



**Florida's Pregnancy-Associated Mortality Review
2017 Update**

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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 2017 Update provides an overview and comparison of PRD data and trends for Florida between 2007 and 2017. Distributions of PRDs are shown by race/ethnicity, age, body mass index (BMI), timing of death, pregnancy outcome, type of delivery and cause of death, and, when applicable, pregnancy-related mortality ratios (PRMRs).

The data linkage process identified 156 Florida resident pregnancy-associated deaths (PADs) from January 1, 2017 to December 31, 2017. The PAMR case selection committee determined that 48 PADs were selected for abstraction. Upon full team review of the 48 PADs, the PAMR committee found that 35 (76.1%) were pregnancy-related.

The 2017 pregnancy-related mortality ratio (PRMR) in Florida was 15.7 per 100,000 live births. Although the 2017 PRMR was lower than the 2009 ratio (26.2 per 100,000 live births), the trend for the period 2007-2017 was not statistically significant.

For 2017:

- Of the 35 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 2017 were cardiovascular (28.6%), hemorrhage, thrombotic embolism, infection (14.3% each), and cardiomyopathy (8.6%)
- Of the 35 PRDs, 29 (82.9%) occurred during the postpartum period
 - 46.9% of postpartum PRDs with known data, occurred prior to hospital discharge
 - 37.5% of postpartum PRDs with known data, occurred after hospital discharge
- PRDs by pregnancy outcome

- 68.6% after a live birth delivery
- 17.1% after a stillbirth
- 5.7% while still pregnant (undelivered)
- 2.9% after a miscarriage/abortion
- 2.9% after an ectopic pregnancy
- 29 PRDs occurred during or after delivery
 - 53.3% (16) had cesarean section (C-section) as a delivery method
 - 30.0% were planned C-section deliveries
 - 23.3% were unplanned C-section deliveries
- 14 PRDs (53.8%) were overweight or obese women based on their BMI classifications

The leading recommendations in 2017 were:

- Providers should plan C- section hysterectomy for patients with known placenta accreta.
- Providers should perform complete examination of patients including auscultating heart sounds with stethoscope.
- A full cardiac work-up, including an echocardiogram, should be performed for women who are obese and have chronic hypertension.
- Interventional Radiology (IR) is not recommended for the treatment of a massive hemorrhage. Follow the Obstetric Hemorrhage Initiative (OHI) guidelines at: <http://health.usf.edu/publichealth/chiles/fpqc/OHI>

The Department of Health (Department) collaborates with diverse public and private organizations to pursue multifaceted approaches to moving recommendations into tangible actions. After identifying the leading causes of PRD, the Department:

- Contracted with the Florida Perinatal Quality Collaborative (FPQC) to implement an OHI that addressed the leading cause of PRD during the 2014-2015 fiscal year. After a successful first round, FPQC launched round two in February 2016, for hospitals who missed the first round to lead their own initiative in their hospital with FPQC technical assistance and support.
- Contracted with the FPQC to implement a Hypertension in Pregnancy (HIP) initiative that launched in 2015 and entered a Sustainability Phase in 2017.
- Contracted with the FPQC in April 2017 to implement a postpartum Long-Acting Reversible Contraceptive (LARC) quality improvement initiative

Next Steps:

- Ongoing surveillance
- Results from the Maternal Mortality Review Information Application (MMRIA) database use
- Ongoing partnership building

Pregnancy-Related Mortality Findings — Florida, 2017

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 2007-2017

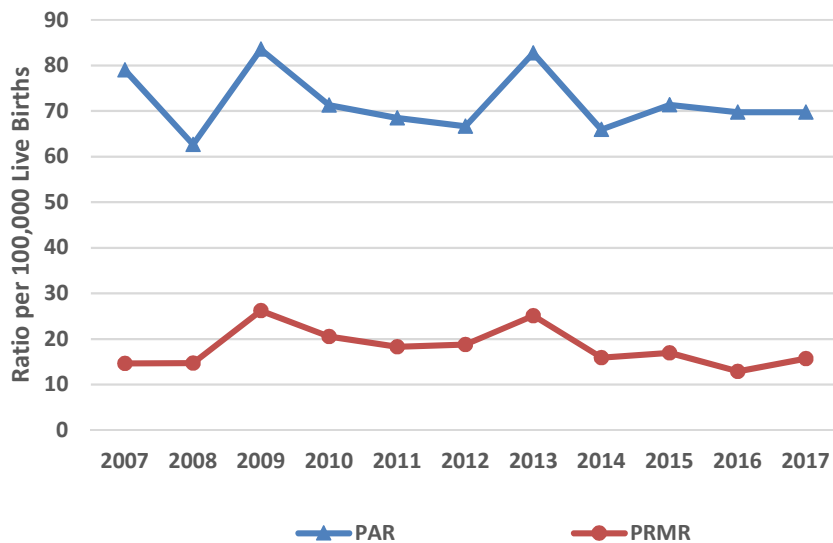


Table 1. Total Pregnancy-Associated Deaths and Pregnancy-Related Deaths 2007-2017

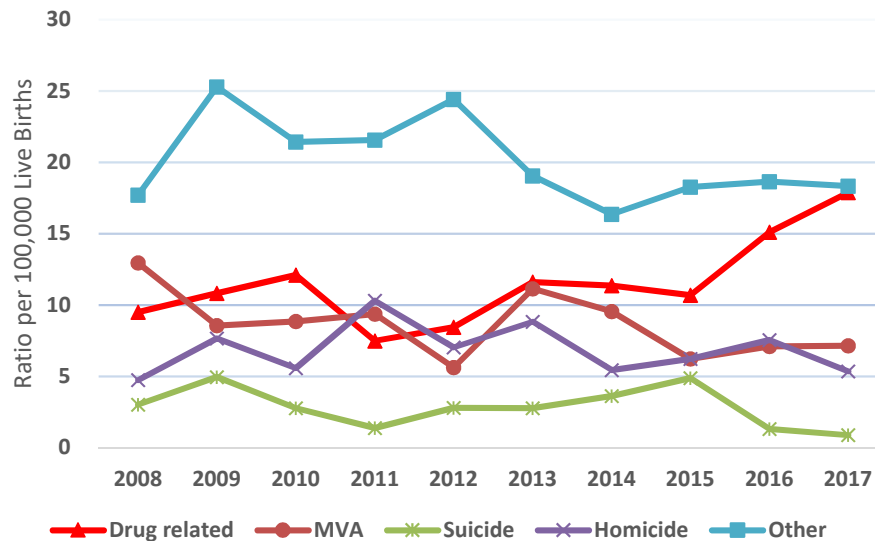
Year	# PAD	# PRD	%PRD	Year	# PAD	# PRD	%PRD
2007	189	35	18.5	2013	178	54	30.3
2008	145	34	23.4	2014	145	35	24.1
2009	185	58	31.4	2015	160	38	24.0
2010	153	44	28.8	2016	157	29	18.5
2011	146	39	26.7	2017	156	35	22.4
2012	142	40	28.2				

- The total number of PADs in Florida ranged from 142 to 189 per year between 2007 and 2017. The number of PADs in 2017 was 156.
- The proportion of PADs that were pregnancy-related ranged from 18.5% to 31.4% between 2007 and 2017. In 2017, 22.4% of PADs were determined to be PRDs by the Florida PAMR committee.

