



Florida's Pregnancy-Associated Mortality Review 2016 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 2016 Update provides an overview and comparison of PRD data and trends for Florida between 2006 and 2016. 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 157 Florida resident pregnancy-associated deaths (PADs) from January 1, 2016 to December 31, 2016. The PAMR case selection committee determined that 48 were most likely pregnancy-related. Upon full team review of the 48 PADs, the PAMR committee found that 29 (60.4%) were pregnancy-related.

The 2016 pregnancy-related mortality ratio (PRMR) in Florida was 12.9 per 100,000 live births. Although the 2016 PRMR was lower than the 2013 ratio (26.2 per 100,000 live births), the trend for the period 2006-2016 was not statistically significant.

For 2016:

- Of the 29 PRDs
 - 44.8% were non-Hispanic White women
 - 41.4% were non-Hispanic Black women
 - 10.3% were Hispanic women
 - 3.4% were non-Hispanic Other Races women
- The leading pregnancy-related causes of death in 2016 were hemorrhage (20.7%), and cerebrovascular accident, cardiomyopathy, and hypertensive disorder (13.8% each)
- Of the 29 PRDs, 21 (72.4%) occurred during the postpartum period
 - 42.9% of postpartum PRDs occurred prior to hospital discharge
 - 57.1% of postpartum PRDs occurred after hospital discharge
- PRDs by pregnancy outcome

- 65.5% after a live birth delivery
- 13.8% while still pregnant (undelivered)
- 6.9% after a miscarriage/abortion
- 6.9% during or after an emergency delivery
- 3.4% after a stillbirth
- 3.4% after an ectopic pregnancy
- 23 PRDs occurred during or after delivery
 - 76.2% (16) had C-section as a delivery method
 - 18.8% were planned C-section deliveries
 - 81.3% were unplanned C-section deliveries
- 13 PRDs (48.1%) were overweight or obese women based on their BMI classifications

The leading recommendations in 2016 were:

- Facilities should institute protocols for early recognition and treatment for hemorrhage. The Florida Perinatal Quality Collaborative (FPQC) Obstetric Hemorrhage Tool Box contains resources, suggested protocols for risk screening, diagnosis and treatment and is available at: <http://health.usf.edu/publichealth/chiles/fpgc/OHI.htm>.
- Emergency room facilities should have a standardized policy for treatment of hypertensive postpartum patients; resources are available in the Hypertension in Pregnancy Initiative (HIP) toolbox located at: <http://health.usf.edu/publichealth/chiles/fpgc/hip>.
- Provide education, counseling and access to a highly effective birth control method such as Long-Acting Reversible Contraceptive (LARC), for women with severe medical complications (i.e. cardiomyopathy), where a future or immediate pregnancy can be life threatening.

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 Obstetric Hemorrhage Initiative (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:

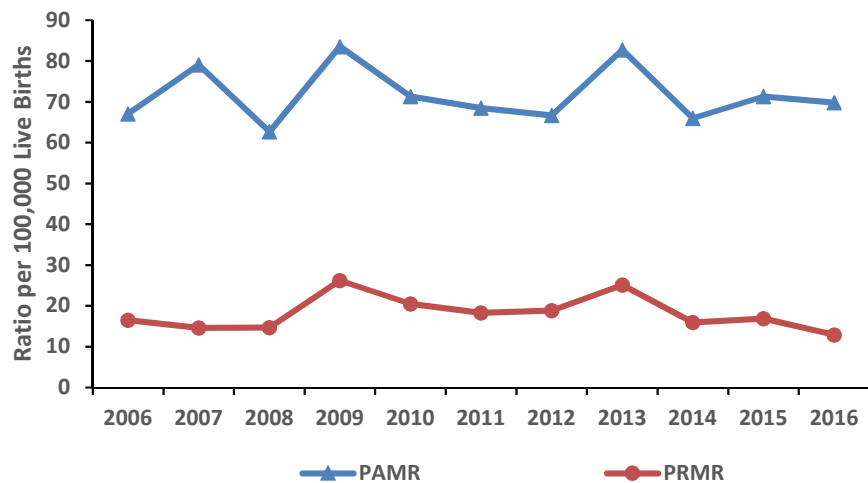
- Ongoing Surveillance
- Results from the Maternal Mortality Review Information Application (MMRIA) database use
- Ongoing building partnerships

Pregnancy-Related Mortality Findings — Florida, 2016

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 (PAMR) and pregnancy-related mortality ratios (PRMR) are shown in Figure 1.

Figure 1. Pregnancy-Associated Mortality Ratios and Pregnancy-Related Mortality Ratios, Florida 2006-2016



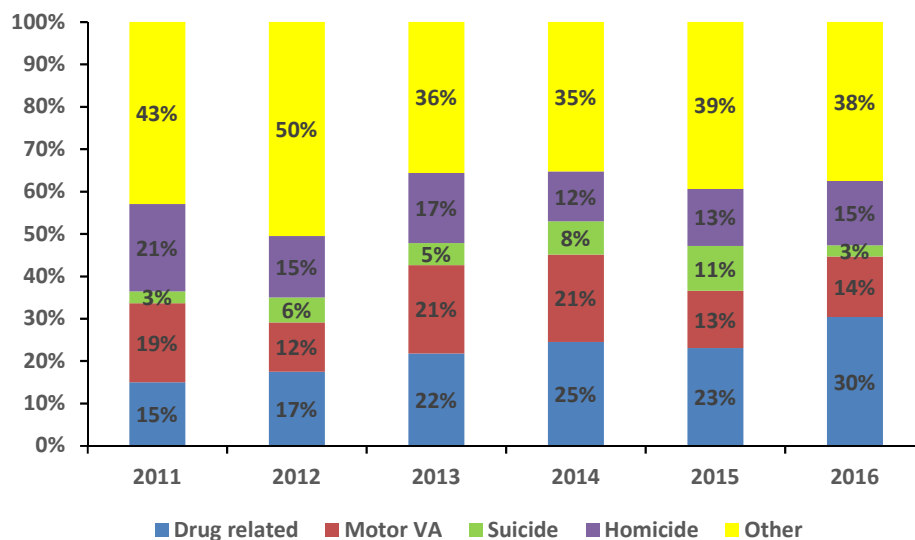
Year	# PAD	#PRD	%PRD	Year	# PAD	#PRD	%PRD
2006	159	39	24.5	2012	142	40	28.2
2007	189	35	18.5	2013	178	54	30.3
2008	145	34	23.4	2014	145	35	24.1
2009	185	58	31.4	2015	160	38	24.0
2010	153	44	28.8	2016	157	29	18.5
2011	146	39	26.7				

- The total number of PADs in Florida ranged from 142 to 189 per year between 2006 and 2016. The number of PADs in 2016 was 157.
- The proportion of PADs that were pregnancy-related ranged from 18.5% to 31.4% between 2006 and 2016. In 2016, 18.5% of PADs were determined to be PRDs by the Florida PAMR committee.

