, preeclampsia

continued

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Florida HEALTH

Updated July 2019

Urgent Maternal Mortality Message to Providers

DIAGNOSIS

- Early diagnosis is essential—watch for early signs and symptoms and a decline in function
- Echocardiogram, the primary diagnostic test, to identify left ventricular systolic dysfunction[4]
- Differential Diagnosis: myocardial infarction, amniotic fluid embolism, severe preeclampsia, pericarditis, pulmonary thromboembolism, myocarditis, sepsis, drug toxicity, metabolic disorders, and aortic dissection[6, 9]
- Postpartum patient with cough, shortness of breath, hypoxemia, and if risk factors raise suspicion, perform a careful physical examination and consider an echocardiogram
- For patients presenting with dyspnea, orthopnea, tachypnea, palpitations, syncope, and chest pain, consider obtaining an EKG and a brain natriuretic peptide (BNP)[6, 7]

PAMR Recommendations:

Importance of identifying barriers for participation in treatment for non-compliant patients.

MANAGEMENT[3]

- Similar to standard treatment for other forms of heart failure
- Avoid routine use of ACE-inhibitors or angiotensin receptor blockers (ARBS) during pregnancy
- Collaboration between cardiologists, obstetricians, perinatologists, neonatologists and anesthesiologists is essential
- Consider transfer to high risk perinatal center and potential for early delivery
- Consider prophylactic anticoagulation during pregnancy and immediate postpartum period

PAMR Recommendations:

Important to provide preconception and interconception care for patients with co-morbidities.

DISCHARGE

- Ensure follow-up appointment in one week and consider more frequent follow-up care if history of cardiac symptoms.
- Patient and family should be counseled to return immediately to emergency room or L&D triage if showing any signs or symptoms
- Educate on the importance of long-acting reversible contraceptives (LARCs), interconception care and risks of future pregnancies
- Women with chronic heart disease should see a cardiologist before becoming pregnant
- Providers should consider referral to community resources to assist women having difficulty accessing cardiac prescriptions

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Florida Pregnancy Associated Mortality Review (PAMR)

Call for the Implementation of Maternal Early Warning Systems (MEWS)

Florida PAMR Findings:

- 55.3% of the maternal deaths in Florida in 2015 were preventable. In an additional 18.4% of the deaths, there was a possible chance to alter the outcome.[1]

Contributing factors:

- lack of healthcare standardized policies and procedures (80%)
- delay of treatment (25%)
- lack of diagnosis (20%)
- lack of healthcare knowledge/skills assessment (20%)
- lack of treatment (15%)
- delay of diagnosis (10%)
- lack of care coordination/referrals/transfers, follow-up (10%)

PAMR MESSAGE TO PROVIDERS:

Deterioration of the clinical condition of a maternity patient can occur rapidly and lead to tragic consequences if adverse signs are not recognized early. Case reviews of maternal deaths have revealed a concerning pattern of delay in recognition of hemorrhage, hypertensive crisis, sepsis, venous thromboembolism, and heart failure.[2] Having a Maternal Early Warning System can help facilitate timely recognition, diagnosis, and treatment for women developing critical illness. A number of organizations have recommended the use of maternal early warning tools as a method of addressing this problem. There are now clinical data suggesting that the use of these tools can reduce maternal morbidity and mortality especially due to hemorrhage and infection.[3]

PAMR MESSAGE TO HOSPITALS:

PAMR endorses the Joint Commission requirements that:

- Hospitals have a process in place for recognizing and responding as soon as a patient's condition appears to be worsening.
- Hospitals develop written criteria describing early warning signs of a change or deterioration in a patient's condition and when to seek further assistance.[4]

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Florida HEALTH

Updated January 2020

PAMR Recommendations:

Follow the National Partnership for Maternal Safety, Patient Safety Tool, Maternal Early Warning System (MEWS) Protocol.[5] An example of a MEWS protocol that could be used as an early warning system is provided in the table labelled "Maternal Early Warning System".

- The early warning score is a guide used to determine the degree of sickness and is based on key vital sign measurements and clinical condition.
- Early recognition of vital sign changes is important to trigger further clinical evaluation.[1]

The Maternal Early Warning System has two components:

- Maternal Early Warning Criteria/Signs
- Effective Escalation Policy

Urgent bedside evaluation is indicated if:

- Any value persists for more than one measurement.
- Any value recurs more than once.
- Values present in combination with additional abnormal parameters.

An Effective Escalation Policy includes:

- **Prompt notification** of abnormal values to an obstetrician or other qualified clinician (anesthesiologist, midwife, etc.).
- **Prompt bedside evaluation** by a physician or other qualified clinician with the ability to activate resources in order to initiate emergency diagnostic and therapeutic interventions as needed.[6]
- If unresolved, escalate level of care by either initiating an obstetric emergency response team, rapid response team, consulting maternal fetal medicine, or by transferring to a higher level acuity unit (ex. intensive care unit) or hospital.

