Postpartum Emergencies

Uterine Rupture
Amniotic Fluid Embolism
Pulmonary Embolism
Sepsis

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Disclosures

- We have no financial relationships with any commercial interests
- No relevant financial relationships exist
Objectives

- Discuss abnormal conditions that increase a pregnant woman’s risk for rapid decline
- Review the physiological changes of pregnancy that mask the severity of maternal decompensation
- Describe the importance of multidisciplinary care teams aimed to provide comprehensive care
- Cite at least 3 patient safety bundles aimed to prevent maternal morbidity and death
Objectives

- Review normal physiologic changes of pregnancy that impact maternal decompensation.
- Highlight abnormal conditions that contribute to the severity of obstetric emergencies.
- Cite four Maternal Safety Bundles aimed to reduce maternal morbidity and death.
- Describe how direct care nurses can improve patient safety with their organization.
Maternal Mortality Is Rising in the U.S. As It Declines Elsewhere

Deaths per 100,000 live births

- U.S.A. (26.4)
- U.K. (9.2)
- Portugal (9)
- Germany (9)
- France (7.8)
- Canada (7.3)
- Netherlands (6.7)
- Spain (5.6)
- Australia (5.5)
- Ireland (4.7)
- Sweden (4.4)
- Italy (4.2)
- Denmark (4.2)
- Finland (3.8)

Notes


Only data for 1990, 2000 and 2015 was made available in the journal.

Source: The Lancet
Credit: Rob Weychert/ProPublica

- Severe morbidity during delivery hospitalizations more than doubled
- Blood transfusion, hysterectomy & eclampsia accounted for ~75% of severe morbidity

Current Commentary

The Maternal Early Warning Criteria
A Proposal From the National Partnership for Maternal Safety

Mhyre, J., D’Oria, R., Hameed, A., et al
Maternal Warning Systems

- The Joint Commission (2010) requires hospitals to have written criteria to observe change or deterioration in a patient’s condition and how to recruit staff to manage patient care.

- Signs and symptoms of impending severe maternal illness or collapse went unrecognized in many cases (CEMACH, 2011) due to the relative rarity of such events and normal changes in physiology associated with pregnancy and childbirth compounds the problem.
  
  **Recommendation:** Develop and adopting systems to alert the team of maternal deterioration to assist in early recognition, intervention and timely referral of treatment of women (CEMACH, 2011).

- The *National Partnership for Maternal Safety* is a multi-stakeholder consensus effort and is comprised of representatives from organizations in women’s health care and other provider, state, federal, and regulatory bodies which supports early warning criteria to promote patient safety. [http://www.safehealthcareforeverywoman.org/maternal-safety.html](http://www.safehealthcareforeverywoman.org/maternal-safety.html)
Vital Sign Assessment

- Vital sign assessment is critical during active bleeding. Blood pressure, pulse and respirations have been the standard in assessing vital signs.

- Often variations in vital signs are ignored or dismissed as “normal” due to the physiological changes in pregnancy (CEMACH, 2011)

- Lack of standardized documentation can result in delays in recording of abnormal results which can effect timeliness of clinical decision making (Yeung, Lapinsky, Granton, Doran, & Cafasso, 2012)
Maternal Early Warning Systems

- Abnormal physiologic signs and symptoms precede critical illness
- Early intervention will avoid severe M&M occurrence
- Effective policy of escalation of care

*Nip it in the bud*
# Maternal Early Warning Criteria

<table>
<thead>
<tr>
<th>Measure</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic Blood Pressure (mm Hg)</td>
<td>&lt;90 or &gt;160</td>
</tr>
<tr>
<td>Diastolic Blood Pressure (mm Hg)</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Heart rate (beats per minute)</td>
<td>&lt;50 or &gt;120</td>
</tr>
<tr>
<td>Respiratory rate (breaths per min)</td>
<td>&lt;10 or &gt;30</td>
</tr>
<tr>
<td>Oxygen saturation on room air, at sea level %</td>
<td>&lt;95</td>
</tr>
<tr>
<td>Oliguria, mL/hr for ≥2 hrs</td>
<td>&lt;35</td>
</tr>
<tr>
<td>Maternal agitation, confusion, or unresponsiveness</td>
<td></td>
</tr>
<tr>
<td>Woman with preeclampsia reporting a non-remitting headache or shortness of breath</td>
<td></td>
</tr>
</tbody>
</table>
National Partnership Strategy to Enhance Maternal Safety

BUNDLE SCIENCE

A "bundle" is a group of interventions related to a disease process that, when executed together, result in better outcomes than when implemented individually.
### CA-PAMR: Chance to Alter Outcome

**Grouped Cause of Death; 2002-2004 (N=145)**

<table>
<thead>
<tr>
<th>Grouped Cause of Death</th>
<th>Strong / Good (%)</th>
<th>Some (%)</th>
<th>None (%)</th>
<th>Total N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstetric hemorrhage</td>
<td>69</td>
<td>25</td>
<td>6</td>
<td>16 (11)</td>
</tr>
<tr>
<td>Deep vein thrombosis/pulmonary embolism</td>
<td>53</td>
<td>40</td>
<td>7</td>
<td>15 (10)</td>
</tr>
<tr>
<td>Sepsis/infection</td>
<td>50</td>
<td>40</td>
<td>10</td>
<td>10 (7)</td>
</tr>
<tr>
<td><strong>Preeclampsia/eclampsia</strong></td>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiomyopathy and other cardiovascular causes</td>
<td>25</td>
<td>61</td>
<td>14</td>
<td>28 (19)</td>
</tr>
<tr>
<td>Cerebral vascular accident</td>
<td>22</td>
<td>0</td>
<td>78</td>
<td>9 (6)</td>
</tr>
<tr>
<td>Amniotic fluid embolism</td>
<td>0</td>
<td>87</td>
<td>13</td>
<td>15 (10)</td>
</tr>
<tr>
<td>All other causes of death</td>
<td>46</td>
<td>46</td>
<td>8</td>
<td>26 (18)</td>
</tr>
<tr>
<td><strong>Total (%)</strong></td>
<td><strong>40</strong></td>
<td><strong>48</strong></td>
<td><strong>12</strong></td>
<td><strong>145</strong></td>
</tr>
</tbody>
</table>
Normal physiologic changes