Not-Pregnancy-Related Deaths

Not-Pregnancy-Related Deaths are a subset of PAD. The leading causes of maternal death in the not-pregnancy-related cases for 2011-2016, 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 2016, deaths due to certain types of cancer and other miscellaneous causes represented 38% of not-pregnancy-related cases, while drug related, motor vehicle accidents (MVA), and homicides had percentages from 14% to 30%. Suicides represented 3% of the not-pregnancy-related deaths.

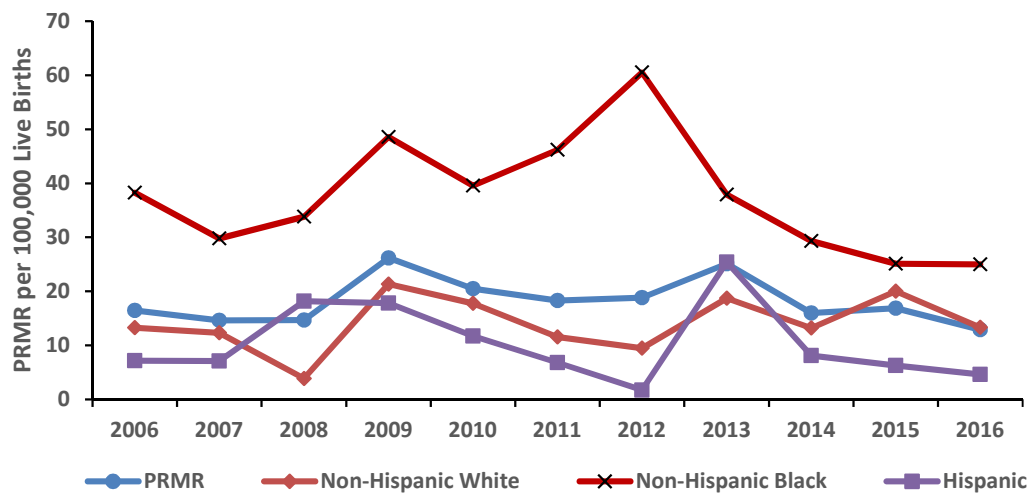
**Figure 2. Not-Pregnancy-Related Death Cases by Cause of Death
Florida, 2010-2016**



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 of time to identify increasing or decreasing trends. Figure 3 displays PRMRs for Florida between 2006 and 2016 by race and Hispanic ethnicity.

**Figure 3. Pregnancy-Related Mortality Ratios (PRMRs) by Race/Ethnicity
Florida, 2006-2016**



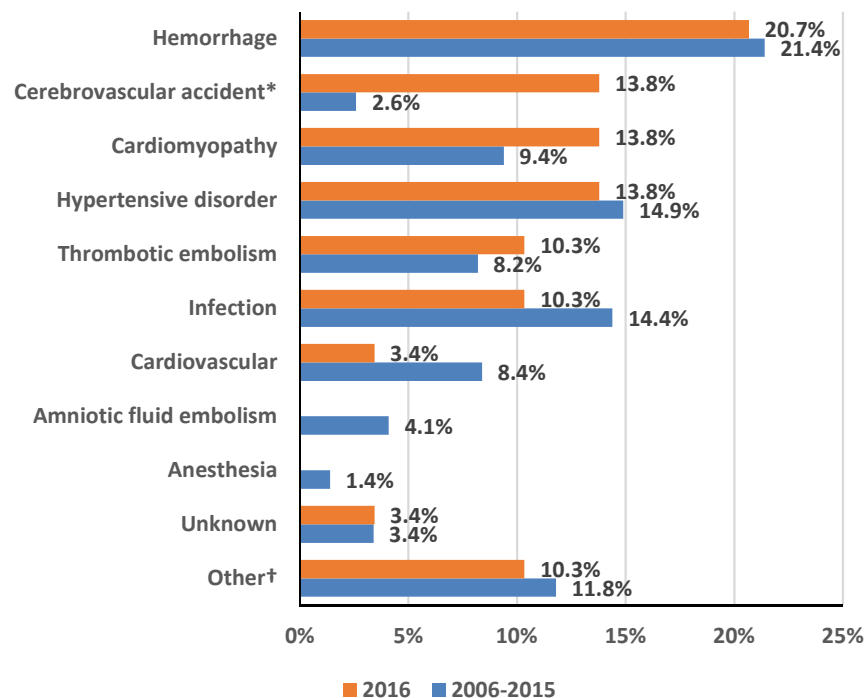
- During the period 2006-2016, the overall Florida PRMR fluctuated from 16.4 deaths per 100,000 live births in 2006 to a high of 26.2 in 2009 and a low of 12.9 in 2016. The PRMR in 2016 was 12.9 deaths per 100,000 live births.
- As evidenced in Figure 3, Florida PRMRs exhibit consistent racial disparities but the gap between non-Hispanic Blacks and non-Hispanic Whites between 2006 and 2016 has decreased from 8.7 in 2008 to 1.9 in 2016. 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 2016, the PRMR per 100,000 live births was 25.0 for non-Hispanic Black women, 13.3 for non-Hispanic White women, and 4.6 for Hispanic women.

Cause of Pregnancy-Related Deaths

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

- In 2016, the leading causes of PRDs were hemorrhage 20.7%, cerebrovascular accident, cardiomyopathy, and hypertensive disorder (the last three with 13.8% each); and thrombotic embolism, and infection, each one with 10.3% each.
- Figure 4 and Table 1 show how the percentage of deaths for cerebrovascular accident, cardiomyopathy, and thrombotic embolism were higher in 2016 compared with the period 2006-2015. Also, Figure 4 and Table 1 show decreases in the percentage of deaths in 2016 due to hemorrhage, hypertensive disorders, infection, cardiovascular problems, and other causes compared with 2006-2015. In 2016, there were not any deaths due to amniotic fluid embolism or anesthesia.

