WOMEN AT RISK: THE HIGH-RISK PREGNANCY

Maternal-Fetal Medicine Practice & Maternal Mortality
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http://www.acadianamfm.com/
DISCLOSURES..

• I disclose that I have a minimal working knowledge of Power Point and IT type of work
• I disclose that this is my first “formal” presentation online
• I disclose that I’m from Franklin and I talk fast
• I have no financial disclosures, however
• To gain an appreciation of the idea that a patient may walk into a room, a situation, a store, an office... and what was thought to possibly be a “routine” pregnancy can quickly turn into the “unroutine”

• We are here to talk about Maternal Mortality ... Let us not forget the “other” patient.
BASELINE NUMBERS...

• ~ 85% of women will deliver normally in the United States
• ~ 10 – 15% will develop some complication
• ~ 3 – 5 % will need some surgical intervention

• 700 – 900 women in the U.S. die/year – HIGHEST IN THE DEVELOPED WORLD
• American women are more than 3x likely as Canadian women to die
• Some 65,000 nearly die

We are talking about a very small group of people in actual numbers but in reality, each individual... is an individual.
TO THE WORLD YOU MAY BE ONE PERSON, BUT TO ONE PERSON YOU MAY BE THE WORLD

Dr. Suess
THE PATIENT SAFETY MOVEMENT

• Born from the Annenberg Conference in 1996
• Launched efforts devoted to improving patient safety
  • National Patient Safety Foundation (NPSF)
  • Institute for Healthcare Improvement (IHI)
• Institute of Medicine publication – 2000
  • ~ 44,000 – 98,000 patients die annually from medical errors
• More recent studies suggest that it may be the 3rd leading cause of death in the United States
MORBIDITY, MORTALITY AND THE DEFINITIONS

• Severe maternal morbidity (SMM) – refers to health-impacting and life-threatening events that occur surrounding pregnancy / childbirth

• Pregnancy-related death: death w/in one year of the pregnancy from a pregnancy complication, chain of events initiated by the pregnancy or aggravation (preeclampsia, eclampsia, extreme hypertension..)

• Pregnancy-associated, but not related: death w/in one year from a cause that is not related to pregnancy (car crash etc..)

• Pregnancy associated, unable to be determined: pregnancy associated but unable to be determined (suicide)
DATA, DATA, DATA...

• Purpose: ...to propose guidelines for delivering facilities to systematically implement (evidence based) and improve patient care.

• All of the SMM and PAMR are significantly limited by the limited reliable and reproducible means of collecting data and the rarity of many complications

• Autopsies were performed in only 57% of cases in our own review*
• OVER HALF of the cases were missing at least “some” crucial records
• Pregnancy registry...

## Maternal Mortality - Worldwide & US

### Worldwide
- Obstetric hemorrhage – 27%
- Hypertensive disorders – 14%
- Pregnancy-related sepsis – 11%
- Abortion – 8%
- Embolism – 3%
- “Other direct” – 10%
- Complications of labor etc..
- “Other indirect” – 28%
- Preexisting medical disorders

### United States
- Cardiovascular conditions – 15%
- Noncardiovascular medical cond – 14%
- Infection – 12%
- Hemorrhage – 11%
- Cardiomyopathy – 10.8%
- Embolism – 9%
- HTN disorders 7%
- CVA – 7%
- Unknown – 6%
- AFE – 5%
- Anesthesia complications – 0.3%

Causes of Maternal Death

All causes of confirmed pregnancy-related deaths in Louisiana from 2011-2016, by number of deaths.

- Hemorrhage: 8
- Cardiomyopathy: 8
- Cardiovascular and Coronary Conditions: 7
- Embolism: 4
- Amniotic Fluid Embolism: 4
- Preeclampsia and Eclampsia: 3
- Cerebrovascular Accidents: 3
- Infection: 2
- Conditions Unique to Pregnancy: 2
- Renal Diseases: 1
- Liver and Gastrointestinal Conditions: 1
- Blood Disorders: 1
- Autoimmune Diseases: 1
- Unknown: 2

LOUISIANA 2011 – 2016
CAUSES OF PREGNANCY-RELATED DEATH


- Hemorrhage: 11.0%
- Infection: 12.5%
- Amniotic fluid embolism: 5.6%
- Thrombotic pulmonary embolism: 9.0%
- Hypertensive disorders of pregnancy: 6.9%
- Anesthesia complications: 0.3%
- Cerebrovascular accident: 7.7%
- Cardiomyopathy: 11.0%
- Other cardiovascular conditions: 15.7%
- Other noncardiovascular causes: 13.9%