Not-Pregnancy-Related Deaths

Not-Pregnancy-Related Deaths (NPRD) are a subset of PAD. The causes of maternal death in the NPRD ratios for 2008-2017, based on documentation in the death certificates, are shown in Figure 2. These maternal deaths were identified through the data identification process described in Appendix 2. In 2017, the NPRD ratio due to certain types of cancer and other miscellaneous causes was 18.3 per 100,000 live births, followed by drug related with a ratio of 17.9, motor vehicle accidents (MVA) with a ratio of 7.2, homicides with a ratio of 5.4, and suicides 0.9 per 100,000 live births, respectively.

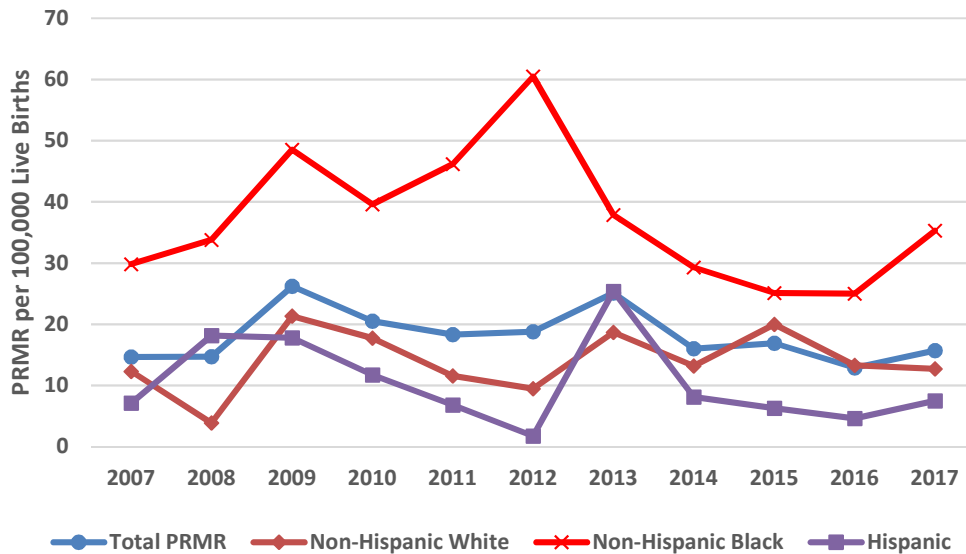
Figure 2. Not-Pregnancy-Related Death Ratios by Cause of Death Florida, 2008-2017



Pregnancy-Related Mortality Ratios (PRMRs)

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 2007 and 2017 by race and Hispanic ethnicity.

Figure 3. Pregnancy-Related Mortality Ratios (PRMRs) by Race/Ethnicity Florida, 2007-2017



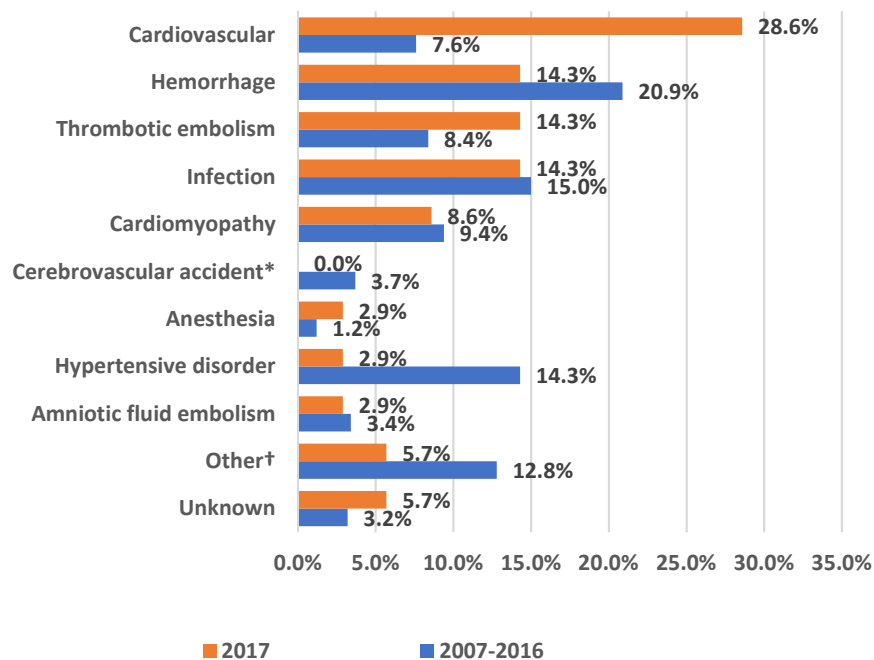
- During the period 2007-2017, the overall Florida PRMR fluctuated from 14.6 deaths per 100,000 live births in 2007 to a high of 26.2 in 2009 and a low of 12.9 in 2016. The PRMR in 2017 was 15.7 deaths per 100,000 live births.
- As evidenced in Figure 3, Florida PRMRs exhibit consistent racial disparities but the gap between non-Hispanic Blacks and non-Hispanic Whites between 2007 and 2017 has decreased from 8.7 in 2008 to 2.8 in 2017. 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 2017, the PRMR per 100,000 live births was 35.3 for non-Hispanic Black women, 12.7 for non-Hispanic White women, and 7.5 for Hispanic women.

Cause of Pregnancy-Related Deaths

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

- In 2017, the leading causes of PRDs were cardiovascular problems 28.6%, hemorrhage, thrombotic embolism, and infection (with 14.3% each), and cardiomyopathy 8.6%.
- Figure 4 and Table 2 show how the percentage of deaths for cardiovascular problems, thrombotic embolism, and anesthesia were higher in 2017 compared with the period 2007-2016. Also, Figure 4 and Table 1 show decreases in the percentage of deaths in 2017 due to hemorrhage, hypertensive disorders, infection, cardiomyopathy, amniotic fluid embolism, and other remaining causes. There were no maternal deaths caused by cerebrovascular accident in 2017.

Figure 4. Distribution of Pregnancy-Related Causes of Death Florida, 2007-2016 (n=406) and 2017 (n=35)



*Cerebrovascular accident no known hypertensive disorders.

†Other comprises various causes of deaths not easily captured with sufficient numbers in a homogeneous category.

**Table 2. Distribution of Causes of Pregnancy-Related Death
Florida, 2007-2016 and 2017**

Causes of Deaths	2007-2016	2017	Change in Percentage
	N (%)		
Cardiovascular	31 (7.6)	10 (28.6)	276.3
Hemorrhage	85 (20.9)	5 (14.3)	-31.6
Thrombotic embolism	34 (8.4)	5 (14.3)	70.2
Infection	61 (15.0)	5 (14.3)	-4.7
Cardiomyopathy	38 (9.4)	3 (8.6)	-8.5
Cerebrovascular accident*	15 (3.7)	0	-
Anesthesia	5 (1.2)	1 (2.9)	141.7
Hypertensive disorders	58 (14.3)	1 (2.9)	-79.7
Amniotic fluid embolism	14 (3.4)	1 (2.9)	-14.7
Other remaining causes*	52 (12.8)	2 (5.7)	-55.5
Total	406**	35**	

*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.