Figure 4. Distribution of Pregnancy-Related Causes of Death Florida, 2006-2015 (n=416) and 2016 (n=29)



*Cerebrovascular accident no known hypertensive disorders.

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

**Table 1. Distribution of Causes of Pregnancy-Related Death
Florida, 2006-2015 and 2016**

Causes of Deaths	2006-2015	2016	Change in Percentage
	N (%)		
Hemorrhage	89 (21.4)	6 (20.7)	-3.3
Cerebrovascular accident	11 (2.6)	4 (13.8)	430.8
Cardiomyopathy	39 (9.4)	4 (13.8)	46.8
Hypertensive disorders	62 (14.9)	4 (13.8)	-7.4
Thrombotic Embolism	34 (8.2)	3 (10.3)	25.6
Infection	60 (14.4)	3 (10.3)	-28.5
Cardiovascular	35 (8.4)	1 (3.4)	-59.5
Amniotic Fluid Embolism	17 (4.1)		
Anesthesia	6 (1.4)		
Other remaining causes*	49 (11.8)	3 (10.3)	-12.7
Total	416**	29**	

*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.

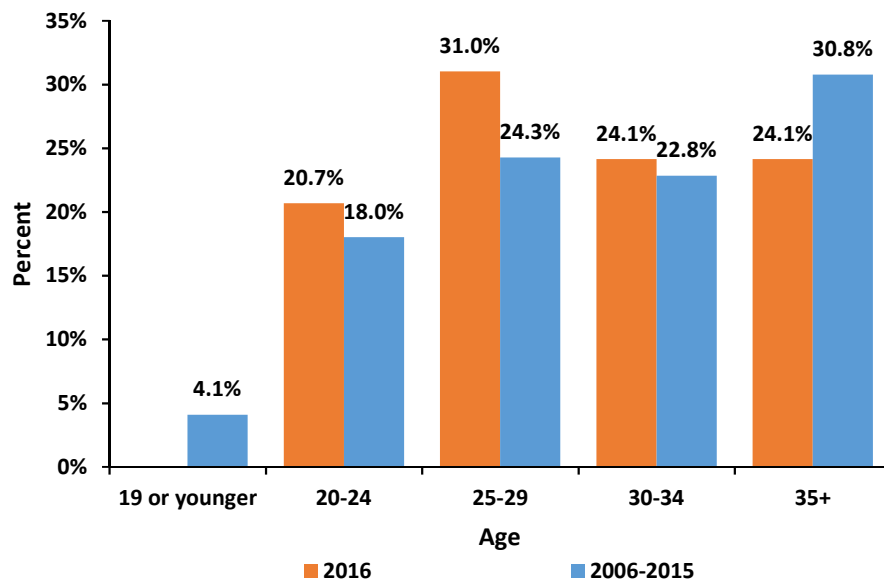
**Total includes unknowns.

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.

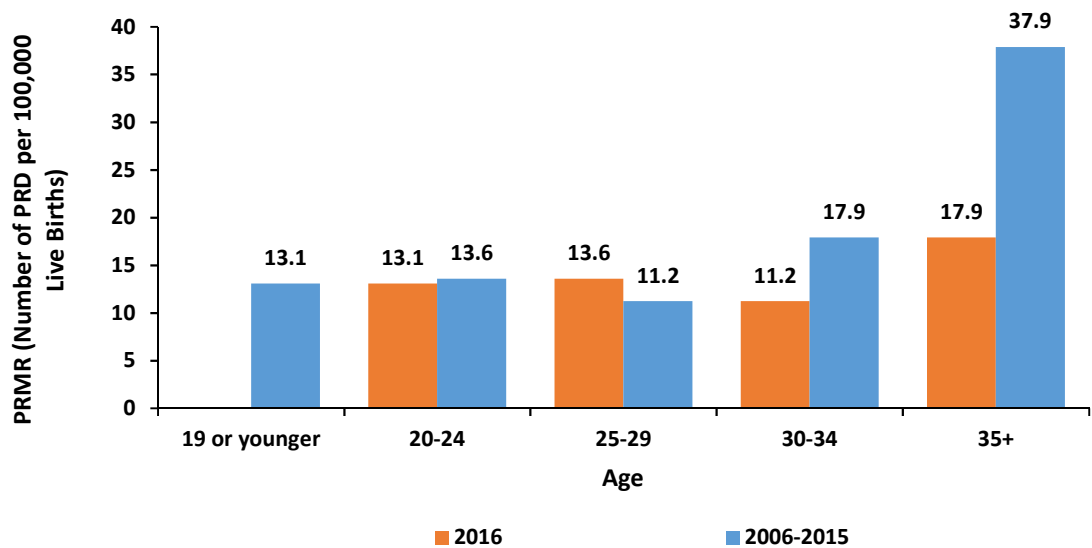
- In 2016, no maternal deaths for young women less than 20 years old were observed. The highest percentage of maternal deaths (31.0%) occurred in women 25-29 years old. In contrast, fewer older mothers age 35 or more died in 2016 compared with 2006-2015 (24.1% vs. 30.8% respectively) as shown in Figure 5a.