CDC Data
TRENDS IN PREGNANCY RELATED MORTALITY


*Number of pregnancy-related deaths per 100,000 live births per year

PRMR*
Maternal deaths per 100,000 live births in the U.S. and Louisiana

Maternal deaths were identified through vital records data alone, using the WHO definition of maternal death (death during or within 42 days of pregnancy)

SPECIFIC CONDITIONS IN PREGNANCY - MORBIDITY AND MORTALITY
Postpartum Hemorrhage, 1993–2014*

Rates of postpartum hemorrhage per 10,000 delivery hospitalizations

PPH with blood transfusions

PPH with obstetric procedures to control hemorrhage

CDC Data
HEMORRHAGE

• There is approximately 600 ml of blood that goes through the uterus every minute.
• Leading cause of death worldwide in 2014 (27%)
• 1:20 – 1:100 deliveries
• No. 4 in the US (11%) for maternal death
• Increasing in frequency – increase in cesarean deliveries
• Antepartum hemorrhage
• Postpartum hemorrhage

Petersen EE et al. MMWR Morb Mortal Wkly Rep 2019; 68:423
OBSTETRICAL HEMORRHAGE- ANTEPARTUM

- First Trimester Bleeding
  - Pregnancy loss / threatened spontaneous abortion / “implantation”
  - Cervical pathology
  - Vaginal trauma
  - Ectopic pregnancy
HEMORRHAGE – ECTOPIC PREGNANCY

- **Risk factors**
  - Previous ectopic
  - Prior fallopian tube surgery
  - Previous pelvic or abdominal surgery
  - Previous STI’s / PID
  - Endometriosis

- **Treatment**
  - Medical – methotrexate
  - Surgical intervention
  - Cigarette smoking
  - Age > 35
  - History of infertility
  - ART (IVF)
OBSTETRICAL HEMORRHAGE – ANTEPARTUM

- Second trimester bleeding / Third
  - Bloody show
  - Vasa previa
  - Other (polyps, trophoblastic disease, non-tubal ectopics, trauma)
- Placenta previa
- Abruption
- Uterine rupture
POSTPARTUM HEMORRHAGE

• Obstetrical emergency
• Definitions have varied by time and by source making investigation/research difficult
• Incidence of ~ 1 – 3% of deliveries
• May be divided into “early” or “late” (aka “delayed”, “secondary”)
• ACOG revision 2017 – “... or bleeding associated w/ signs/sx of hypovolemia w/in 24hrs of birth
• Main causes:
  • Uterine Atony
  • Trauma
  • Coagulopathy
<table>
<thead>
<tr>
<th>Organization</th>
<th>Definition of PPH</th>
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- Severe PPH: Blood loss ≥1000 mL within the same time frame.                                                                                                                                                    |
| American College of Obstetricians and Gynecologists[2]          | - Cumulative blood loss ≥1000 mL or blood loss accompanied by signs or symptoms of hypovolemia within 24 hours after the birth process (includes intrapartum loss) regardless of route of delivery. |
| Royal College of Obstetricians and Gynaecologists[3] 2017       | - Minor PPH (500 to 1000 mL) and major PPH (>1000 mL). Subdivisions of major PPH include moderate (1001 to 2000 mL) or severe (>2000 mL).                                                                          |
| International expert panel[4]                                   | - Active bleeding >1000 mL within the 24 hours following birth that continues despite the use of initial measures, including first-line uterotonic agents and uterine massage.                                             |
- Stage 1: Blood loss >500 mL after vaginal or >1000 mL after cesarean delivery; or change in vital signs >15% or heart rate ≥110 beats/minute, blood pressure ≤85/45 mmHg, O₂ saturation <95%.  
- Stage 2: Continued bleeding with total blood loss <1500 mL.  
- Stage 3: Total blood loss >1500 mL or >2 units packed red cells transfused; or unstable vital signs; or suspicion of disseminated intravascular coagulation. |
POSTPARTUM HEMORRHAGE – CAUSES / RISK FACTORS