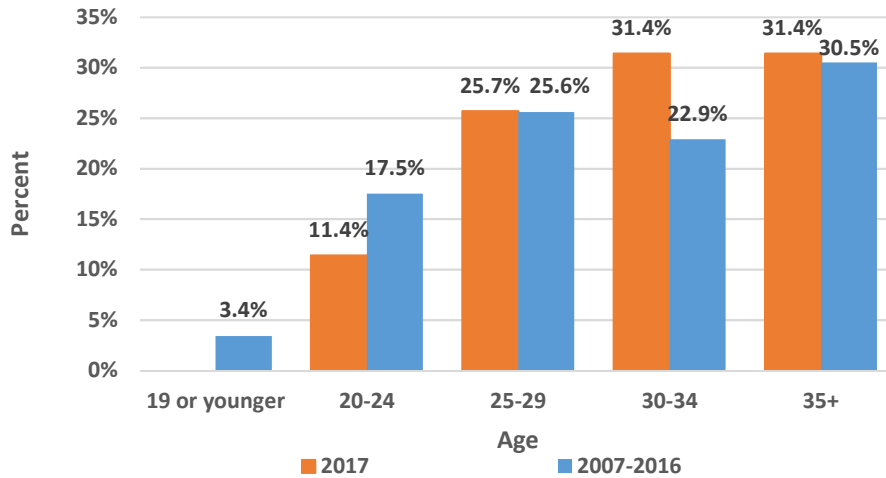
**Total includes unknowns.

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 by age group are shown in Figures 5a and 5b.

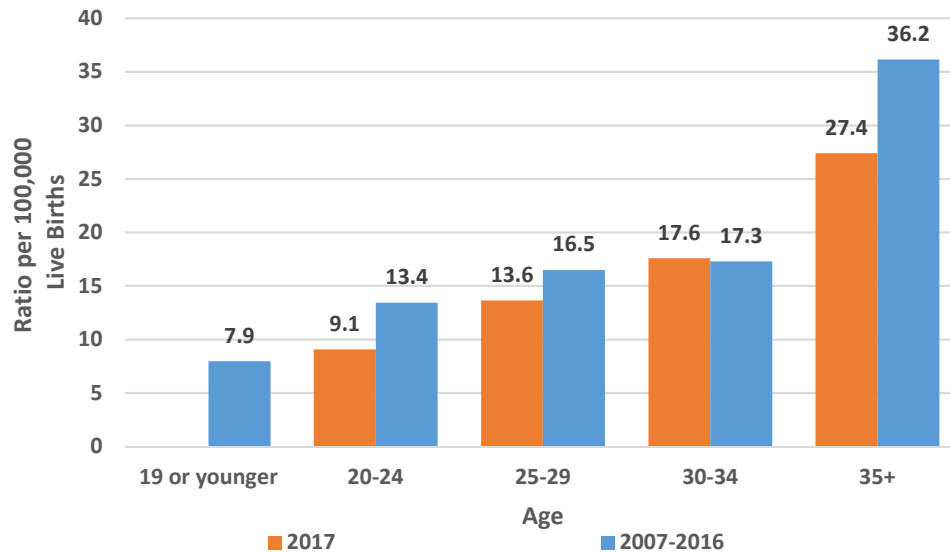
- In 2017, no maternal deaths for young women less than 20 years old were observed. The highest percentage of maternal deaths (31.4%) occurred in women 30-34 and 35+ years old. In contrast, fewer mothers 20-24 died in 2017 compared with 2007-2016 (11.4% vs. 17.5%, respectively) as shown in Figure 5a.

**Figure 5a. Distribution of Pregnancy-Related Deaths by Age
Florida, 2007-2016 (n=406) and 2017 (n=35)**



- In 2017, the PRMR of mothers age 35 or more (27.4) was almost 2 times (1.6) the PRMR of mothers 30-34 years old (17.6). (Figure 5b)

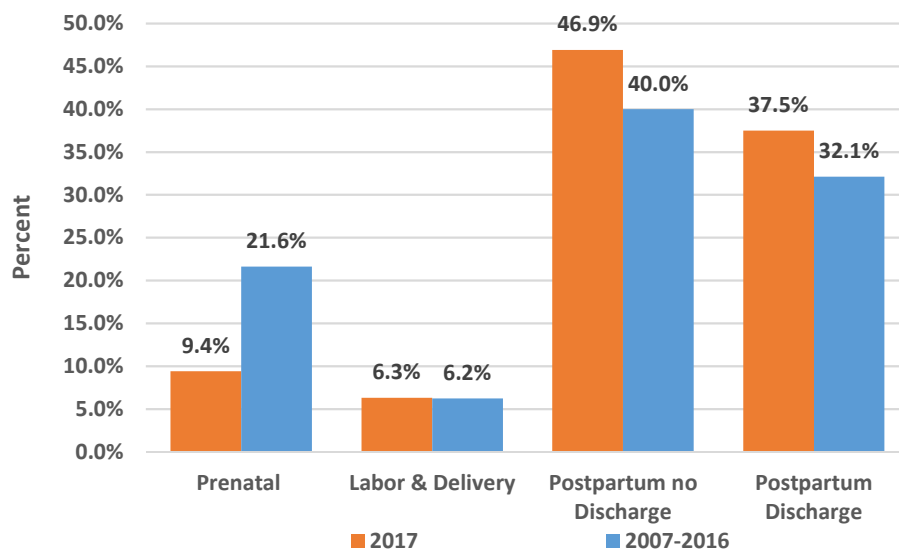
**Figure 5b. Pregnancy-Related Mortality Ratios (PRMRs) by Age
Florida, 2007-2016 (n=406) and 2017 (n=35)**



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 the hospital. [See Appendix 1 for detailed definitions]. PRDs by timing of death between 2007-2016 and 2017 are shown below in Figure 6.

Figure 6. Distribution of Pregnancy-Related Deaths by Timing of Death Florida, 2007-2016 (n=406) and 2017 (n=35)



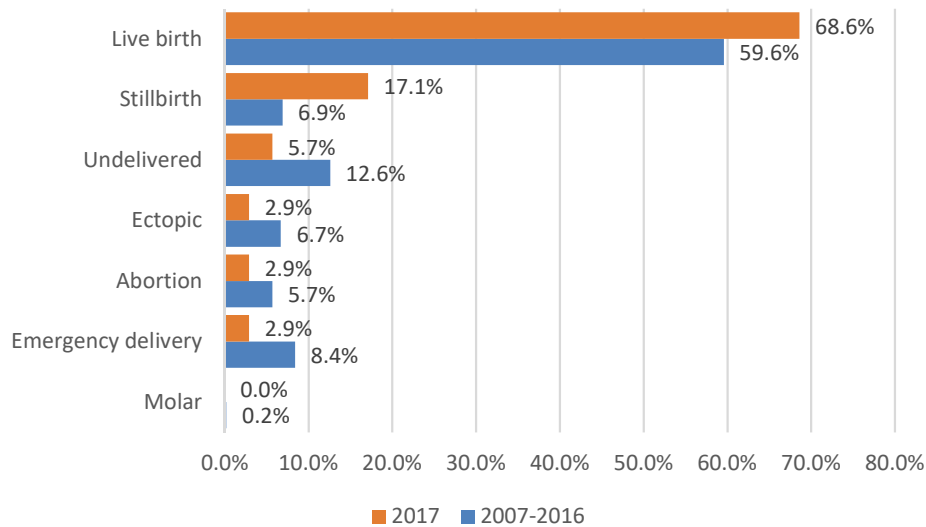
- In 2017 most PRDs (82.9%) occurred during the postpartum period. There are differences between the causes of death in the postpartum period by hospital discharge status.
 - Of the postpartum PRD cases who were not discharged from the hospital, the PRD causes were: hemorrhage, infection, thrombotic embolism, and other cardiovascular problems.
 - Of the women who died after hospital discharge: the PRDs that occurred during the first six weeks postpartum were due to cardiovascular problems, thrombotic embolism, infection, and other remaining causes. For women who died after six-weeks postpartum and were discharged