Cardiovascular

Hematologic

Pulmonary
Cardiovascular

Normal Cardiac Adaptation during Pregnancy

Cardiac Changes

**Stroke Volume**
- **↑ 30-50%**

**Heart Rate**
- **↑ 20% (~10-20 beats)**

**Anatomic Changes**
- **↑ Uterus**

**Vascular Resistance**
- **↓ SVR**
- **↓ PVR**

Cardiac Output

Percent Change

Weeks of gestation:
- Pregnant
- Postpartum

UCSF Benioff Children's Hospitals
Hematologic
Normal Hematologic Events Associated with Pregnancy

**Blood Volume Changes**

**Total Volume**
\[\uparrow 35\% \ (\sim 2,000ml)\]

**Plasma Volume**
\[\uparrow 50\% \ (\sim 1,600ml)\]

**RBC Mass**
\[\uparrow 17\% \ (\sim 350mL)\]
## Hematologic continued:
### Clotting Factors During Pregnancy

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibrin</td>
<td>Increases 40% at term</td>
</tr>
<tr>
<td>Plasma fibrinogen</td>
<td>Increases 50% (300 – 600) mg/dl</td>
</tr>
<tr>
<td>Coagulation factors I, VII, VIII, X, XII</td>
<td>Increases markedly</td>
</tr>
<tr>
<td>Von Willebrand factor antigen</td>
<td>Increases markedly</td>
</tr>
<tr>
<td><strong>Coagulation factor XI</strong></td>
<td>Decreases 60% - 70%</td>
</tr>
<tr>
<td><strong>Coagulation factor XIII</strong></td>
<td>Decreases slightly</td>
</tr>
<tr>
<td>Coagulation factors II, V</td>
<td>Increases slightly or unchanged</td>
</tr>
<tr>
<td><strong>Protein S (anticoagulant) activity</strong></td>
<td>Decreased</td>
</tr>
<tr>
<td>Clotting and bleeding time</td>
<td>Unchanged</td>
</tr>
<tr>
<td>Prothrombin time</td>
<td>Increases slightly or unchanged</td>
</tr>
<tr>
<td>Partial plasma thromboplastin time</td>
<td>Increases slightly or unchanged</td>
</tr>
<tr>
<td>Fibrin degradation products</td>
<td>Increased (D–Dimer increased)</td>
</tr>
<tr>
<td>Platelets</td>
<td>Unchanged (150 K – 500K)</td>
</tr>
</tbody>
</table>
Hematologic

Factors V, VII, VIII, IX, X, XII

Fibrinolysis

Fibrinogen

Prothrombin
Pulmonary

- Diaphragm 4-7 cm – ribs flare
- Functional Residual Capacity 25%
- Respiratory Rate 16-20
- Tidal volume from 500 – 700 ml
- Compensatory Alkalemia

<table>
<thead>
<tr>
<th>Not Pregnant</th>
<th>Pregnant</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>pH</td>
</tr>
<tr>
<td>7.35 – 7.45</td>
<td>7.40 – 7.45</td>
</tr>
<tr>
<td>pO2</td>
<td>pO2</td>
</tr>
<tr>
<td>90 -100</td>
<td>104 -108</td>
</tr>
<tr>
<td>pCO2</td>
<td>pCO2</td>
</tr>
<tr>
<td>35 – 45</td>
<td>27 – 32</td>
</tr>
<tr>
<td>HCO3</td>
<td>HCO3</td>
</tr>
<tr>
<td>22 - 26</td>
<td>18 - 22</td>
</tr>
</tbody>
</table>
Pathophysiology of Hypovolemic Shock

- Tissue hypoperfusion $\rightarrow$ metabolic acidosis $\rightarrow$ inflammatory mediators $\rightarrow$ tissue and vascular injury $\rightarrow$ multiple organ failure
Adult Respiratory Distress Syndrome

Hemorrhagic Shock →

Damage to endothelial cells in pulmonary vasculature → Fluid leaks from vascular space into alveoli → Respiratory failure
Case Presentation: Hemorrhage

- 38 y.o. @40+2 admitted for elective IOL:
- Dinoprostone placed, misoprostol X2, AROM, oxytocin started
- Epidural is placed
- Rapidly progress to 10 cm, MD Notified
- 15 minute 2nd stage → male infant
- 1 minute later: Placenta delivered spontaneously
- Manual exploration of uterus “cleared of clots “
- Fundal checks (6) RN charted “moderate”
Case Presentation: Hemorrhage

- 1 hour 22 minutes later patient to MBU – Pulse: 82  BP: 126/70
- Patient passes “large clot” and “gush” when transferred to MBU bed
- IM methylergonovine
- 30 minutes later carboprost given
- 5 minutes later misoprostol given
- 30 minutes later 2\textsuperscript{nd} carboprost given
- 10 minutes later VS: Pulse 106, BP: 116/72
- Foley catheter placed – urine concentrated, amount not documented
- Shift change
Case Presentation: Hemorrhage