- Abnormal placentation
- Placental abruption
- Hypertensive disorders
- IUFD
- Induction of labor
- Prolonged 1\textsuperscript{st} or 2\textsuperscript{nd} stage
- Retained placenta / membranes
- Morbidly adherent placenta
- Lacerations
- Instrumental delivery
- LGA (> 4,000 g)

POSTPARTUM HEMORRHAGE – LATE / DELAYED

- Generally defined as significant uterine bleeding b/w 24hrs – 12 weeks post
- Occurs in 0.2 – 2.5% of post partum in high-income countries
- Most common causes:
  - Retained product of conception
  - Infection
  - Subinvolution of the placental bed
HEMORRHAGE – GENERAL PRINCIPLES OF MANAGEMENT

• Goals
  • Restore / Maintain adequate circulatory volume to prevent hypoperfusion
  • Reverse / Prevent coagulopathy
  • Eliminate the cause of the PPH
• Quantify blood loss
• Timely diagnosis
• Teamwork
• Monitoring

The risk of recurrence can be ~ 18% dependent upon the etiology

NPMS Bundle for Hemorrhage
• Readiness
• Recognition
• Response & reporting
• Systems learning
REDUCING MATERNAL MORTALITY: OBSTETRIC HEMORRHAGE

- Assessment all women to be delivered for risk of postpartum hemorrhage
- Every obstetrical unit needs a hemorrhage–response protocol
  - Member should train as a team and frequently
- All providers on every level must be able to identify and respond to clinical triggers
- Uterotonics, intrauterine balloons, uterine compression sutures and skills should be available to all maternity providers
- Women with a suspected morbidly adherent placenta should deliver at a center capable of massive transfusion protocols, rapid cesarean delivery availability and experience.
Hypertensive Disorders, 1993–2014

Rate of hypertensive disorders per 10,000 delivery hospitalizations

- Hypertensive disorders in pregnancy
- Chronic hypertension

CDC Data
HYPERTENSION

- Second leading cause of maternal death worldwide by the WHO 2014
- 33% of all adults ≥ 20y/o have CHTN as of 2016
- Number 7 in a US report from 13 MMR (7%)
- Perinatal mortality is 3 – 4x
- Comes in four forms:
  1. Chronic hypertension
  2. Gestational hypertension
     - Mild / Severe
  3. Preeclampsia/Eclampsia
     - HELLP
  4. Superimposed preeclampsia
HYPERTENSION – COMPLICATIONS

- Abruption
- Fetal growth restriction
- IUFD (fetal death)
- Oligohydramnios (low fluid)
- Prematurity
- Pulmonary edema
- Retinopathy
- Cerebral hemorrhage – largest contributor to mortality
HELLP... A SPECIAL KIND OF SICK

- Increased risk of maternal death – 1%
- Substantial increase in the perinatal morbidity / mortality – (7-20%)
- Increased risk of preterm birth (70%)
- Specific risks to the patient with HELLP
  - Pulmonary edema (8%)
  - ARF (3%)
  - DIC (15%)
  - Abruption (9%)
  - Liver hemorrhage / failure (1%)
  - Subsequent CVD
LDH – OPH – Bureau of Family Health

Louisiana Perinatal Quality Collaborative (LaPQC): Reducing Maternal Morbidity

What is LaPQC?
The Louisiana Perinatal Quality Collaborative (LaPQC) is an initiative of the Louisiana Commission on Perinatal Care and Prevention of Infant Mortality. LaPQC is a voluntary network of perinatal care providers, public health professionals and patient and community advocates who work to advance equity and improve outcomes for women, families, and newborns in Louisiana.

The first initiative of the LaPQC is the Reducing Maternal Morbidity Initiative. The goal of this initiative is to achieve a 20% reduction in severe maternal morbidity among pregnant and postpartum women who experience hemorrhage or severe hypertension/preeclampsia in LaPQC participating birthing facilities in 12 months, and to narrow the Black-White disparity in this outcome in 12 months.