from the hospital, the causes of deaths were cardiomyopathy, cerebrovascular accident, and other remaining causes.

Pregnancy-Related Deaths by Pregnancy Outcome

In the PAMR process, pregnancy outcomes are classified as live birth, emergency delivery, undelivered, ectopic, abortion, and still birth (see Appendix 1 for detailed pregnancy outcome definitions). Figure 7 below shows PRDs by pregnancy outcome in Florida for 2017 versus 2007-2016.

Figure 7. Distribution of Pregnancy-Related Deaths by Pregnancy Outcome Florida, 2007-2016 (n=406) and 2017 (n=35)



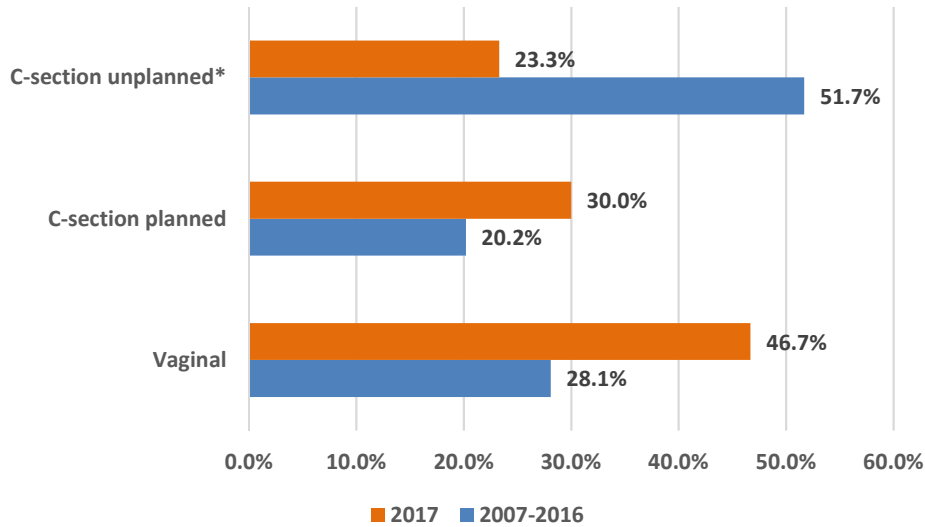
*There was one emergency delivery in 2017, who was a live birth.

- In 2017, the majority (68.6%) of PRDs occurred after a live birth and 17.1% were stillbirth.
- In 2017, there were 52 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/delivery or postpartum period.

**Figure 8. Distribution of Pregnancy-Related Deaths by Type of Delivery
Florida, 2007-2016 (n=302), 2017 (n=30)**



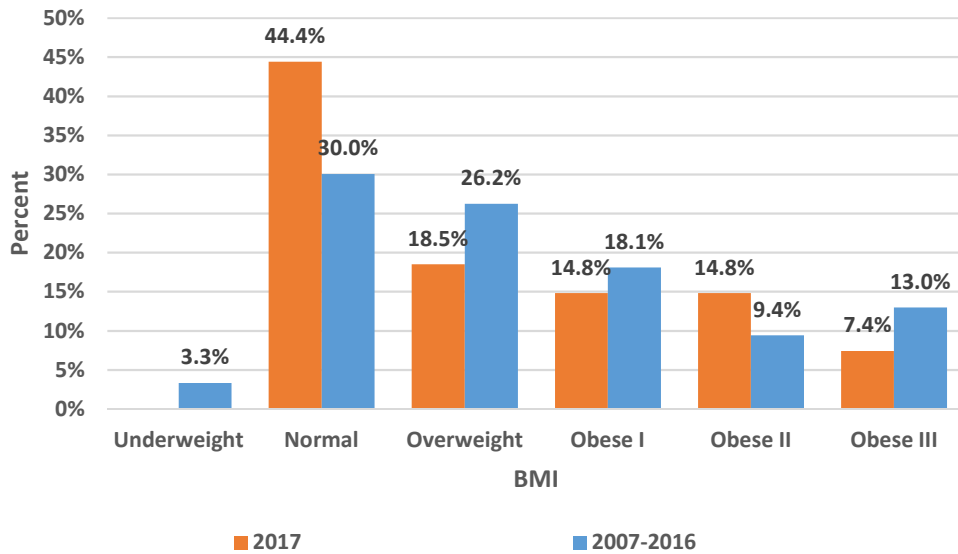
*Of 7 (24.1%) unplanned cesarean sections, 1 (14.3%) was an emergency delivery.

- In 2017, 53.3% of PRDs that occurred during the labor/delivery or postpartum period were by C-section. In comparison, 37.2% of all live births in Florida were C-section deliveries in 2017 (not shown in figure 8) [1].
- More than 23% of the C-sections among the PRDs that occurred in 2017 were unplanned C-section deliveries.

Pregnancy-Related Death by Prepregnancy Body Mass Index

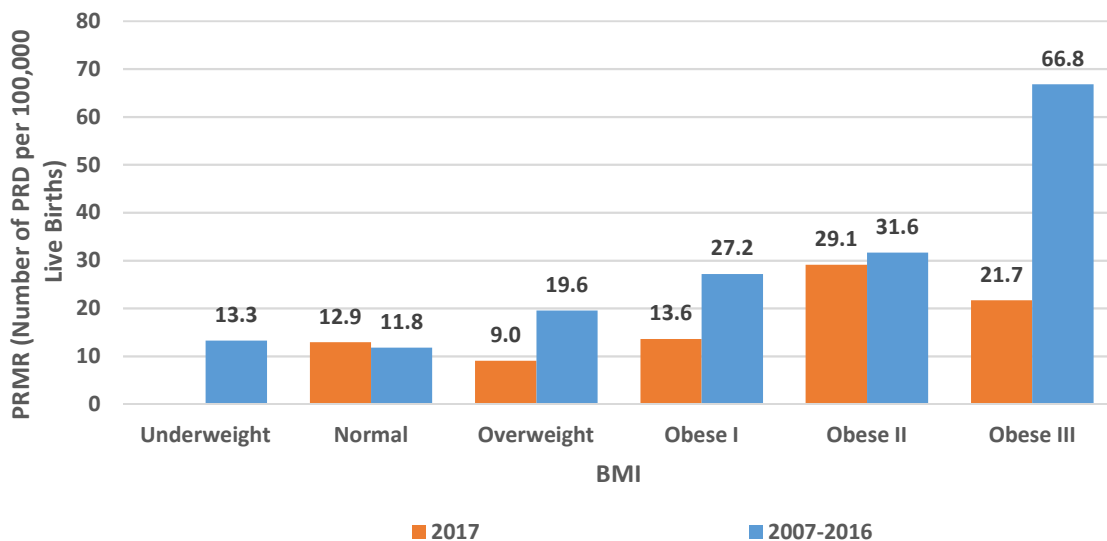
Body mass index (BMI) is a calculated measure of the relative percentage of body fat based on height and weight. PAMR uses the following six BMI categories to examine associations between weight before pregnancy and PRD: underweight, normal weight, overweight, and obese Class I, obese Class II, and obese 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 Prepregnancy BMI Florida, 2007-2016 (n=406) and 2017 (n=35)