MATERNAL EARLY WARNING SYSTEM

MEASUREMENT:	LESS THAN OR EQUAL TO:	BETWEEN:	BETWEEN:	GREATER THAN OR EQUAL TO:
Systolic BP (mmHg)	80	81–89	150–159	160
Diastolic BP (mmHg)	49		91–99	100
Respiratory Rate (breaths per minute)	10		22–29	30
Heart Rate (beats per minute)	50		111–119	120
Oxygen Saturation (% at room air)	94			
Urine output (ml per hour, for 2 hours)	35			
Any combination of the following: Maternal agitation, confusion, or unresponsiveness				
Patient with hypertension reporting a non-remitting headache or shortness of breath				
Patient complaining of constant, systemic, and severe musculoskeletal pain				

Red = any 1 red, requires immediate action, call provider immediately to come for bedside evaluation	**Orange** = any 1 orange, should be reassessed and confirmed prior to calling the provider within 10 minutes	**Yellow** = any 2 yellow, should be reassessed and confirmed prior to calling the provider within 10 minutes

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Opioid Use During Pregnancy

Florida Pregnancy-Associated Mortality Review (PAMR)

March 2020

Urgent PAMR Message to Providers and Hospitals

Obstetric providers and hospitals are the first health care contact for most mothers with Opioid Use Disorder (OUD) and need to lead the effort to screen, assess, and refer these mothers as well as providing for their obstetrical needs.

Florida PAMR Findings:

- Opioid Use Disorder (OUD) is a life-threatening chronic condition and is dangerous to pregnant and postpartum women.
- The rate of Florida women with OUD identified at delivery admission quadrupled from 0.5 per 1,000 deliveries in 1999, to 6.6 in 2014.[1] Use of illicit opioid and related drugs is now increasing as prescription opioids are becoming more restricted.[2]
- Drug-related deaths are the leading cause of death to mothers during pregnancy or within one year afterwards in 2017, accounting for 1 in 4 of these deaths in Florida. There are now as many maternal drug-related deaths as deaths due to traditional causes of maternal mortality. 75% of maternal drug-related deaths occur after the baby is born and the mother has been discharged.[3]

Risk Factors:

- Stigma and bias by the public and by health professionals make it very difficult for patients to discuss their condition and get help. Getting treatment during pregnancy and continuing afterwards are key to maternal survival and healthy families.[4]
- More than 30% of women with OUD have underlying depressive disorders that complicate patient care during pregnancy and postpartum.[5]
- Women with OUD who decide to stop medication-assisted treatment are at high-risk of relapse and potentially fatal consequences.[6]
- Loss of Medicaid or other health care benefits after delivery (such as, through loss of infant custody) may result in reduced access to the needed medication-assisted treatment.

PAMR Recommendations:

Prenatal Care and Screening

- Screen all pregnant women for OUD during prenatal care and at the time of delivery using a validated verbal or written screening tool: NIDA Quick Screen, 5P's, or CRAFFT. Using only biological testing for opioids and other drugs is not recommended.[6]
- Assess patients' prescription history though the Prescription Drug Monitoring Program (PDMP), preferably during the first prenatal visit.
- Be prepared to counsel women regarding opioid use during pregnancy and postpartum in a non-judgmental way. Tools such as SBIRT (Screening, Brief Intervention, Referral to Treatment) have been developed to help.[6]
- If a provider is unable to provide care for women with OUD, direct referral to another prenatal care provider or clinic to assure complete and compassionate care of the mother is essential.[6]
- A plan of safe care should be developed during prenatal care with input from all involved including prenatal care providers, community support services, and medication-assisted treatment providers.[6]

Referral and Treatment

- Provide direct referrals for medication-assisted treatment and/or other community support services. Connecting and supporting treatment with rehabilitation specialists is essential to maintaining these patients in obstetrical care.[7]

continued

Florida HEALTH

More information on a maternal opioid care bundle is available on the FPQC website:
https://health.usf.edu/publichealth/chiles/fpqc/more

Urgent PAMR Message to Providers and Hospitals

- Treatment needs to be multi-disciplinary and requires rehabilitation specialists to enhance care.[7]

Prior to Discharge

- All women with OUD should receive a prescription for naloxone and counseling on its use, especially those women with a prior overdose.[7]
- Before discharge, ensure the mother has a safe discharge plan: schedule postpartum mothers for early postpartum follow-up visits, medication-assisted treatment, and other needed services.
- Coordinate with the pediatric team caring for the infant as this is essential to ensure that both mom and baby can receive the necessary coordinated services in the hospital and at discharge. When possible, encourage prenatal contact/consult.

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