What does the LaPQC do?
The LaPQC provides support to hospitals for continuous quality improvement on perinatal outcomes. It works to:

- Facilitate collaborative learning opportunities through Learning Sessions and monthly calls
- Identify and share best practices
- Facilitate mentorship between hospitals
- Provide teams with a data portal to allow for real-time evaluation to guide decision-making
- Provide subject-matter experts who are brought on as Faculty
- Coordinate a guiding Advisory Committee
- Ensure Louisiana’s work is connected to national initiatives
REDDUCING MATERNAL MORTALITY: PREECLAMPSIA

• Aggressively treat both systolic and diastolic hypertension
• Protocols for the use of IV antihypertensives for severe range blood pressure should be used widely on L&D and in the ER
• Laboratory evaluation should be completed for all women who present in the 3rd trimester with new onset hypertension OR RECENTLY POSTPARTUM
• Magnesium sulfate should be used to reduce the risk of eclampsia in women with hypertension and severe features
• Women with preeclampsia with severe features who are expectedly managed should be admitted to a hospital
• Guide, educate, and support providers, staff, hospitals and all involved with a culture of awareness and recommend best practices for prevention and response

• Timely recognition and an organized and swift response to hypertensive disorders surrounding pregnancy
THROMBOEMBOLISM

Rates of deep vein thrombosis and pulmonary embolism per 10,000 delivery hospitalizations

- Deep vein thrombosis
- Pulmonary embolism

CDC Data
VENOUS THROMBOEMBOLISM

• DVT – condition when a blood clot forms in a “deep vein”.
• Typically develop in the lower leg, thigh, or pelvis
• Potential for pulmonary embolus (PE)
• Pregnancy /surrounding postpartum period are well established risk factors
  • as much as 50 x risk of nonpregnant women
• Incidence 1:500 – 1:2,000
• PE is the 7th leading cause of maternal mortality
• Accounts for 9% of maternal deaths
• Conflicting reports of current trends**

VENOUS THROMBOSIS RISK FACTORS

### Antepartum
- Multiples
- Inflammatory bowel disease
- UTI
- Diabetes
- Hospitalization (>3d)
- BMI
- Increased maternal age

### Postpartum
- C/S (esp emergent)
- Comorbidities
- AMA
- EGA < 36 weeks
- Obstetric hemorrhage
- Smoking
- Pre-eclampsia
- Infection
- Stillbirth
ROOM FOR IMPROVEMENT IN THE US

- United Kingdom’s push for lowering rate of VTE
- Achieved ~ 50% reduction from baseline of the previous 6 years
  - Better risk assessment
  - Wider use of prophylaxis
- Current UK rate is ~ 0.8 / 100,000 vs US 1.5 / 100,000
- Now most US hospitals now follow prophylaxis recommendations by The Joint Commission and ACOG
REDUCING MATERNAL MORTALITY: VENOUS THROMBOEMBOLISM

• Evaluate all women for risk of venous thromboembolism
• Use sequential compression devices during and after all cesarean deliveries
• Use pharmacologic prophylaxis in women with a personal history
• Consider pharmacologic thromboprophylaxis for patients with other high risk conditions (obesity, thrombophilias, nephrotic proteinuria level, blood transfusion, surgical procedures, AMA)
• Consider pulmonary embolus in the differential diagnosis of sudden onset SOB, chest pain, tachypnea, hypoxia and/or tachycardia... and promptly
CONGENITAL / ACQUIRED HEART DISEASE
In the US, cardiovascular disease is the leading cause of death in the pregnant and postpartum woman.

- Constitutes 26.5% of U.S. pregnancy-related deaths.
- It affects ~ 1-4% of nearly 4 million pregnancies in the U.S. every year.
- Can be classified as “congenital” or “acquired”.
- Increasing in incidence.
  - 6.4 → 9.0 /10,000 delivery hospitalizations from 2000 – 2010.
  - 97% seem to be related to acquired heart disease.
- Higher rates of morbidity & mortality in nonwhite, lower-income women.

CARDIOVASCULAR DISEASE IN PREGNANCY

- Most common presentations
  - Heart failure
  - Myocardial infarction
  - Arrhythmia
  - Aortic dissection
- Diagnosis can be challenging because of the overlap of symptoms
- Estimated that ¼ or more of maternal deaths in the US could be prevented
- UK report in 2015 on maternal mortality:
  - 50% were associated with substandard health care
  - ½ of those were considered “avoidable”