**Figure 5a. Distribution of Pregnancy-Related Deaths by Age
Florida, 2006-2015 (n=416) and 2016 (n=29)**



- In 2016, the PRMR of mothers age 35 or more (17.9) was almost 2 times (1.6) the PRMR of mothers 30-34 years old (11.2). (Figure 5b)

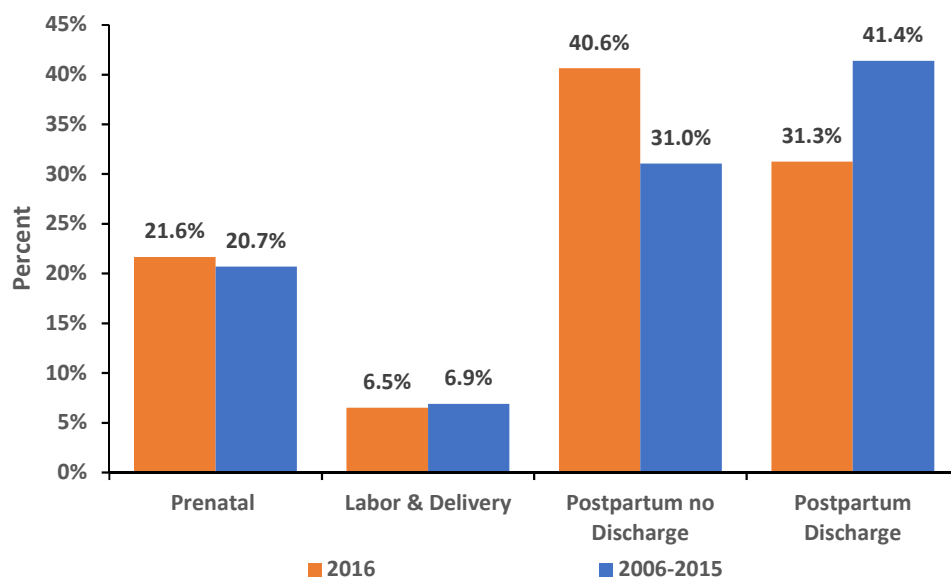
**Figure 5b. Pregnancy-Related Mortality Ratios (PRMRs) by Age
Florida, 2006-2015 and 2016**



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 2006-2015 and 2016 are shown below in Figure 6.

**Figure 6. Distribution of Pregnancy-Related Deaths by Timing of Death
Florida, 2006-2015 (n=416) and 2016 (n=29)**



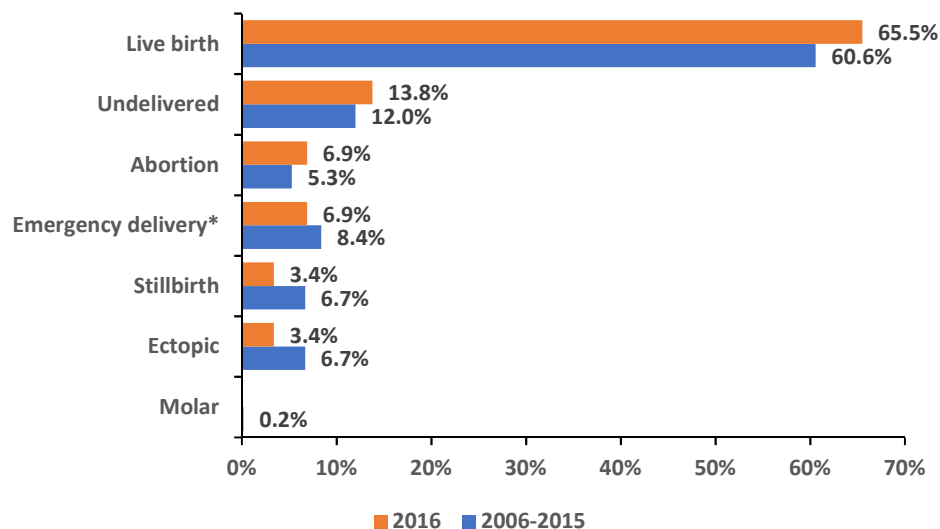
- In 2016, most PRDs (71.9%) occurred during the postpartum period. There are differences between the causes of death in the postpartum period by hospital discharge status.
 - Of the postpartum PRD cases who were not discharged from the hospital, the PRD causes were: hemorrhage, hypertensive disorders, thrombotic embolism, and other remaining causes.
 - Of the women who died after hospital discharge: the PRDs that occurred during the first six weeks postpartum were due to cerebrovascular accident, infection, hypertensive disorder, and cardiomyopathy. For women who died after six-weeks postpartum and were discharged from

the hospital, the causes of deaths were cardiomyopathy and thrombotic embolism.

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 2016 versus 2006-2015.

**Figure 7. Distribution of Pregnancy-Related Deaths by Pregnancy Outcome
Florida, 2006-2015 (n=416) and 2016 (n=29)**



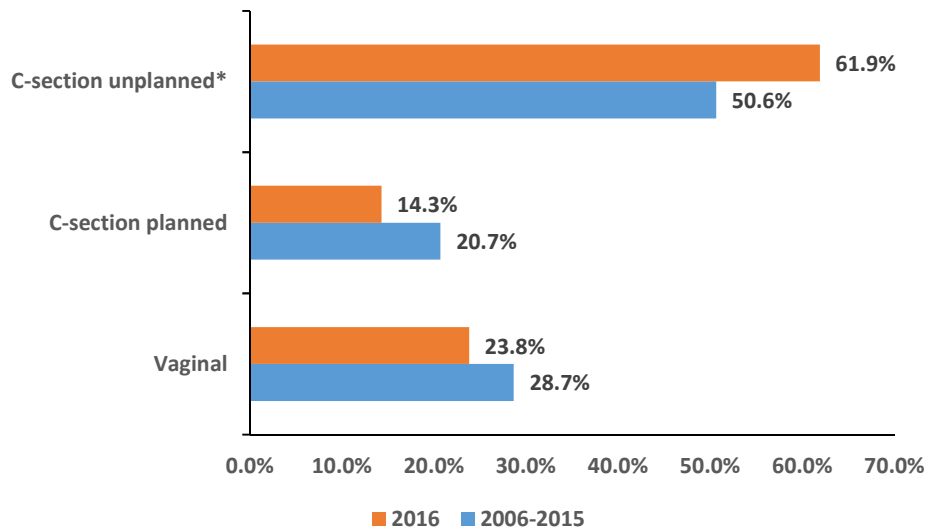
*There were two emergency deliveries in 2016, one was a live birth and one a stillbirth.