- RN weighs chux 462 gm
- RN reports to MD patient has “bled out” and is short of breath
- Patient feels light headed
- MD orders type and cross 2 units PRBC’s, another fluid bolus and wants to go to Main OR for D&C
- 3 more chux “saturated with blood” no clots
- Coagulation Lab values obtained and sent to lab
- 2\textsuperscript{nd} IV is started
- 1 hour and 20 minutes later, 1\textsuperscript{st} unit of blood is transfused
- 8 liters of crystalloid up to this point
Case Presentation: Hemorrhage

- Laboratory values:
  - Hct nadir 13, Plts 22K (dysfunctional/abnormal aggregation)
  - Fibrinogen 137, D Dimer >35,000, ABG pH: 7.14

- Multiple doses of pressor support
  - **Norepinephrine** drip to maintain BP/MAP
  - To OR for unplanned emergency Hysterectomy

- Patient to ICU intubated on IV pressor support

- Blood products received:
  - 6 units PRBC
  - 4 units, FFP
  - 2 units Single Donor Platelets
  - 2 units of Cryoprecipitate
Unplanned Hysterectomy:
Postoperative Course

- Transfer from ICU
- Weak but stable
- Loss of choice
- Hbg Hct
  - Iron—IV (sucrose)
  - Rh-Erythropoeitin
  - Heparin

➢ Discharge home with support
How Errors Occur

Failures

Defenses

Culture

Policies

Resources

Training

Communication

Safeguards

Stop the line

Standard work

Flexible staffing

Self-checks

Harm
# The Maternal Safety Bundle for Obstetric Hemorrhage

- **Proactive approach**
- **Includes 13 elements**
- **Establishes resources**
- **Manage OB Hemorrhage**

## Readiness

**Every unit**
- Hemorrhage cart with supplies, checklist, and instruction cards for intrauterine balloons and compressions stitches
- Immediate access to hemorrhage medications (kit or equivalent)
- Establish a response team - who to call when help is needed (blood bank, advanced gynecologic surgery, other support and tertiary services)
- Establish massive and emergency release transfusion protocols (type-O negative/uncrossmatched)
- Unit education on protocols, unit-based drills (with post-drill debriefs)

## Recognition & Prevention

**Every patient**
- Assessment of hemorrhage risk (prenatal, on admission, and at other appropriate times)
- Measurement of cumulative blood loss (formal, as quantitative as possible)
- Active management of the 3rd stage of labor (department-wide protocol)

## Response

**Every hemorrhage**
- Unit-standard, stage-based, obstetric hemorrhage emergency management plan with checklists
- Support program for patients, families, and staff for all significant hemorrhages

## Reporting/Systems Learning

**Every unit**
- Establish a culture of huddles for high risk patients and post-event debriefs to identify successes and opportunities
- Multidisciplinary review of serious hemorrhages for systems issues
- Monitor outcomes and process metrics in perinatal quality improvement (QI) committee
Hemorrhage

ACOG defines OB hemorrhage as: cumulative blood loss ≥1000 mL accompanied by s/sx of hypovolemia within 24 hrs after birth (including intrapartum blood loss) regardless of mode of birth.

- Even with proper management can occur in
  - ~ 4% of vaginal births and ~ 6% of cesarean birth
  - As a result: 1/20 women will experience PPH
- **Early** or Primary (< 24 hr after birth)
  - Highest risk in the first hour after delivery because large venous areas are exposed after placental separation
- **Late or Secondary** (>24 hr to 6 weeks after)
  - Caused by infection, placental site subinvolution, retained placental fragments, or coagulopathies (DIC)

Etiologies of Obstetric Hemorrhage

Antepartum
- Uterine rupture
- Placental abruption
- Placenta Previa
- Vasa Previa

Postpartum
- Uterine atony
- Retained Placenta
- Lower genital tract lacerations
  (cervix, vagina, perineum)
- Upper genital tract lacerations
  (uterine rupture)
- Placenta accreta, increta, percreta
- Uterine inversion
- Inherited coagulopathy
  (Von Willebrand Disease)
- Acquired coagulopathy
  (abruption, AFE, retained dead fetus syndrome)

Intrapartum
- Uterine rupture
- Placental abruption
Perform on-going objective quantification of actual blood loss during and after all births (*record output on a flow sheet*)

- Training and quantification of how blood loss is estimated – put up posters

- Measurement of actual blood
  - Fluid in canisters, under buttocks drapes
  - Weigh saturated items
  - and subtract dry weight
AWHONN Postpartum Hemorrhage Project Video

https://www.youtube.com/watch?v=F_ac-aCbEn0
OB Hemorrhage Cart

- Quick access to emergency supplies
- Refrigerator for meds
- Establish necessary items and par levels
- Label drawers/compartments
- Include checklists
- Develop process for checking and restocking
- Educate nursing and physician staff

Photo courtesy of J. McNulty MD, 2014.
Tranexamic acid (TXA)

- For women with established PPH
  - Not responsive to medications or treatments
  - Considered an adjunct treatment
  - Most effective if used within first 3 hours
  - Dose: 1 gram
  - may repeat in 30 minutes if bleeding persists

Intrauterine Balloons

- Used for intrauterine tamponade during hemorrhage
- Need ultrasound guidance to determine placement
- Use sterile solution (normal saline)
- Average filling volume = 250 ml – 300 ml (500 ml max)
- Document amount of NS used
- Insert vaginal packing and secure tubing
- Connect to a closed system/urinary catheter bag
Additional Hemorrhage Management