Kuklina E et al. BJOG 2011;118:345–52
MATERNAL CARDIOVASCULAR DISEASE – RISK FACTORS

- Non-Hispanic black race
- Older age (>40)
- Hypertensive disorders
  - Preeclampsia spectrum
- Chronic disease
  - CHTN
  - Pregestational diabetes
- Obstructive sleep apnea
- History of preterm birth
- Family history
- Exposure to cardiotoxic drugs
- Obesity
<table>
<thead>
<tr>
<th>COMMON SIGNS &amp; SYMPTOMS VS ABNORMAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ROUTINE CARE</strong></td>
</tr>
<tr>
<td>Reassurance</td>
</tr>
<tr>
<td>History of CVD</td>
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<tr>
<td>Self-reported symptoms</td>
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<tr>
<td>Shortness of breath</td>
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<tr>
<td>Chest pain</td>
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<td>Palpitations</td>
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<td>Syncope</td>
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<td>Fatigue</td>
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<tr>
<td>Vital signs</td>
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<td>HR (beats per minute)</td>
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<tr>
<td>Systolic BP (mm Hg)</td>
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<tr>
<td>RR (per minute)</td>
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<tr>
<td>Oxygen saturation</td>
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<tr>
<td>Physical examination</td>
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<tr>
<td>JVP</td>
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<tr>
<td>Heart</td>
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<tr>
<td>Lungs</td>
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<tr>
<td>Edema</td>
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</tbody>
</table>
# WHO Pregnancy Risk Classification

## Modified WHO Pregnancy Risk Classification

(Risk of Pregnancy by medical condition)

<table>
<thead>
<tr>
<th>Suggested follow-up*</th>
<th>Specific Cardiac Lesions</th>
<th>Pregnancy Care Delivery Location</th>
</tr>
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<tbody>
<tr>
<td><strong>mWHO Risk Class I</strong></td>
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</table>
| No detectable increased risk of maternal mortality and no or mild increase in morbidity (2–5% risk of maternal cardiac event rate) | Uncomplicated, small, or mild  
- Pulmonary stenosis  
- Patient ductus arteriosus  
- Mitral valve prolapse | Prepregnancy/pregnancy counseling  
- Care at local hospital  
- Delivery at local hospital* |
| Follow-up: Cardiology evaluation once or twice during pregnancy | Successfully repaired simple lesions (atrial or ventricular septal defect, patent ductus arteriosus, anomalous pulmonary venous drainage) |                                 |
| | Atrial or ventricular ectopic beats, isolated |                                 |
| **mWHO Risk Class II** | Unoperated atrial or ventricular septal defect  
- Repaired Tetralogy of Fallot or aortic coarctation  
- Most arrhythmias (supraventricular arrhythmias)  
- Turner syndrome without congenital cardiac disease | Prepregnancy/pregnancy counseling  
- Pregnancy Heart Team* consultation/counseling  
- Care at local hospital  
- Delivery at local hospital* |
| Small increased risk of maternal mortality or moderate increase in morbidity (6–10% maternal cardiac event rate) | Follow-up: Cardiology, every trimester | |
WHO – CLASS II (CONT) & III

mWHO Risk Classes II and III
Intermediate increased risk of maternal mortality or moderate to severe increase in morbidity (11–19% maternal cardiac event rate)
Follow-up: Cardiology, every trimester

- Mild left ventricular impairment (EF >45%)
- Hypertrophic cardiomyopathy
- Native or bioprosthetic valve disease not considered mWHO Risk Class I or IV (mild mitral stenosis, moderate aortic stenosis)
- Marfan or other HTAD syndrome without aortic dilation
- Aorta <45 mm in bicuspid aortic valve pathology
- Repaired coarctation without residua (non-Turner)
- Atrioventricular septal defect

Pre-mWHO Risk Class III
Significantly increased risk of maternal mortality or severe morbidity (20–27% maternal cardiac event rate)
Follow-up: Cardiology, every 1–2 months

- Moderate left ventricular impairment (EF 30–45%)
- Previous peripartum cardiomyopathy without any residual left ventricular impairment
- Mechanical valve
- Systemic right ventricle with good or mildly decreased ventricular function
- Uncomplicated Fontan circulation,
- Unrepaired cyanotic heart disease
- Other complex heart disease
- Moderate mitral stenosis
- Severe asymptomatic aortic stenosis
- Moderate aortic dilation (40–45 mm in Marfan syndrome or other HTAD; 45–50 mm in bicuspid aortic valve; Turner syndrome ASI 20–25 mm/m²; Tetralogy of Fallot <50 mm)
- Ventricular tachycardia
- Pregnancy heart team consultation/
counseling
- Care at an appropriate level hospital (critical members of the Pregnancy Heart Team available depending on cardiac disease)
- Delivery at an appropriate level hospital†