- In 2017, 55.6% of women who experienced a PRD had overweight/obese (overweight plus the three obese categories) prepregnancy BMIs (Figure 9a). Similarly, during the same year, 51.6% of all Florida women who had a live birth were in the overweight/obese prepregnancy category (not shown in figure 9a) [1].

Figure 9b. Pregnancy-Related Mortality Ratios (PRMRs) by Prepregnancy BMI Florida, 2007-2016 (n=406) and 2017 (n=35)



- As shown in Figure 9b, in 2017, there were no maternal deaths at the underweight category, the PRMR was 12.9 maternal deaths per 100,000 live births with normal prepregnancy BMI, 9.0 with overweight and 13.6, 29.1, and 21.7 with obese Class I, Class II, and Class III prepregnancy BMIs, respectively.

PAMR Identified Issues and Recommendations for PRDs, 2017

After reviewing PRD cases, the PAMR committee identifies relevant issues (See Appendix 3) related to each death and makes recommendations to promote system improvements. The PAMR committee places identified issues and recommendations into four prevention categories: Clinical Factors, System Factors, Individual/Community Factors, and Death Review Factors. The following narrative outlines how the PAMR committee used the four prevention categories when they identified issues and made 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.

Clinical Factors (Health Care Services, Practice, Protocols, and Care Coordination)

Clinical factors relate to services delivered by all health care providers and include actions involving diagnosis, treatment, and communication.

Issues

Contributing factors identified in the review of 2017 PRDs include:

- Knowledge/Skills/Assessment: 28%
- Care Coordination-Referrals, Transfers, Follow-up: 24%
- Lack of Treatment: 16%
- Delay of Diagnosis: 16%
- Delay of Treatment: 8%
- Lack of Diagnosis: 8%

Clinical Recommendations

- Pregnant patients transitioning from oral to injectable anticoagulation medication should be admitted for observation.
- Providers should follow current guidelines for delivery of a patient with elevated liver enzymes and low platelet syndrome (HELLP).
- Providers should refer high-risk pregnant patients to maternal-fetal medicine specialists.
- Providers should follow the American College of Obstetricians and Gynecologists (ACOG) standard guidelines in the treatment of hypertension during pregnancy.
- A full work-up should be done to rule out deep vein thrombosis for pregnant and postpartum women complaining of leg pain or lumps in their legs.
- Providers should consider early admission for an extensive cardiac work-up and management for patients with unstable elevated blood pressures.
- Providers should stabilize patients with disseminated intravascular coagulation (DIC) before delivery.
- Providers should be aware of the signs and symptoms of pulmonary edema.
- Pregnant women who are obese, have chronic hypertension, and are exhibiting cardiac symptoms should be referred to a maternal-fetal medicine (MFM) specialist.
- A full cardiac work-up, including an echocardiogram, should be performed for women who are obese and have chronic hypertension.
- Providers should follow the Florida Perinatal Quality Collaborative (FPQC) guidelines to stabilize patients prior to sending to the operating room.
- Chemo-prophylaxis is recommended for morbidly obese patients.
- An echocardiogram is recommended for pregnant women who are morbidly obese and have chronic hypertension.
- A C-section at 37 weeks gestation is recommended for morbidly obese patients who have chronic hypertension, to reduce the work load on the heart.
- Women experiencing an incomplete abortion with abnormal lab values should receive care and treatment immediately.
- A Maternal Early Warning System (MEWS) should be implemented to monitor for abnormal vital signs and/or a change in vital sign values.

System Factors (Health Care Management, Reimbursement and Access)

System factors relate to system level processes involving policies, barriers to access health insurance, nursing knowledge, or infrastructure.

Issues

Contributing factors mentioned in review of 2017 PRDs include:

- Lack of Standardized Policies and Procedures: 30%
- Barriers to Accessing Care: 30%
- Lack of Care Coordination: 20%
- Other (Lack of Autopsy): 20%

System Recommendations

- Autopsies should be performed on all unexpected maternal deaths.
- It is important to provide care coordination, including a patient navigator, for care services.
- Hospital emergency departments should have a protocol in place to consult with an obstetrician when a patient has an incomplete abortion and abnormal labs.
- High-risk patients and patients at less than 36 weeks gestation should be transferred from a Level I facility to a higher-level care facility.
- High-risk patients should have a follow-up visit within one week.
- Healthy Start care coordination is needed to access women at the time of their clinic appointments if they are otherwise unable to be located.
- Healthy Start repeat referrals are necessary for women with identified multiple issues.
- Patients with a chronic disease should have a consultation with a physician before traveling out of state or out of country.
- Care coordination is needed at hospital discharge to ensure patients will be able to afford prescribed medications.

Individual/Community Factors

Individual/Community factors relate to non-medical issues that have an underlying causal role in the PRD. For example, these can include barriers to recognizing

symptoms or personal decisions about seeking care or following medical recommendations.

Issues

Contributing factors mentioned in review of 2017 PRDs include:

- Significant Co-Morbidity: 37%
- Personal Decisions (Example: Delayed Seeking Care): 30%
- Substance Abuse/Use: 11%
- Lack of Patient Knowledge: 11%
- Financial Barriers: 7%
- Lack of Social Support: 4%

Individual/Community Recommendations

- Preconception counseling is important for women with a chronic disease.
- It is important to be at an optimal and healthy weight prior to becoming pregnant.
- It is important to follow-up with a health care provider for identified health issues.
- Community services and treatment facilities are needed for women with substance use/abuse during pregnancy.
- Women of reproductive age should receive preconception care to optimize their health status prior to pregnancy.
- Patients should seek care immediately when experiencing signs/symptoms of illness, or when not feeling well.
- A patient navigator and care coordinator should be established to ensure follow-up in high-risk patients.
- Women with chronic heart disease should follow medical advice concerning becoming pregnant.
- Women with chronic heart disease should consider the use of highly-effective, long-acting contraception, if not contraindicated.
- Women should be at an optimal weight and have stable blood pressures before becoming pregnant.
- Patients with chronic illnesses should adhere to medical care recommendations.
- Women should seek and receive prenatal care when pregnant.
- Women should be educated on the signs of pregnancy.

Death Review Factors

The PAMR process relies on information from death certificates and autopsy reports for the identification and evaluation of PRDs.