- In 2016, the majority (65.5%) of PRDs occurred after a live birth and 13.8% were undelivered.
- In 2016, there were 55 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, 2006-2015 (n=314), 2016 (n=21)**



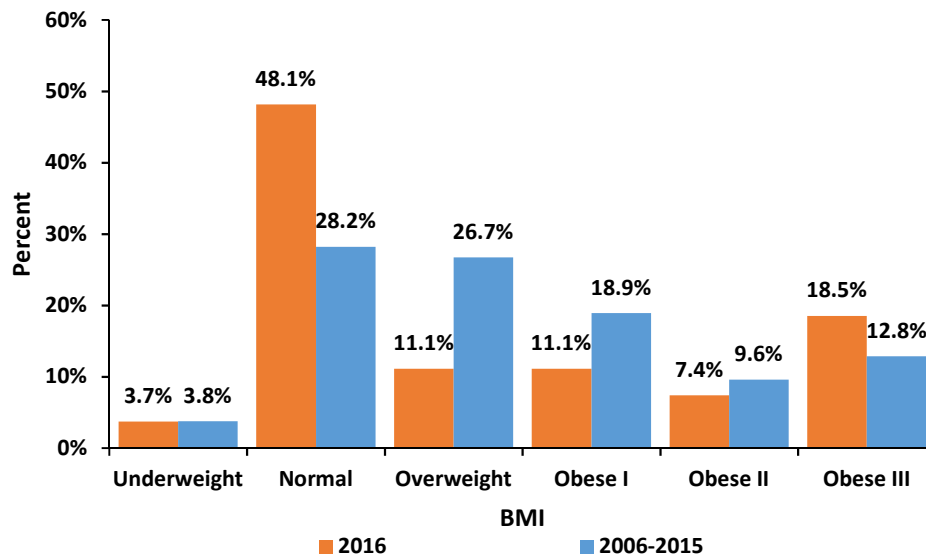
*Of 13 (61.9%) unplanned C-sections, 2 (15.4%) were emergency deliveries.

- In 2016, 76.2% of PRD cases that occurred during the labor/delivery or postpartum period were by C-section. In comparison, 37.4% of all live births in Florida were C-section deliveries in 2016 (not shown in figure 8) [1].
- Nearly 62% of the C-sections among the PRD cases that occurred in 2016 were unplanned C-section deliveries.

Pregnancy-Related Death by Pre-Pregnancy Body Mass Index

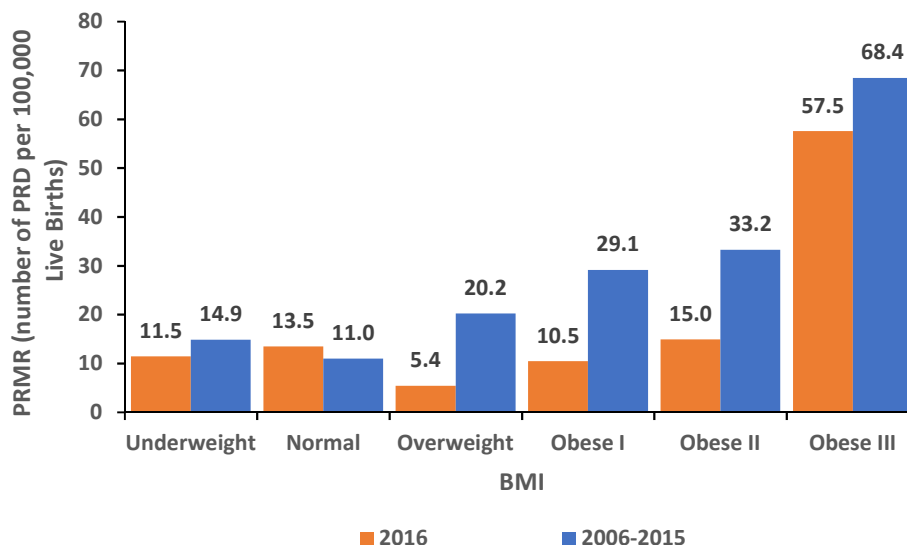
Body mass index (BMI) is a calculated measure of the relative percentage of body fat based on height and weight. PAMR uses the following six BMI categories to examine associations between weight before pregnancy and PRD: underweight, normal weight, overweight, and obese Class I, obese Class II, and obese 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, 2006-2015 (n=416) and 2016 (n=29)**



- In 2016, 48.1% 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, 50.2% 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, 2006-2015 (n=416) and 2016 (n=29)**



- As shown in Figure 9b, in 2016, the PRMR was 11.5 maternal deaths per 100,000 live births with underweight pre-pregnancy BMIs, 13.5 with normal BMIs, 5.4 with overweight and 10.5, 15.0, and 57.5 with obese Class I, Class II, and Class III pre-pregnancy BMIs, respectively.

PAMR Identified Issues and Recommendations for PRDs, 2016

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 2017 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 2016 PRDs include:

- Lack of Treatment: 27%
- Knowledge/Skills/Assessment: 20%
- Delay of Treatment: 20%
- Lack of Diagnosis: 13%
- Care Coordination-Referrals, Transfers, Follow-up: 13%
- Prevention-Patient education 7%

Clinical Recommendations

- Follow up patient education to make sure the patient understands the disease process and management of chronic diseases before pregnancy.

- Providers should stabilize a sickle-cell crisis before performing a C-section.
- Providers should consider delivery prior to 39 weeks gestation for clinical indicators such as Intrauterine Growth Restriction (IUGR) and maternal cardiac complications.
- Simplify the medication regimen of the patient to improve compliance with the treatment plan.
- Hospitals should develop protocols for communicating with difficult patients to prevent leaving against medical advice (AMA).
- Provide education and counseling and increase access to highly effective birth control methods such as Long-Acting Reversible Contraceptives (LARCs), for women with severe medical complications where a future or immediate pregnancy can be life threatening.
- Access to primary care and mental health records is vital to the abstraction process.
- Autopsy reports must provide full detail on the autopsy report to facilitate the abstraction process.
- Patients with abnormal vital signs visiting a non-obstetric clinic should be referred or transported to the emergency room.
- Develop a standardization of care for pregnant and postpartum patients in the hospital setting who have abnormal vital signs.
- Evaluate and reassess abnormal vital signs, such as tachycardia, before discharging a patient from the hospital.
- Re-evaluate and revise the criteria for non-medically necessary inductions in pregnant women with co-morbidities known to result in a possible PRD.

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 2016 PRDs include:

- Lack of Standardized Policies and Procedures: 50%
- Lack of Care Coordination: 50%

System Recommendations

- Establish a “medical home” to coordinate patient care.
- Patients with chronic illnesses should have an initial postpartum checkup within one to two weeks after being discharged home.