- Prepregnancy/pregnancy counseling
- Pregnancy Heart Team consultation/
counseling
- Care at an appropriate level hospital†
- Delivery at an appropriate level hospital†
**RISK CLASS IV**

- Pulmonary arterial hypertension
- Severe systemic ventricular dysfunction (EF <30%, NYHA III-IV)
- Previous peripartum cardiomyopathy with any residual left ventricular dysfunction
- Severe mitral stenosis
- Severe symptomatic aortic stenosis
- Systemic right ventricle with moderate to severely decreased ventricular function
- Severe aortic dilation (>45 mm in Marfan syndrome or other HTAD; >50 mm in bicuspid aortic valve; Turner syndrome ASI >25 mm/m²; Tetralogy of Fallot >50 mm)
- Vascular Ehlers-Danlos
- Severe (re)coarctation
- Fontan circulation with any complication

- Pregnancy Heart Team* consultation/counseling
- Care at an appropriate level hospital* (critical members of the Pregnancy Heart Team available depending on cardiac disease)
- Delivery at an appropriate level hospital*¹

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**mWHO Risk Class IV**

**Pregnancy contraindicated**

**Discuss induced abortion**

Extremely high risk of maternal mortality or severe morbidity

(>27% maternal cardiac event rate)

**Follow-up: Cardiology follow-up every month (minimum)**
• California Improving Health Care Response to Cardiovascular Disease in Pregnancy & Postpartum

• Could have identified 88% of patient prior to maternal deaths

CLINICAL CONSIDERATIONS

• Preconceptual counseling / risk assessment
• Detailed history
• Proper referrals
  • Cardiology
  • MFM
  • Anesthesia
• Patient education
Symptoms such as severe dyspnea, orthopnea or syncope warrant further evaluation.

Women who present late in pregnancy or recently postpartum with pulmonary edema or other evidence of volume overload of unknown etiology should have an echocardiogram.

All women with known underlying cardiac disease should be co-managed with an MFM and cardiologist.

Women with WHO Class IV should be counseled that pregnancy is contraindicated, even discussions at regular gyn visits.

Careful delivery planning for women with cardiac disease is required in a multidisciplinary collaboration.
AMNIOTIC FLUID EMBOLISM
AMNIOTIC FLUID EMBOLISM (AFE)

- Rare and often catastrophic condition of pregnancy
- Diagnosis of exclusion and clinical findings
- Characterized by sudden cardiovascular collapse, severe respirator difficulty, hypoxia and/or seizures. DIC typically follows these symptoms
- Generally arises during labor or shortly thereafter
- Occurs ~ 1.9 – 6.1 cases / 100,000 deliveries
- One of the leading causes of maternal mortality
- Pathogenesis is unclear with many hypotheses
AMNIOTIC FLUID EMBOLISM – RISK FACTORS

- Cesarean delivery
- Instrumental delivery
- Placental abnormalities
  - Previa
  - Abruption
  - Accreta
- Preeclampsia / eclampsia
AFE – SYMPTOMS AND LOOK-ALIKES

- Aura – 1/3 sense doom, chills, n/v, agitation, anxiety
- Sudden cardiorespiratory failure
- Hemorrhage / DIC
- Tonic-clonic seizure
- Hemorrhage secondary to atony
- Thromboembolism
- Anesthetic accident
- MI
- Septic shock
• Supportive care and monitoring
• ICU and ruling out other causes / narrow diagnosis
  - Vasopressors
  - IVF
  - Blood products
  - Arterial access
• Mortality rate is ~ 15 – 40% (overall acceptable number is ~ 20%)
• 85% patients with significant neurologic injury
• 20 – 60% neonatal mortality and ~ Only 50% of survivors are neurologically “intact”
• Recurrence is unknown
REDUCING MATERNAL MORTALITY: AMNIOTIC FLUID EMBOLISM

- Consider amniotic fluid embolism in the differential diagnosis
- Initiate aggressive and immediate cardiopulmonary support
- Initiate massive transfusion protocol early - emphasis on large quantities of coagulation factors
- If AFE occurs during pregnancy with a viable fetus, expedited delivery
- Immediately involve staff from anesthesia, obstetricians (other help), critical care

*Mortality can occur even in BEST cases that are optimally managed*
INFECTION / SEPSIS
“Infection” can come in many forms during pregnancy.