**Intervention Radiology**
- Uterine artery embolization
- Collateral circulation
- Ongoing assessment

☆ Patient must be in stable condition

Henry Vandyke Carter [Public domain], via Wikimedia Commons
Blood Products and Equipment

- Rapid Infuser
- Platelet infusion set
- Mechanical warming device

Massive Transfusion Guideline

Photos courtesy of Holli M. Mason MD, 2017
CPMS Blood Bank Webinar Slide Set
<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>VOLUME (ML)</th>
<th>CONTENTS</th>
<th>EFFECT (PER UNIT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packed Red Blood Cells</td>
<td>240</td>
<td>RBC, WBC, plasma</td>
<td>↑ hematocrit 3% &amp; Hgb 1 g/dl</td>
</tr>
<tr>
<td>Platelets</td>
<td>50</td>
<td>Platelets, RBC, WBC, plasma</td>
<td>↑ platelet count 5,000-10,000 mm$^3$ per unit</td>
</tr>
<tr>
<td>Fresh Frozen Plasma</td>
<td>250</td>
<td>Fibrinogen, antithrombin III, factors V* &amp; VIII*</td>
<td>↑ fibrinogen by 10mg/dl</td>
</tr>
<tr>
<td>Cryoprecipitate</td>
<td>40</td>
<td>Fibrinogen, factors VIII &amp; XIII and Von Willebrand</td>
<td>↑ fibrinogen by 10mg/dl</td>
</tr>
</tbody>
</table>
Laboratory Diagnosis of DIC

All routine screening tests of coagulation yield grossly abnormal results

<table>
<thead>
<tr>
<th>Laboratory Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platelets</td>
<td>Decreased</td>
</tr>
<tr>
<td>Fibrinogen</td>
<td>Less than 200</td>
</tr>
<tr>
<td>Fibrin Split Products</td>
<td>Increased</td>
</tr>
<tr>
<td>PT &amp; aPTT</td>
<td>Initially increased</td>
</tr>
<tr>
<td>D Dimer</td>
<td>Increased</td>
</tr>
</tbody>
</table>
The Lethal Triad of Coagulopathy: Why?

- **Dilutional**
  - Transfusion of crystalloid and packed cells devoid of clotting factors
  - A problem once 1½ total blood volume replaced

- **Hypothermia**
  - Significantly decreases platelet function: even if counts are adequate

- **Acidemia**
  - Occurs with massive hemorrhage due to hypovolemia, peripheral tissue hypoxia: as hydrogen ion concentration increases, enzyme functions involved in coagulation pathway stop functioning
  - VERY DIFFICULT TO REVERSE!
What is DIC?

- Underlying disorder
- Activates coagulation cascade
  - Blood clot formation
  - Coagulation factors become depleted
  - Results in uncontrolled bleeding
    - Death
Disseminated Intravascular Coagulation

Society on Thrombosis and Hemostasis defines “DIC as:

An *acquired* syndrome characterized by the *intravascular activation of coagulation* with loss of localization arising from different causes. It can originate from and cause damage to the *microvasculature* which if sufficiently severe *can produce organ dysfunction.*

- Accompany certain obstetrical conditions
- Varied clinical presentation and prognostic course
- An “effect “ of other disease processes
- Treatment will be focused on *removal of the causative agent*
Etiology of DIC

- Infection
- Cancer
- OB/Gyn Complications
OB Complications

Placental Tissue
After Birth

- Coagulation is initiated to prevent hemorrhage at placentation
- Platelet plugs and fibrin clots for to provide hemostasis
  - Fibrinogen and platelet counts decrease
Physiology Review: Hemostasis

Failure or deficiencies in any of the components can lead to varying degrees of uncontrolled hemorrhaging or clotting

Primary components:

- Vascular endothelium
- Circulating platelets
- Circulating proteins
Vascular System: Blood Vessels

Daily Function

- **Endothelium**
  - Controls vessel permeability
  - Controls blood flow rate
    - vasoconstriction
  - Produces and releases substances that inhibit or stimulate platelets, coagulation, and fibrinolysis
Endothelium

Anatomy

- Endothelium
- Single layer of endothelial cells, lining vessels
- Coated by glycocalyx (protein and mucopolysaccarides)
- Protects basement membrane
- Negatively charged, repels circulating proteins and platelets
- Secretes substances to keep the blood vessel in a nonreactive environment
Vascular System

Anatomy of the blood vessels

- **Subendothelium**
  - Smooth muscle and connective tissue with collagen fibers
  - Basement membrane
    - Collagen – stimulates platelets
    - Tissue Factor (TF) – activates coagulation & fibrin formation
  - Connective tissue
    - Elastic fibers – provide support around vessels
Coagulation Cascade Pathway

The Role of Tissue Factor

- Tissue damage
- Tissue factor is released
  - Tissue factor is a protein found in tissue
Hemostatic Trigger

Once vessel damage occurs, action begins!