Issues

- Death certificate accuracy
- PAMR abstraction process
- Lack of autopsy for sudden, unexplained, or inconclusive cause of death

Death Review Recommendations (There were no recommendations for this category in 2017)

Committee Recommendations Related to the Leading Causes of Death

Also outlined are the PAMR committee's specific recommendations related to four leading causes of PRD for the year 2017: cardiovascular problems, hemorrhage, infection, and cardiomyopathy. The PAMR committee did not make specific recommendations for thrombotic embolism PRDs.

Cardiovascular problems

Clinical Recommendations

- Providers should perform a complete examination of patients, including auscultating heart sounds with a stethoscope.
- A full work-up should be performed on patients with signs and symptoms of an autoimmune disease and renal disease.
- Patients with thrombocytopenia during pregnancy should be referred to a maternal-fetal medicine specialist.
- Pregnant women who are obese, have chronic hypertension, and are exhibiting cardiac symptoms should be referred to a MFM specialist.
- A full cardiac work-up, including an echocardiogram, should be performed for women who are obese and have chronic hypertension.
- It is important to perform a thorough evaluation of postpartum patients complaining of pain and shortness of breath.

Individual/Community Recommendations

- Women with cardiac disease should be aware of cardiac disease symptoms and should seek care immediately.

Hemorrhage

Clinical Recommendations

- Interventional Radiology (IR) is not recommended for the treatment of a massive hemorrhage. Follow the OHI guidelines at: <http://health.usf.edu/publichealth/chiles/fpgc/OHI>
- Providers should follow the Obstetric Hemorrhage Initiative (OHI) guidelines for treatment and stabilization of a woman with a massive hemorrhage. The OHI guidelines can be found at: <http://health.usf.edu/publichealth/chiles/fpgc/OHI>.
- Providers should use quantification of blood loss.
- Providers should follow standard of care guidelines for the treatment of placenta accreta.
- Providers should plan C-section/hysterectomy for patients with known placenta accreta.

Individual/Community Recommendations

- Women of child-bearing age should seek care immediately when experiencing persistent severe abdominal pain and heavy vaginal bleeding.

Infection

Clinical Recommendations

- Providers should withhold antenatal steroids until after 23 weeks gestation.

Cardiomyopathy

Clinical Recommendations

- Women with chronic heart disease should see a cardiologist before becoming pregnant.

Assessing Preventability of Maternal Deaths in Florida in 2017

In 2017, the Florida PAMR began the transition to implement 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 to the patient. 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: 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.
- None: 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.

After the committee determines that a death is a PRD, identifies the underlying cause of death, and determines potential preventability, they proceed to identify the factors that contributed to the death. MMRIA classifies the following factors: Community, Patient/Family, Systems of Care, Facility, and Provider. This report combines the factors

as Patient/Community Factors (Includes Community and Patient/Family), System Factors (Includes Systems of Care and Facility) and Clinical Factors (Providers same category included in MMRIA).

The Florida PAMR committee members are optimistic that this information will help to focus the PAMR committee recommendations.

Results

Overall, in 2017, 37.2% of PRDs had a good chance to alter the outcome, and 31.4% had some chance to alter the outcome for a total of 69% of deaths to be preventable (Table 3).

The causes of death that were preventable (Good plus Some Chance) showed little variation (Table 3). All causes of death were 100% preventable except cardiovascular problems (56%), thrombotic embolism (40%), and infection (20%).

Table 3. Pregnancy-Related Death and Preventability, Florida 2017 (n=35)

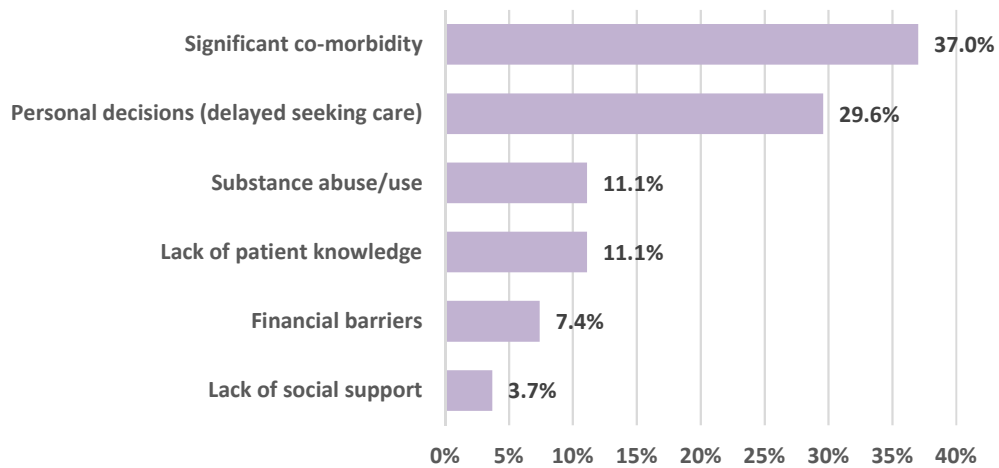
Cause of PRDs	PRDs with Chance to Alter Outcome			Total	% Preventable
	Good	Some	None		
Cardiovascular	4	2	4	10	60.0%
Hemorrhage	5	0	0	5	100.0%
<i>Intrauterine</i>	4	0	0	4	100.0%
<i>Ectopic</i>	1	0	0	1	100.0%
Thrombotic embolism	0	2	3	5	40.0%
Infection	0	1	4	5	20.0%
Cardiomyopathy	1	2	0	3	100.0%
Other remaining causes*	1	1	0	2	100.0%
Hypertensive disorder	0	1	0	1	100.0%
Amniotic fluid embolism	0	1	0	1	100.0%
Anesthesia	1	0	0	1	100.0%
Unknown	1	1	0	2	100.0%
Total	13	11	11	35	68.6%

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

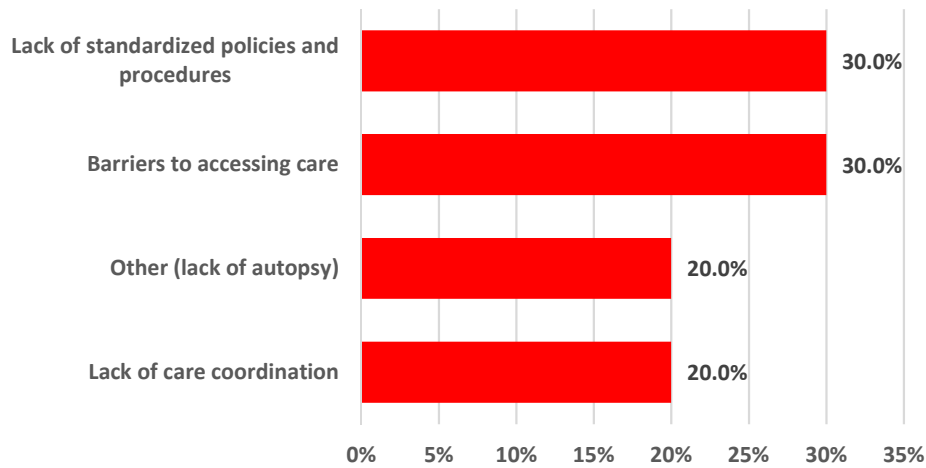
For 2017 PRDs, the Florida PAMR committee identified factors that could have contributed to the maternal deaths. The Committee identified and grouped the maternal causes of death into Individual/Community, System Facility, and Clinical Contributing Factors. Each maternal death may have had multiple contributing factors. By individual/community, factors that contributed to the death were significant co-morbidities, personal decisions, substance abuse, lack of patient knowledge, financial barriers, and lack of social support. Systems issues were related to lack of standardized policies and procedures, barrier to accessing care, lack of care coordination, and other factors (lack of autopsy). Clinical factors that contributed were knowledge/skill assessment, care coordination-referrals, lack of treatment, delay of diagnosis, and delay of treatment. (Figures 10.a, 10.b and 10.c).