Depending upon the infection, mother and fetus may be affected.

Sepsis is one of the leading causes of mortality in an ICU.

Accounts for ~ 12% of maternal deaths in the North America.

Mostly due to multi-organ dysfunction.
The obstetric patient is particularly vulnerable...

- Decrease immune system
- Opportunities for viral reactivation and/or bacteremia
  - Pyelonephritis
  - Intra-amniotic infection
  - Endometritis
- Wound infections
REDUCING MATERNAL MORTALITY: SEPSIS

- Pregnant and postpartum women with an infection should be evaluated for sepsis
- All provider/medical staff must be able to identify and respond to clinical triggers demonstrating risk of progression to septic shock
- Culture should be collected to identify the organizing responsible for the infection*
- Supportive care (pressors, intubation etc.) is critical when needed
SUICIDE AND HOMICIDE
Causes of Death
As determined by the PAMR Committee

- Homicide: 10 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Cardiovascular and Coronary Conditions: 6 Pregnancy-Related, 4 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Motor Vehicle Crash (MVC): 10 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Accidental Overdose: 7 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Cardiomyopathy: 3 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Suicide: 3 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Malignancies: 3 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Infection: 2 Pregnancy-Related, 2 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Pulmonary Conditions: 2 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Preeclampsia and Eclampsia: 2 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Embolism: 2 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Fire/Burns: 1 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Unknown Cause of Death: 1 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Liver and Gastrointestinal Conditions: 1 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Seizure Disorders: 1 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Autoimmune Diseases: 1 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness
- Amniotic Fluid Embolism: 1 Pregnancy-Related, 1 Pregnancy-Associated, 1 but Unable to Determine Relatedness

Louisiana PAMR Report 2017
• Older studies likely underestimate the contribution of suicide and homicide
• National data lacking because of death not historically reported to the CDC
• There is now a more accurate standardized classification with the new CDC collection tool (MMRIIA).
• Intimate partner violence - 54% of cases
SUICIDE / HOMICIDE DEMOGRAPHICS

• Pregnancy associated suicide
  • Older (>30 years)
  • White or Native American
  • employed

• Suicide victims associated with substance use
  • Younger victims
  • Single
  • Unemployed
SUICIDE DEATHS IN COLORADO

- 17% had a known substance use disorder
- 54% had a prior psychiatric diagnosis, predominantly depression
- Psychopharmacotherapy was discontinued and almost 50% - patient or provider
- Most cases, these were medications that were considered “safe in pregnancy”
  - Lack of understanding of the risk of the medication
  - Lack of understanding of the risk of discontinuation
- Counsel on Patient Safety and Women’s Healthcare – 2016 bundle
REDUCING MATERNAL MORTALITY: SUICIDE AND HOMICIDE

• Screening pregnant women for mental health disorders and referral to treatment when identified
• Allowing for access to the proper treatment for the patient
• Discuss the risk and benefits of cessation of medications, particularly those of mental health disorders – education
• Screen pregnant women for intimate – partner violence and provide resources if identified
• Resources available and readily known to healthcare providers
• Screen pregnant women for substance use disorders and refer to treatment
• Resources for treatment of substance use disorders in pregnant women
“...too much plane for one man to fly”
WHAT CAN BE DONE?

- Use of safety bundles and check list
- Checklists in Obstetrics
  - Oxytocin
- Safety personnel / Committee
- Event reporting tools
- Hospitalists
- Team training and simulation
THE NEAR MISS
WHO MATERNAL NEAR-MISS CRITERIA