- Arteries and arterioles vasoconstrict
- Smooth muscle cells contract to reduce blood flow
- The endothelium becomes thrombogenic
  - Platelets and coagulation proteins are activated
  - VWF is secreted
  - Fibrinolysis initiated
Bone Marrow Stem Cells

- Proerythroblast
  - Polychromatic erythroblast
  - Erythrocytes
- Myeloblast
- Hemocytoblast
  - Lymphoblast
  - Monoblast
  - Megakaryoblast
  - Megakaryocyte
- Granulocytes
  - Basophil
  - Eosinophil
  - Neutrophil
- Agranulocytes
- Leukocytes
- Platelets
Platelets: The 3A’s

- **Platelet Adhesion**
  - Injury
  - Platelets contact subendothelium
  - vWF
  - Fibrinogen
  - Platelets bind with subendothelium

- **Platelet Activation**
  - Adhere and activate
  - Change shape
  - Release proteins and coag factors
  - Localized vasoconstriction

- **Platelet Aggregation**
  - Platelet agonists attract more platelets
  - Activated platelets combine with adhered platelets
  - Thrombin
  - Fibrinogen
  - Platelet plug formed
The population we serve
Pathophysiology of DIC

1. **Disseminated Fibrin Thrombi**
   - Obstructed blood flow
   - End organ ischemia / necrosis

2. **Activation of kinin system**
   - Vascular permeability
   - Hypotension
   - Shock
Pathophysiology of DIC

3. Activation of the complement system
   - Red cell and platelet lysis
   - ↑ vascular permeability
   - Shock

4. Release of cytokines (IL 1 & 6) and TNF

5. Plasma-induced lysis of fibrin
   - FDP’s
   - Depletion of Coag factors
   - Hemorrhage and shock
Pathophysiology of Hypovolemic Shock

- Tissue hypoperfusion $\rightarrow$ metabolic acidosis $\rightarrow$ inflammatory mediators $\rightarrow$ tissue and vascular injury $\rightarrow$ multiple organ failure
The Nurse Detective
Etiology of DIC
Underlying OB conditions associated with DIC

- Intrauterine Fetal Demise: 25%
- Placental abruption: 37%
- PPH / Hypovolemia / MBT: 29%
- Severe Pre E / HELLP: 14%
- Acute Fatty Liver: 8%
- Amniotic Fluid Embolism: 6%
- Sepsis: 6%

100%
Intrauterine Fetal Demise 25%

**Mechanism**
- Release of
  - Necrotic tissue and Thromboplastin
- Plasma fibrinogen
- FDP’s circulate

**Diagnosis**
- U/S ⇒ Confirm fetal demise
- Baseline coagulation tests
  - Platelet count
  - PT
  - aPTT
  - Fibrinogen

**Management**
- Deliver fetus and placenta
- If DIC is Present
  - Volume
  - Blood products
  - Supportive care
Placental Abruption 37%

**Mechanism**
- Release of procoagulant substances
- Activation of fibrinolytic enzyme pathway

**Diagnosis**
- Vaginal bleeding
- Abdominal pain
- Uterine tenderness
- Uterine contractions
- Coagulation tests

**Management**
- Delivery v/s Expectant
- If DIC is Present
  - Volume
  - Blood products
  - Supportive care
Clinical Presentation

- Peripheral cyanosis
- Renal impairment
- Drowsiness
- Confusion
- Coma
- Cardiorespiratory failure
- Large and small vessel thrombosis
- Ischemia
- End organ damage
Bleeding from unrelated sites

- Venipuncture sites
- Epistaxis
- Ecchymosis
- Purpura
- Petechiae
- Hematomas
Diagnosis of DIC

- Obvious with massive hemorrhage
- Lab tests
  - CBC, Plts
  - Fibrinogen, FDP’s
  - PT, aPTT
  - D Dimer
- Rotem
Risk Factors for PPH

Maternal Hx
- High parity
- History of PPH
- Previous uterine surgery

Pregnancy Factors
- Uterine overdistension
  - Macrosomia
  - Polyhydramnios
  - Multiple gestation

Labor Factors
- Chorioamnionitis
- Rapid or prolonged labor
- Augmented labor
- Preeclampsia
- Prolonged third stage

Placental abnormality
- Previa
- Accreta
- Abruption

UCSF Benioff Children’s Hospitals
### Risk Assessment

<table>
<thead>
<tr>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>No previous uterine incision</td>
<td>History of previous PPH</td>
<td>Placenta previa/Low lying placenta</td>
</tr>
<tr>
<td>No known bleeding disorder</td>
<td>Prior cesarean birth(s) or uterine surgery</td>
<td>Suspected placenta accreta</td>
</tr>
<tr>
<td>No history of PPH</td>
<td>Multiple gestation</td>
<td>Active bleeding (greater than show) on admission</td>
</tr>
<tr>
<td>≤ 4 previous vaginal births</td>
<td>Large uterine fibroids</td>
<td>Hematocrit &lt; 30</td>
</tr>
<tr>
<td>Singleton pregnancy</td>
<td>Chorioamnionitis</td>
<td>Known coagulopathy</td>
</tr>
<tr>
<td></td>
<td>Magnesium sulfate</td>
<td>Active anticoagulation therapy</td>
</tr>
<tr>
<td></td>
<td>Preeclampsia</td>
<td>Platelets &lt;100,00</td>
</tr>
<tr>
<td></td>
<td>Rapid or prolonged labor</td>
<td>EBL on admission &gt;1500</td>
</tr>
<tr>
<td></td>
<td>Antibody positive on prenatal type &amp; screen</td>
<td>Other factors designated by physician</td>
</tr>
</tbody>
</table>

- □ Verify Type & Screen on prenatal record
- □ Send HOLD CLOT on admission
- □ Order T&S if not on available on record

- □ Order Type & Screen on admission
- □ Review hemorrhage protocol

- □ Order Type & Crossmatch X 2 unit on admission
- □ Review hemorrhage protocol
- □ Notify anesthesia and blood bank of patient risk
Stage 2 – Continued bleeding ≤1,500ml

Meds/ Procedures
- 2nd IV access 18 gauge

Blood Bank
- Send additional Labs
- DIC Panel
Stage 3 – Blood loss >1,500ml or 2 units PRBC’s or unstable VS or suspicion of DIC