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 2016 PRDs include:

- Significant Co-Morbidity: 42%
- Personal Decisions (Example: Delayed Seeking Care): 33%
- Substance Abuse/Use: 9%
- Lack of Social Support: 6%
- Lack of Patient Knowledge: 6%
- Cultural or Religious Belief: 3%

Individual/Community Recommendations

- Increase access to preconception education, including educating patients on stabilizing chronic medical health issues prior to becoming pregnant.
- Educate patients and providers on the importance of getting chronic medical conditions under control or stabilized prior to conception.
- Target family planning and access to effective contraception for high-risk women.
- Refer patients to a substance use/abuse treatment program during preconception and prenatal care.
- Educate patients on the importance of seeking immediate medical attention when showing signs of declining health.
- Women with a history of depression or mental illness should receive care for mental health prior to becoming pregnant.
- Educate family and significant others of women with a history of mental illness or the signs of depression.

- Educate patients to take medications only as instructed by medical providers.
- Pregnant women with a history of seizure disorders or epilepsy should consult with a neurologist or specialist to maintain therapeutic levels of anti-seizure medications.
- Women with a chronic illness, such as human immunodeficiency virus (HIV), should seek prenatal care early during the pregnancy and continue with prenatal care throughout the pregnancy.
- Educate patients to continue taking antiretroviral medicines for HIV during pregnancy.
- Providers should train patients requiring self-catheterization to practice clean techniques for each catheterization.
- Educate patients on the importance of keeping scheduled appointments with health care providers.
- Educate patients on the importance of being at an optimal and healthy weight prior to becoming pregnant.
- Target women with chronic illnesses to educate them on family planning counselling and access to highly effective contraceptives.
- Women with a history of mental health disorders or abuse should have mental health counselling prior to becoming pregnant and throughout the duration of the 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 2016)

Committee Recommendations Related to the Leading Causes of Death

Also outlined are the PAMR committee's specific recommendations related to three leading causes of PRD for the year 2016: hemorrhage, hypertensive disorders, and infection. The PAMR committee did not make any specific recommendations for cerebrovascular accident, cardiomyopathy, and thrombotic embolism.

Hemorrhage

Clinical Recommendations

- Manage intraoperative care of postpartum hemorrhages; management of obstetric hemorrhage guidelines are available in the Florida Obstetric Hemorrhage Initiative toolkit at: <http://health.usf.edu/publichealth/chiles/fpgc/OHI>.
- Develop a prenatal plan for patients who refuse receiving blood products/transfusions; resources for protocols are available in the Florida Obstetric Hemorrhage Initiative (OHI) toolkit located at: <http://health.usf.edu/publichealth/chiles/fpgc/OHI>, Special Circumstances page 26-27.
- Perform a hysterectomy in the operating room when a postpartum patient is having an acute hemorrhage crisis.
- Educate providers on the importance of following the OHI guidelines on hemorrhage assessment, treatment and care.

System Recommendations

- Treatment of postpartum hemorrhage should be done in a monitored unit such as labor and delivery, intensive care unit (ICU), or the operating room.
- Hospitals should develop a policy for patients who refuse blood products/transfusions; a sample policy is available in the Florida Obstetric Hemorrhage Initiative (OHI) toolkit located at: <http://health.usf.edu/publichealth/chiles/fpgc/OHI>, Special Circumstances page 26-27 or the California Maternal Quality Care Collaborative (CMQCC) at: <https://www.cmqcc.org/resource/ob-hem-planning-women-jehovahs-witnesses-and-others-who-may-decline-blood-and-blood>.
- Educate providers that interventional radiology (IR) is not a recommended treatment for an acute hemorrhage crisis.

- Patients experiencing an uncontrolled massive hemorrhage should immediately be taken to the operating room for surgical intervention, i.e. hysterectomy. Follow the hemorrhage treatment guidelines in the OHI toolkit.

Individual/Community Recommendations

- Women of child-bearing age should seek care immediately when experiencing persistent severe abdominal pain.
- Educate patients to stress the importance of avoiding self-medication when experiencing persistent abdominal pain.

Hypertensive Disorders

Clinical Recommendations

- Hospitals should develop policies and procedures to require practitioners to consult an obstetrician when a postpartum patient presents to the emergency room with hypertension.
- Florida Department of Health and its partners should develop educational materials to raise awareness of the importance of treating pregnant and post-partum chronic hypertensive women with aspirin prophylactically, unless contraindicated.
- Educate practitioners to normalize elevated blood pressures in pregnant and post-partum women with HELLP syndrome.

System Recommendations

- Emergency room facilities should have a standardized policy for treatment of hypertensive postpartum patients; resources are available in the Hypertension in Pregnancy Initiative (HIP) toolbox located at:
<http://health.usf.edu/publichealth/chiles/fpqc/hip>.
- Educate emergency room physicians on the appropriate treatment of hypertensive emergencies in postpartum patients.

Infection

Clinical Recommendations

- ER physicians should immediately consult an OB physician for postpartum patients who come to the ER showing signs of sepsis/infection.

System Recommendations

- ERs should have a sepsis alert policy and procedure in place for pregnant and postpartum women.
- Women who deliver prematurely should have a full sepsis work-up prior to being discharged home.

Assessing Preventability of Maternal Deaths in Florida in 2016

In 2014, the Florida PAMR committee initiated the assessment of preventability of PRDs. After a series of discussions with the PAMR preventability work group and mirroring the California PAMR process [2], two new columns were included in the Florida PAMR review form.

First, the PAMR committee reaches consensus on whether the death appeared to have been preventable and to what degree the death was preventable by asking the following question: *If specific actions had been implemented, to what degree would these actions have changed the woman's trajectory and led to her survival?* There are three possible answers to this question:

- **Strong**: A case with a strong 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 strong 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.
- **Possible**: 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.

Second, for each PRD case, the PAMR committee identifies whether health care providers, facility, or patient/community factors contributed to the death with the following question: *Did the factors identified in the improvement categories contribute to the maternal death?* This question has two choices to select (when the factor did not contribute to the death, the question should be left blank).

- Definitely: In the reviewer's best judgment, the factor was present and definitely contributed to the cause of death.
- Probably: In the reviewer's best judgment, the factor was present and probably contributed to the cause of death.