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<thead>
<tr>
<th>Clinical criteria</th>
<th>Laboratory-based criteria</th>
<th>Management-based criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute cyanosis</td>
<td>Oxygen saturation &lt;90% for ≥60 minutes</td>
<td>Use of continuous vasoactive drugs**</td>
</tr>
<tr>
<td>Gasping*</td>
<td>PaO₂/FiO₂ &lt;200 mmHg</td>
<td>Hysterectomy following infection or hemorrhage</td>
</tr>
<tr>
<td>Respiratory rate &gt;40 or &lt;6/min</td>
<td>Creatinine ≥300 micromol/L or ≥3.5 mg/dL</td>
<td>Transfusion of ≥5 units red cell transfusion</td>
</tr>
<tr>
<td>Shock¶</td>
<td>Bilirubin &gt;100 micromol/L or &gt;6.0 mg/dL</td>
<td>Intubation and ventilation for ≥60 minutes not related to anesthesia</td>
</tr>
<tr>
<td>Oliguria nonresponsive to fluids or diureticsΔ</td>
<td>pH &lt;7.1</td>
<td>Dialysis for acute renal failure</td>
</tr>
<tr>
<td>Clotting failure †</td>
<td>Lactate &gt;5</td>
<td>CPR</td>
</tr>
<tr>
<td>Loss of consciousness lasting ≥12 hours §</td>
<td>Acute thrombocytopenia (&lt;50,000 platelets)</td>
<td></td>
</tr>
<tr>
<td>Loss of consciousness AND absence of pulse/heart beat</td>
<td>Loss of consciousness AND the presence of glucose and ketoacids in urine</td>
<td></td>
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<tr>
<td>Stroke‡</td>
<td></td>
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<tr>
<td>Uncontrollable fit/total paralysis ‡</td>
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<tr>
<td>Jaundice in the presence of preeclampsia †</td>
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</tbody>
</table>

The WHO maternal near-miss criteria: A woman presenting with any of the life-threatening conditions listed in the table and surviving a complication that occurred during pregnancy, childbirth, or within 42 days of termination of pregnancy should be considered as a maternal near-miss case.

CPR: cardiopulmonary resuscitation; IV: intravenous.
* Gasping is a terminal respiratory pattern, and the breath is convulsively and audibly caught.
¶ Shock is a persistent severe hypotension, defined as a systolic blood pressure <90 mmHg for ≥60 minutes with a pulse rate of at least 120 despite aggressive fluid replacement (>2 L).
Δ Oliguria is defined as a urinary output <30 mL/hour for 4 hours or <400 mL/24 hours.
◊ Clotting failure can be assessed by the bedside clotting test or absence of clotting from the IV site after 7 to 10 minutes.
§ Loss of consciousness is a profound alteration of mental state that involves complete or near complete lack of responsiveness to external stimuli. It is defined as a Coma Glasgow Scale <10 (moderate or severe coma).
‡ Stroke is a neurologic deficit of cerebrovascular cause that persists beyond 24 hours or is interrupted by death within 24 hours.
† Condition in which the brain is in a state of continuous seizure.
‡ Preeclampsia is defined as the presence of hypertension associated with proteinuria. Hypertension is defined as a blood pressure of at least 140 mmHg (systolic) or at least 90 mmHg (diastolic) on at least 2 occasions and at least 4 to 6 hours apart after the 20th week of gestation in women known to be normotensive beforehand. Proteinuria is defined as excretion of 300 mg or more of protein every 24 hours. If 24-hour urine samples are not available, proteinuria is defined as a protein concentration of 300 mg/L or more (≥1+ on dipstick) in at least 2 random urine samples taken at least 4 to 6 hours apart.
** For instance, continuous use of any dose of dopamine, epinephrine, or norepinephrine.
Review committees crucial
Louisiana & National findings continue to confirm that leading causes of death are PREVENTABLE

Almost half of confirmed pregnancy-related deaths were thought to be preventable by the review committee.

The committee reviewed all confirmed pregnancy-related deaths and used the Maternal Mortality Review Committee Decisions Form (see Appendix G) to determine their preventability and the chance to alter the outcome of each case. A death was considered preventable if the committee determined 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.

Preventability & Chance to Alter Outcomes
Among confirmed pregnancy-related deaths

National Findings
Based on data from review committees in 9 other states and cities:

- 70% of deaths due to hemorrhage were thought to be preventable.
- 68.2% of deaths due to cardiovascular/coronary conditions were thought to be preventable.
- 66% of deaths occurring within 42 days of pregnancy were thought to be preventable.

Louisiana Findings

- 62.5% of hemorrhage deaths were deemed preventable.
- 62.5% of cardiomyopathy deaths were deemed preventable.
- 40% of deaths due to cardiovascular/coronary conditions were deemed preventable.
- 7 out of 8 deaths due to embolism, including thromboembolism and amniotic fluid embolism, were deemed not preventable.
IN CONCLUSION... CHANGE YOUR CULTURE

- Be **Ready** for an event
- **Recognize** warning signs & symptoms & risk factors
- **Respond** to those findings
- **Report** and **Revaluate**
  - Train
  - Train
  - Train