Meds/ Procedures
• Activate MTP

Blood Bank
• Transfuse aggressively
• Near 1:1 PRBC to FFP
• 1 PLT apheresis pack (per 4-6 units PRBC’s)
# Clinical Signs of Hypovolemia

**CMQCC OB Hemorrhage Emergency Management**

**Cumulative blood loss of 500 - 999 mL**  
- Should trigger increased supervision and intervention

<table>
<thead>
<tr>
<th>Amount of Blood Loss</th>
<th>Clinical Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 mL</td>
<td>- Slight BP $\triangle$, HR, RR UO normal</td>
</tr>
<tr>
<td>1500 mL</td>
<td>- Narrow PP, HR $&gt;100$, diaphoretic</td>
</tr>
<tr>
<td>2000 mL</td>
<td>- $\downarrow$ BP, Narrow PP, HR $&gt;120$, pale cool, restlessness</td>
</tr>
<tr>
<td>$\geq$ 2500 mL</td>
<td>- Profound Hypotension, HR $&gt;140$, RR $&gt;40$, $\downarrow$ UO, anuria</td>
</tr>
</tbody>
</table>
Where do we go from here?

- Immediate post-op plan
  - Ongoing maternal assessment
  - Treat anemia
    - IV Iron Sucrose
  - Care of newborn

- Long term patient follow-up
  - Negative impact on patient
    - Hemorrhage during childbirth
    - Unexpected hysterectomy
    - Near death experience

Photo courtesy of UCSF, Circa:1906.
Postpartum Care and Patient Satisfaction after Hemorrhage

- Australian study: 206 women primary PPH >1500 ml
  - Written questionnaire 1st week and 2 and 4 months
  - Four Themes:
    1. Adequacy of care
    2. Emotional response
    3. Future Implications
    4. Concern for the baby

- Findings suggest pay particular attention to informational and emotional needs of women who experience significant PPH
Case Presentation

- 33 yo G5 P0 admitted at 36 +2 weeks admitted for IOL
  - Hx Hypothyroidism, Severe Hyperemesis
  - IUGR – severe (1% ile)
    - Reactive NST / Baseline 145 - FHR: Cat I Tracing
    - Normal AFI
    - normal Doppler flow
  - Admission VS: 98.5F, 117, 20, 117/78
  - SVE: 1cm/60%/-3/soft /posterior
  - UC’s 4-9 minutes – patient describes as “tightening's” pain + 0/10
  - IV started
  - Cervidil placed
Case Presentation

- EBL for C/S: 600 mL
- Additional 2 L intraoperatively
- Hct 6.4
- Fibrinogen < 40
- Platelets 26K

Patient received intraoperatively:
- 3 units of PRBC’s
- 2 units of FFP
- 1 unit of Cryoprecipitate
- 2 units of pooled single donor Platelets

Infants transferred for cooling
How Errors Occur

Failures

Defenses

- Culture
- Policies
- Resources
- Training
- Communication

Safeguards
- Stop the line
- Standard work
- Flexible staffing
- Self-checks

Harm
HISTORICAL PERSPECTIVE

- 1926  AFE is identified by Meyer in a Spanish medical journal

- 1941  Described in detail by Steiner and Lushbaugh, as AFS

- 1979  272 cases reported by Morgan weakened uterine stimulation theory

- 1988  Clark at University of Utah SOM created a national registry

- 1995  Clark describes anaphylactoid syndrome of pregnancy
INCIDENCE and FINDINGS

- AFE accounts for 10% of US maternal deaths
- Occurs 1/20,000 deliveries
- US reported a mortality rate of 60%
  - 15% of patient’s survive neurologically intact
- Neonatal survival rate 79%
  - Only 50% of these infants survive w/o neurological impairment
- Can occur up to 48 hours postpartum
PATHOGENESIS

- Breech in the maternal fetal barrier

- Amniotic fluid enters maternal circulation

- Fetal squames and trophoblasts initiate a pathophysiological cascade similar to anaphylaxis and sepsis
Fetal surface

Umbilical cord

Chorion

Maternal surface

Amnion (partially removed)

Placenta in cross-section at umbilical cord
Exposure of Fetal Tissue to Maternal Circulation

Maternal specific risk factors

Activation of Inflammation

DIC

ARDS

HYPOXEMIA

RIGHT HEART FAILURE

LEFT HEART FAILURE

BLEEDING

HYPOTENSION

NEUROLOGIC INJURY

Neligan PJ 2011
Primary and Secondary Phases of AFE

Hypoxemia

Shock
DIFFERENTIAL DIAGNOSIS

- Pulmonary thromboembolism
- Air embolism
- Hemorrhage
- Aspiration of gastric contents
- Anesthetic complications
- Anaphalaxisis
- Sepsis/systemic inflammatory syndrome
- Myocardial Infarction
- Cardiomyopathy
- Eclampsia
- Transfusion Reaction
Chest radiographs usually show pulmonary edema.
Initial Management of AFE

- Optimize hemodynamic function
- Improve cardiac output
- Optimize preload - IV fluids wide open
- Administer high concentration oxygen (100%)
- If respirations are absent: BMV or intubate
- Improve oxygenation
- Transfuse PRBC’s – more hemoglobin
- Reverse coagulopathy
- Transfuse blood components:
  - Fresh or liquid plasma, Platelets, clotting factors
Initial Management of AFE

- Prompt Diagnosis – requires collaboration
- Prompt Resuscitation restore equilibrium

**Maintain:**
- Systolic BP > 90
- Arterial pO2 > 60 mm Hg
- SaO2 > 95%
- Urine output > 25 ml/hr

- Postmortem cesarean delivery - 5 min
- Re-establishing uterine tone
- Implement Massive Transfusion Protocol
- Crisis intervention for the family
Links to Stephanie Arnold videos