Figures 10a, 10b, and 10c. Contributing Factors among Pregnancy-Related Deaths, Individual and Community Factors (10.a), System Factors (10.b) and Clinical Factors (10.c), Florida, 2017

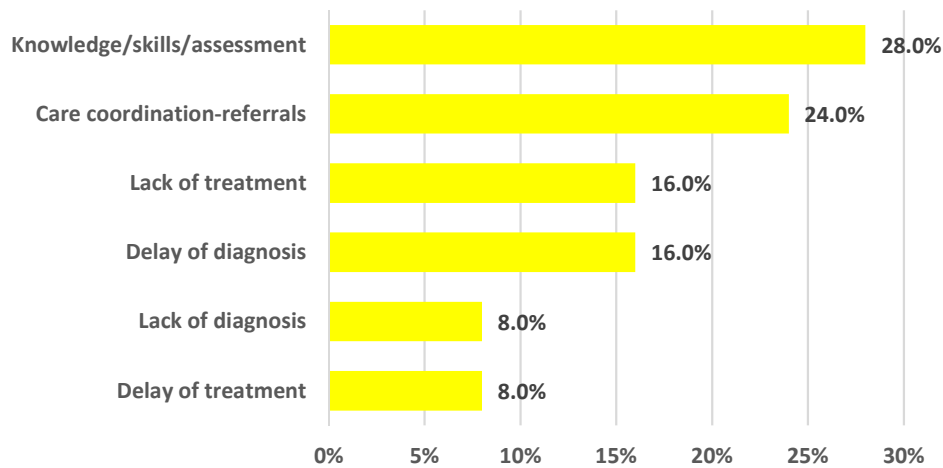
10.a - Contributing Individual/Community Factors



10. b - Contributing System Factors



10.c - Contributing Clinical Factors



The PAMR committee identified 62 contributing factors among 35 PRDs (on average, two contributing factors were identified for every PRD). The contributing factors vary within the leading causes of PRDs (Table 4). The low ratio of factors per PRD identified were thrombotic embolism 0.4 and infection 0.8 contributing factors per PRD respectively.

Table 4. Pregnancy-Related Death by Contributing Factors and Cause of Death, Florida 2017 (n=35)

Cause of Death	Contributing Factors					
	Individual and Community	System	Clinical	Total Factors	Pregnancy-Related Deaths	Factors per Death
Cardiovascular	9	4	7	20	10	2.0
Hemorrhage	4	3	7	14	5	2.8
Thrombotic embolism	2			2	5	0.4
Infection	4			4	5	0.8
Cardiomyopathy	2	1	2	5	3	1.7
Other remaining causes	3		1	4	2	2.0
Hypertensive disorder	2		1	3	1	3.0
Amniotic fluid embolism					1	-
Anesthesia			3	3	1	3.0
Unknown	1	2	4	7	2	3.5
Total	27	10	25	62	35	1.8

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 over 2,800 pregnancy-associated cases. The committee carefully and respectfully considers each case before they identify issues and make recommendations.

The 2017 report shows the consistent disparity in PRDs between non-Hispanic Black and non-Hispanic White women. Non-Hispanic Black women were almost three times as likely to have PRDs compared to 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 [3]. Florida's pregnancy-related ratio from 2007-2017 averaged 18.1 deaths per 100,000 live births; therefore, much work is still needed to meet the Healthy People goal.

Recommendations to Action

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.

Individual/Community, Clinical and System

In 2011, the Department of Health, in partnership with the Florida Perinatal Quality Collaborative (FPQC) and the March of Dimes, established a perinatal health care quality initiative to reduce non-medically indicated deliveries <39 weeks gestation (NMID).

The Department, the FPQC, and the March of Dimes coordinated with the Florida Association of Healthy Start Coalitions to lead an effort in educating pregnant women in the community on NMID by offering provider education packets and e-bulletins. Data provided by the FPQC indicate Florida's NMID rate decreased by 15% between 2010 and 2013.

In 2017, Florida PAMR began the transition to implement the new Maternal Mortality Review Information Application (MMRIA). 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 team began using the new MMRIA system for PAMR case abstraction and review in 2018.

Clinical and System

In fiscal year 2014-2015, the Department contracted with the FPQC to implement the Obstetric Hemorrhage Initiative (OHI) addressing the leading causes of maternal death by providing an evidence-based toolkit to hospital participants and support for implementation of evidence-based guidelines. The hospital toolkit includes highlighted activities such as interdisciplinary simulation drills designed to improve response times

and treatment approaches in an obstetric hemorrhage event. Participating hospitals seek to improve their risk assessment rates, as well as their diagnostic and treatment approaches. The FPQC continues to offer technical support and self-assessment tools to hospitals pursuing this ongoing OHI quality improvement initiative. The OHI's first round successfully contributed to hospitals improving quality practices. Round two of the OHI began February 2016 and consists of hospitals leading their own internal initiative with the FPQC providing online tools, resources, and assistance.

Individual/Community, Clinical and System

In 2015, The Department contracted with the FPQC to implement a Hypertension in Pregnancy (HIP) initiative to address the second leading cause of maternal mortality and morbidity in the state from 2005-2013. The FPQC developed a toolkit to guide hospital participants in implementation and evaluation of quality improvement processes related to prevention, diagnosis, and treatment of hypertensive disorders in pregnancy. The HIP initiative ended June 2017, and is now in a sustainability phase.

In 2017, the FPQC, in partnership with the Department, launched an initiative to address the primary C-section delivery rate among nulliparous, term, singleton, vertex (NTSV) pregnancies in Florida. The goal of the Promoting Vaginal Deliveries (PROVIDE) initiative is 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.

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.

Individual/Community

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.

In August 2014, the Department, in partnership with the national Association of Maternal and Child Health Programs (AMCHP), was selected as a participant in Every Mother Initiative Action Learning Collaborative (ALC). This collaborative is designed to support and improve maternal mortality reviews and translate recommendations into actions by facilitating peer-to-peer maternal mortality site visits between selected states and implement a community-driven project while applying sustainable approaches to

screening, prevention, treatment, and promotion of healthy behaviors. The Department work in partnership with REACHUP, INC., a community based non-profit, to raise awareness of preconception health and to expand the Preconception Peer Educator (PPE) program in historically black colleges and universities. The PPE program trains students to educate their peers and raise awareness of infant mortality, maternal mortality, health disparities, and healthy behaviors, and encourages participants to engage in community awareness events.