These assessments of preventability are based on PAMR committee review and represent the first year of collecting these factors. The Florida PAMR committee members are optimistic that this information will help to focus the PAMR committee recommendations.

Results

Overall, in 2016, 58.6% of PRDs had a strong chance to alter the outcome and prevent the maternal death, and 13.8% had a possible chance to alter the outcome (Table 2). The leading causes of death showed variation (Table 2). The leading causes of death where at least 50% of the cases had a strong chance to alter the outcomes include: Cardiomyopathy (75.0%); hemorrhage; thrombotic embolism, and infection (66.7% each); and hypertensive disorder and cerebrovascular problems (50% each).

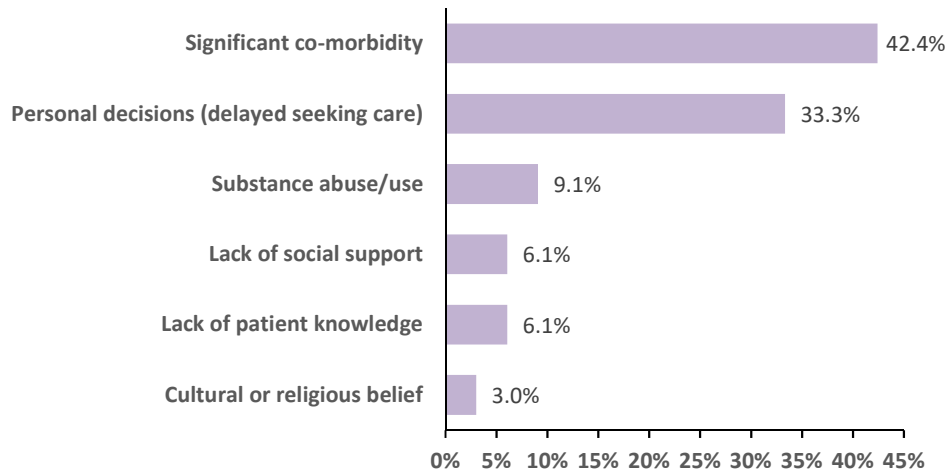
Table 2. Pregnancy-Related Death and Preventability, Florida 2016 (n=29)

Cause of PRDs	PRDs with Chance to Alter Outcome				Total	% Strong Chance to Alter Outcome
	Strong	Possible	None	N/I		
Hemorrhage	4	2	0	0	6	66.7
<i>Intrauterine</i>	3	2	0	0	5	60.0
<i>Ectopic</i>	1	0	0	0	1	100.0
Cerebrovascular accident	2	0	0	2	4	50.0
Cardiomyopathy	3	0	1	0	4	75.0
Hypertensive disorder	2	0	0	2	4	50.0
Thrombotic embolism	2	1	0	0	3	66.7
Infection	2	1	0	0	3	66.7
Cardiovascular	1	0	0	0	1	100.0
Other remaining causes*	1	0	0	2	3	33.3
Unknown	0	0	0	1	1	0.0
Total	17	4	1	7	29	58.6

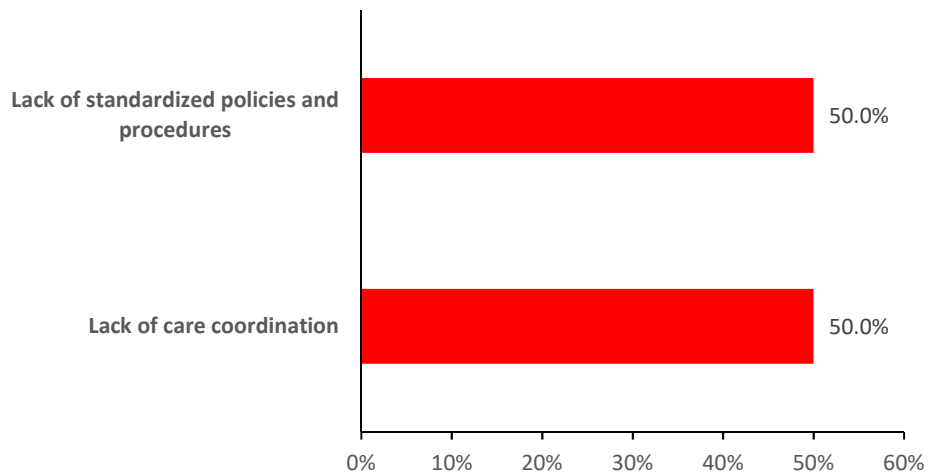
For 2016 PRDs, the Florida PAMR committee identified definite and possible factors that could have contributed to the maternal deaths. The Committee identified and grouped the maternal causes of death into Individual/Community, System Facility, and Clinical Contributing Factors. Each patient may have had multiple contributing factors. By individual/community, the definite factors that contributed to the maternal deaths were significant co-morbidities, personal decisions, substance abuse, lack of social support, lack of patient knowledge, and cultural or religious beliefs. Systems issues were related to lack of standardized policies and procedures and lack of care coordination. Clinical factors were lack of treatment, knowledge/skill assessment, delay of treatment, lack of diagnosis, care coordination-referrals, and prevention-patient education. (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, 2016

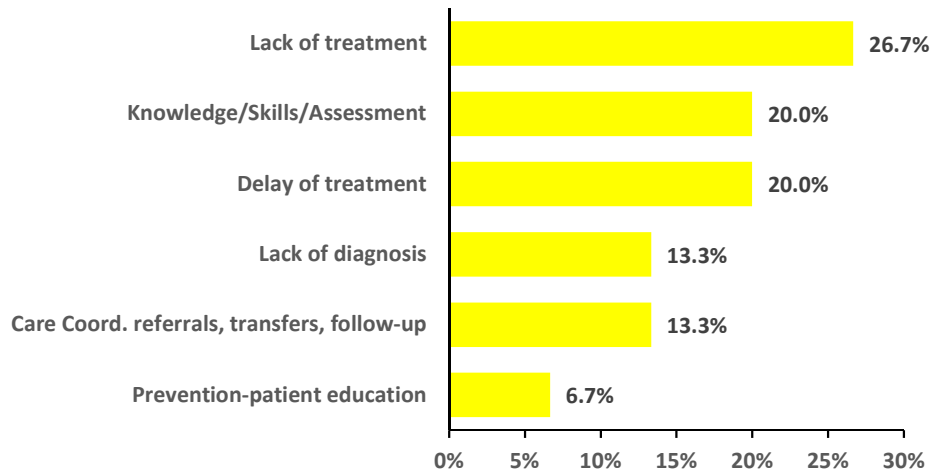
10.a - Contributing Individual/Community Factors



10.b - Contributing System Factors



10.c - Contributing Clinical Factors



The leading causes of death where at least 50% of the cases had factors that definitely contributed to the PRD include: intrauterine and ectopic hemorrhage (100%); cardiomyopathy (75.0%); thrombotic embolism and infection (66.7% each); and cerebrovascular accident and hypertensive disorders (50% each) (Table 3).