Watch in order below:

- **Book Trailer:**
  - [https://www.youtube.com/watch?v=WgUux2u30ms](https://www.youtube.com/watch?v=WgUux2u30ms)

- **Regression Footage: WARNING: Graphic Video)**
  - [http://stephaniearnold.net/intuition-general/](http://stephaniearnold.net/intuition-general/)

- **Press Video for book:**
  - [https://vimeo.com/156957431](https://vimeo.com/156957431)
  - Password: Afterl!fe37SA
Case Presentation:

42 y.o. G3 P1, two days after emergency cesarean for fetal intolerance to labor

- On your initial assessment in the morning:
  - Afebrile, vital signs stable, lungs are clear
  - Dressing dry and intact, bowel sounds in four quadrants
  - Fundus firm midline and below umbilicus
  - Lochia normal
Case Presentation: Venous Thromboembolism

You take out her IV and help her get up to take a shower. As she returns from the bathroom she says her leg hurts. On exam you note redness in one leg.

• What do you think?

• What do you do next?
Deep Vein Thrombosis Formation

Venous stasis

Clotting clearance

Platelets deposits in valve cusp pockets

Hypercoagulation

Anticoagulation

A. Normal Blood Flow

B. Deep Vein Thrombosis

C. Embolus
Maternal Venous Thromboembolism Prevention

READINESS

Every Unit
- Use a standardized thromboembolism risk assessment tool for VTE during:
  - Outpatient prenatal care
  - Antepartum hospitalization
  - Hospitalization after cesarean or vaginal deliveries
  - Postpartum period (up to 6 weeks after delivery)

RECOGNITION & PREVENTION

Every Patient
- Apply standardized tool to all patients to assess VTE risk at time points designated under “Readiness”
- Apply standardized tool to identify appropriate patients for thromboprophylaxis
- Provide patient education
- Provide all healthcare providers education regarding risk assessment tools and recommended thromboprophylaxis

RESPONSE

Every Unit
- Use standardized recommendations for mechanical thromboprophylaxis
- Use standardized recommendations for dosing of prophylactic and therapeutic pharmacologic anticoagulation
- Use standardized recommendations for appropriate timing of pharmacologic prophylaxis with neuraxial anesthesia

REPORTING/SYSTEMS LEARNING

Every Unit
- Review all thromboembolism events for systems issues and compliance with protocols
- Monitor process metrics and outcomes in a standardized fashion
- Assess for complications of pharmacologic thromboprophylaxis

Standardization of health care processes and reduced variation has been shown to improve outcomes and quality of care. The Council on Patient Safety in Women’s Health Care disseminates patient safety bundles to help facilitate the standardization process. This bundle reflects emerging clinical, scientific, and patient safety advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed. Although the components of a particular bundle may be adapted to local resources, standardization within an institution is strongly encouraged.

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October 2015
Deep Vein Thrombosis (DVT)

- Pregnancy predisposes to DVT due to:
  - Venous stasis from enlarge uterus compression, and decreased vascular tone
  - Hypercoagulability
  - Remember Virchow’s triad?
    - Hypercoagulability
    - Stasis of blood flow
    - Endothelial injury
## Risk Factors for DVT

<table>
<thead>
<tr>
<th>Maternal</th>
<th>Pregnancy</th>
<th>Labor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
<td>Multiparity</td>
<td>Cesarean Birth</td>
</tr>
<tr>
<td>Smoking</td>
<td>Preeclampsia</td>
<td>PPH Blood</td>
</tr>
<tr>
<td>Hx of VTE</td>
<td>Physiologic changes of Pregnancy</td>
<td>Infection</td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td>Immobilization</td>
</tr>
<tr>
<td>Age &gt; 35 years</td>
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</tr>
</tbody>
</table>
What is VTE?

- VTE is when you develop a blood clot usually in your leg (calf area)

Signs of VTE

- Leg pain, tender to touch, burning or redness, particularly in calf area

Getting Help

- Call healthcare provider immediately for signs of VTE if no response call 911 or go to nearest hospital emergency department

http://www.awhonn.org/?page=POSTBIRTH
VTE: Key Summary Points

- All patients require VTE risk assessment at multiple time points in pregnancy and postpartum
- All patients undergoing cesarean delivery require mechanical prophylaxis, early ambulation, and adequate hydration
- Women with additional risk factors for VTE after delivery may benefit from pharmacologic prophylaxis
- Empiric pharmacologic prophylaxis is a reasonable option for:
  - All women undergoing cesarean delivery
  - All antepartum patients hospitalized >72 hours

Pulmonary Embolism

• Classic Triad (25%)
  – Dyspnea
  – Pleuritic Chest Pain
  – Hemoptysis

• May Display Hypoxia

Diagnostics
• Blood Gas Studies
• VQ Scan
• CT
• Pulmonary Angiography
Pulmonary Arteriogram

- Black arrows
  - The meniscus of contrast outlines the trailing edge of the thrombus

- White arrows
  - A rim of contrast around the body of the thrombus
Nursing Care: Pulmonary Embolism

- Elevate HOB
- Administer Oxygen 10L/min nonrebreather mask
- O2 Sat Monitor
- Rapid Response Team
- Heparin
- Dopamine
- Morphine
- ICU Transfer
Heparin “High Alert”

- Maintain therapeutic Heparin level
  - (aPTT >1.5 -2.5)

- Protocol provides management guidelines

- Continue for 5 days postpartum
  - Clinical improvement

- Begin oral anticoagulant therapy
  - Warfarin
CVD Case Presentation

- 25 year old obese (BMI 38) African-American G2P2 presents 10 days after an uncomplicated vaginal delivery with fatigue and persistent cough since delivery.