Clinical

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 focused the first Urgent Maternal Mortality Message (UMMM) on hemorrhage and the second message pertained to peripartum cardiomyopathy (Appendix 5.) The third UMMM focuses on the need for a Maternal Early Warning System (MEWS) in hospitals. 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 death have revealed a concerning pattern of delay in recognition of hemorrhage, hypertensive crisis, sepsis, venous thromboembolism, and heart failure. [9] Having a Maternal Early Warning System can help facilitate timely recognition, diagnosis, and treatment for women developing critical illness.

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: $BMI = (\text{weight (pounds)}/\text{height (inches)}^2) \times 703$*
 - *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*
 - *Abortion* - A procedure to end a pregnancy. Medicinal and surgical methods are used to remove an embryo or fetus and placenta from the uterus [2].
 - *Ectopic* – Occurs when the fertilized egg grows in an abnormal place outside the uterus, usually in the fallopian tubes [4].
 - *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 [5].
 - *Postmortem/perimortem C-section:* – An unplanned, emergency C-section delivery that is conducted shortly after a maternal death or during the maternal death process [6].
 - *Live birth* – The complete expulsion or extraction from the mother of a product of human conception that shows evidence of life after expulsion/extraction [5].
 - *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 [7].

- *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 [5].
- *Undelivered* – A woman that dies before delivering or the extraction of her fetus [5].
- *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*
 - *C-section* – An assisted delivery procedure where an infant or fetus is delivered through surgical incisions made in the abdomen and the uterus [8].
 - *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 to a woman during pregnancy or up to one year after the pregnancy ends, regardless of the cause of death. The Florida Department of Health (FDOH) 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 FDOH.

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 cause of death 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 risk 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 and time of death to categorize the cases as pregnancy-related, possibly pregnancy-related, or not pregnancy-related. The pregnancy-associated cases determined to be 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 each quarter to review, case 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

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? <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;"><input type="checkbox"/> YES</td> <td style="width: 33%;"><input type="checkbox"/> NO</td> </tr> <tr> <td><input type="checkbox"/> GOOD CHANCE</td> <td><input type="checkbox"/> SOME CHANCE</td> </tr> <tr> <td><input type="checkbox"/> NO CHANCE</td> <td><input type="checkbox"/> UNABLE TO DETERMINE</td> </tr> </table>	<input type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> GOOD CHANCE	<input type="checkbox"/> SOME CHANCE	<input type="checkbox"/> NO CHANCE	<input type="checkbox"/> UNABLE TO DETERMINE
<input type="checkbox"/> YES	<input type="checkbox"/> NO						
<input type="checkbox"/> GOOD CHANCE	<input type="checkbox"/> SOME CHANCE						
<input type="checkbox"/> NO CHANCE	<input type="checkbox"/> 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
 - Tobacco use
 - Continuity of care/ care coordination
 - Adherence
 - Chronic disease
 - Clinical skill/ quality of care
 - Knowledge
 - Childhood abuse/ trauma
 - Outreach
 - cultural/religious
 - Access/financial
 - Enforcement
 - Environmental
 - Unstable housing
 - Assessment
 - Violence
 - Social support/ isolation
 - Legal
 - Mental health conditions
 - Equipment/ technology
 - Other
 - Substance use disorder alcohol, illicit/prescription drugs
 - Policies/procedures
 - Communication

- | | |
|---|---|
| <p>PREVENTION LEVEL</p> <ul style="list-style-type: none"> • 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) | <p>EXPECTED IMPACT LEVEL</p> <ul style="list-style-type: none"> • 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 Maternal & Child Health Block Grant Director, Department of Health
- **Anthony Gregg, MD** - Professor & Chief, Division of Maternal-Fetal Medicine/Department of Obstetrics and Gynecology/University of Florida, until February 2018
- **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, Department of Health, current coordinator

PAMR Lead Abstractor

Dani Noell, ARNP, NNP, BC, MSN - PAMR Facilitator & Abstractor, Department of Health

PAMR committee Review Members

Sarah Beard, RN, BSN – Maternal and Child Health (MCH) Program Administrator, MCH Section, Department of Health

Estrellita “Lo” Berry, MA, LTFP – President, REACHUP Inc.

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

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, MCH Section, Department of Health

Washington Hill, MD – Emeritus

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

Candace Rouse, RNC, DNP, CNS-BC – Clinical Nurse Specialist, UF Shands Hospital

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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(850) 245-4469



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/2506A40D-EB9A-4A18-AB4F-B4045F6E5FD4/0/FLOHIIToolkitv122014.pdf>

4. Florida Pregnancy Associated Mortality Review 2013 Update.



During Pregnancy or Postpartum:
Women should go to the hospital if they cannot breathe or have severe shortness of breath because they could have Peripartum Cardiomyopathy (PPCM).

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:

1999–2012: 11.1% of pregnancy-related deaths in Florida were due to cardiomyopathy.²

1999–2011: 78% of pregnancy-related deaths occurred during the postpartum period.²

From 2009–2013:

- The percent of pregnancy-related deaths due to cardiomyopathy for non-Hispanic black women was 55% versus 25% for non-Hispanic white women.
- 80% of women who died from pregnancy-related cardiomyopathy were either overweight or obese (BMI > 25).³

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 failure with no identifiable cause and echocardiogram indicative of left ventricular (LV) dysfunction.⁴

SIGNS/SYMPTOMS—ONSET CAN BE EASILY MISSED⁵

- Marked limitation of physical activity. Comfortable at rest. Less than ordinary activity causes **fatigue, palpitation or dyspnea**.⁵
- Unable to carry on any physical activity without discomfort, symptoms of heart failure at rest; if any physical activity is undertaken, discomfort increases.⁵
- Arrhythmia/Cardiac Arrest
- Women with PPCM most commonly have dyspnea, dizziness, chest pain, cough, neck vein distention, fatigue and peripheral edema.⁵

PPCM CRITERIA

- 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^{2,3}

Social: Advanced maternal age, smoking, malnutrition, 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

continued

For more information, contact:

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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^a
- Differential Diagnosis: myocardial infarction, amniotic fluid embolism, severe preeclampsia, pericarditis, pulmonary thromboembolism, myocarditis, sepsis, drug toxicity, metabolic disorders, and aortic dissection^b
- When a postpartum patient presents with a cough and shortness of breath a careful physical examination should follow. If hypoxemia is identified or risk factors raise suspicion an echocardiogram should be considered

PAMR Recommendations (2015):

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

MANAGEMENT

- 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

PAMR Recommendations (2015):

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

1. Florida Department of Health. Pregnancy-Associated Mortality Review 2013 Update. http://www.floridahealth.gov/%5Cstatistics-and-data/PAMR/_documents/2013-pamr-update-092215.pdf

2. Florida Department of Health. Pregnancy-Associated Mortality Review. Pregnancy-Related Deaths during the Postpartum Period, 1999-2011. <http://www.floridahealth.gov/%5Cstatistics-and-data/PAMR/pamr-1999-2011-ppbrief.pdf>

3. Florida Department of Health. Florida Pregnancy-Associated Mortality Review (PAMR) data. Deaths due to cardiomyopathy 2009-2013 data request.

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Call for the Development 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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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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