Table 3. Pregnancy-Related Death by Likelihood of Factors Contributed and Cause of Death, Florida 2016 (n=29)

Cause of PRDs	Factors that Contributed			Total	% Definitely Factor Contributed
	Definitely	Possible	N/I		
Hemorrhage	6	0	0	6	100.0
<i>Intrauterine</i>	5	0	0	5	100.0
<i>Ectopic</i>	1	0	0	1	100.0
Cerebrovascular accident	2	0	2	4	50.0
Cardiomyopathy	3	1	0	4	75.0
Hypertensive disorder	2	0	2	4	50.0
Thrombotic embolism	2	1	0	3	66.7
Infection	2	1	0	3	66.7
Cardiovascular	1	0	0	1	100.0
Other remaining causes*	1	0	2	3	33.3
Unknown	0	0	1	1	0.0
Total	19	3	7	29	65.5

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 2,500 pregnancy-associated cases. The committee carefully and respectfully considers each case before they identify issues and make recommendations.

The 2016 report shows the consistent disparity in PRDs between non-Hispanic Black and non-Hispanic White women. Non-Hispanic Black women were two 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 2006-2016 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, 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 implementing 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 implementing a community-driven project while applying sustainable approaches to screening, prevention, treatment, and promotion of healthy behaviors. The Department worked 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 (UMM) on hemorrhage and the second message pertained to peripartum cardiomyopathy (Appendix 5.) The newest UMM currently in progress 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 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 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 death cases categorized

as pregnancy-related. If there are fewer than 15 PRDs in a given 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

Improvement Categories		
	Possible	Definitely
A. Individual/Community Factors <input type="checkbox"/> 10 – Significant Co-Morbidity <input type="checkbox"/> 11 - Lack of Patient Knowledge <input type="checkbox"/> 12 - Cultural or Religious Beliefs <input type="checkbox"/> 13- Personal Decisions <input type="checkbox"/> 13.1 Delayed Seeking Care <input type="checkbox"/> 14 - Substance Abuse/Use <input type="checkbox"/> 15 - Lack of Social Support <input type="checkbox"/> 16 - Financial Barriers <input type="checkbox"/> Other _____		
B. System/Facility Factors <input type="checkbox"/> 20-Lack of Standardized Policies and Procedures <input type="checkbox"/> 21-Barriers to Accessing Care - Insurance, Provider Shortage, Transportation <input type="checkbox"/> 22-Lack of Care Coordination <input type="checkbox"/> 23-Facility Specific-Inadequate Equipment, Staff, Lab, Blood Bank <input type="checkbox"/> 24-Other _____		
C. Clinical Factors <input type="checkbox"/> 30 - Knowledge/Skills/Assessments <input type="checkbox"/> 30.1-Delay of Diagnosis <input type="checkbox"/> 30.2-Delay of Treatment <input type="checkbox"/> 30.3-Lack of Diagnosis <input type="checkbox"/> 30.4-Lack of Treatment <input type="checkbox"/> 31- Communication/ Documentation <input type="checkbox"/> 32 - Care Coordination-Referrals, Transfers, Follow-up <input type="checkbox"/> 33 - Prevention-Patient Education Preconception/Pregnancy/Postpartum <input type="checkbox"/> Other _____		
D. Death Review Process <input type="checkbox"/> 41 - Death Certificate Accuracy <input type="checkbox"/> 42 - PAMR Abstraction Process <input type="checkbox"/> 43 - Medical Examiner Review and Autopsies		

Appendix 4 - Florida Pregnancy Associated Mortality Review Members, 2017

PAMR committee Co-Chairs

- **Shay Chapman, BSN, MBA** – Chief, Bureau of Family Health Services, Title V MCH Director, DOH
- **Anthony Gregg, MD** - Professor & Chief, Division of Maternal-Fetal Medicine/Department of Obstetrics and Gynecology/University of Florida

PAMR Coordinators

- **Rhonda Brown, RN, BSN** - Program Administrator, Maternal & Child Health Section, DOH until April 2017
- **Deb Burch, RN, MSN**, Interim coordinator until August 2017.
- **Angela Thompson, RN, BSN** – Nursing Consultant, Maternal & Child Health Section, DOH, current coordinator

PAMR Lead Abstractor

Dani Noell, ARNP, NNP, BC, MSN - PAMR Facilitator & Abstractor, DOH

PAMR committee Review Members

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 - Chair, Florida District XII/American Congress of Obstetrician and Gynecologists (ACOG). Since May 2017; President, North Florida Women’s Physicians, PA

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

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

Robert Yelverton, MD – Chair, Florida District XII/ACOG until May 2017

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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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/7506A40D-E89A-4A18-AB4F-B4065F6E5FD4/0/FLOHItoolkitv122014.pdf>

4. Florida Pregnancy Associated Mortality Review 2013 Update.



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 increases⁵
- Arrhythmia/Cardiac Arrest
- Women with PPCM most commonly have dyspnea, dizziness, chest pain, cough, neck vein distention, fatigue and peripheral edema⁵

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-1999-2012-ppbrief.pdf>

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6. American Heart Association. Classes of Heart Failure. http://www.heart.org/HEARTORG/Conditions/HeartFailure/AboutHeartFailure/Classes-of-Heart-Failure_UCM_306328_Article.jsp#Vw_12v5hR4

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- [2] Main E, McCain C, Morton C, Holtby S, Lawton E. Pregnancy-Related Mortality in California Causes, Characteristics, and Improvement Opportunities. *Obstet Gynecol* 2015; 125:938-47
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