- BP 110/80, HR 110, RR 28, afebrile, with O2 sat 94% on room air.

- She gets diagnosed with respiratory infection and is prescribed an antibiotic. Fatigue is attributed to lack of sleep.
CVD Case Presentation (CONTINUED)

- One week later, she presents again with continued symptoms. Antibiotics are switched and beta-agonists are added for presumptive “new-onset asthma.”

- Two days later, the patient experiences cardiac arrest at home and resuscitation attempts are unsuccessful.

- Autopsy findings were indicative of cardiomyopathy.
A California Toolkit to Transform Maternity Care

Improving Health Care Response to Cardiovascular Disease in Pregnancy: A California Quality Improvement Toolkit

THIS COLLABORATIVE PROJECT WAS DEVELOPED BY:
THE CARDIOVASCULAR DISEASE IN PREGNANCY TASK FORCE
CALIFORNIA MATERNAL QUALITY CARE COLLABORATIVE
MATERNAL, CHILD AND ADOLESCENT HEALTH DIVISION; CENTER FOR FAMILY HEALTH
CALIFORNIA DEPARTMENT OF PUBLIC HEALTH

CMQCC
California Maternal Quality Care Collaborative

For More Information and to Download the Toolkit

- Visit
  - www.cmqcc.org
  - https://www.cdph.ca.gov
- Contact:
  - info@cmqcc.org
Rationale for Toolkit

Cardiovascular Disease is

- the leading cause of maternal mortality in CA and U.S.
- under-recognized in pregnant or postpartum women
- higher among African-American women

- 25% of deaths attributed to cardiovascular disease may have been prevented if the woman’s heart disease had been diagnosed earlier.

- Pregnancy is a period of frequent interaction with health care providers and offers an opportunity to detect and treat heart disease, improve pregnancy outcomes, and affect future cardiovascular health.


©California Department of Public Health, 2017; supported by Title V funds. Developed in partnership with California Maternal Quality Care Collaborative Cardiovascular Disease in Pregnancy and Postpartum Taskforce. Visit: [www.CMQCC.org](http://www.CMQCC.org) for details
CVD Toolkit Goals

Given that CVD is the leading cause of maternal mortality & morbidity in California, the Toolkit aims to:

- Encourage obstetric and other healthcare providers to retain a high index of suspicion for CVD, particularly among women with risk factors who present with symptoms in late pregnancy or early postpartum period

- To serve as resource for generalists who provide maternity care to women, with special emphasis on
  - Prenatal visits
  - Postpartum encounters
  - Emergency room visits
Rationale for Toolkit

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CVD Assessment Algorithm
For Pregnant and Postpartum Women

**Red Flags**
- Shortness of breath at rest
- Severe orthopnea ≥ 4 pillows
- Resting HR ≥ 120 bpm
- Resting systolic BP ≥ 160 mm Hg
- Resting RR ≥ 30
- Oxygen saturations ≤ 94% with or without personal history of CVD

**Personal History of CVD**
Without Red Flags

**PROMPT EVALUATION** and/or hospitalization for acute symptoms

*plus*

**CONSULTATIONS** with MFM and Primary Care/Cardiology

**CONSULTATIONS** with MFM and Primary Care/Cardiology
CARDIOVASCULAR DISEASE ASSESSMENT IN PREGNANT and POSTPARTUM WOMEN

SYMPTOMS
*NYHA class > II
Suggestive of Heart Failure:
- Dyspnea
- Mild orthopnea
- Tachypnea
- Asthma unresponsive to therapy
Suggestive of Arrhythmia:
- Palpitations
- Dizziness/syncope
Suggestive of Coronary Artery Disease:
- Chest pain
- Dyspnea

VITAL SIGNS
- Resting HR ≥110 bpm
- Systolic BP ≥140 mm Hg
- RR ≥24
- Oxygen sat ≤96%

RISK FACTORS
- Age ≥40 years
- African American
- Pre-pregnancy obesity (BMI ≥35)
- Pre-existing diabetes
- Hypertension
- Substance use (nicotine, cocaine, alcohol, methamphetamine)
- History of chemotherapy

**PHYSICAL EXAM
ABNORMAL FINDINGS
Heart: Loud murmur or Lung: Basilar crackles

≥ 1 Symptom + ≥ 1 Vital Signs Abnormal + ≥ 1 Risk Factor or
ANY COMBINATION ADDING TO ≥ 4

Consultation indicated:
MFM and Primary Care/Cardiology

Obtain: EKG and BNP
- Echocardiogram +/- CXR if HF or valve disease is suspected, or if the BNP levels are elevated
- 24 hour Holter monitor, if arrhythmia suspected
- Referral to cardiologist for possible treadmill echo vs. CTA vs. alternative testing if postpartum

Consider: CXR, CBC, Comprehensive metabolic profile, Arterial blood gas, Drug screen, TSH, etc.

Follow-up within one week

Results negative
Signs and symptoms resolved
Reassurance and routine follow-up

Results abnormal
CVD highly suspected

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B Type Natriuretic Peptide (BNP)

Neurohormone secreted by the cardiac ventricles in response to ventricular volume expansion and pressure overload

- Inhibits renin-angiotensin-aldosterone system
- Increases natriuresis and diuresis

Image Credit: Afshan Hameed, MD. Used with permission

©California Department of Public Health, 2017; supported by Title V funds. Developed in partnership with California Maternal Quality Care Collaborative Cardiovascular Disease in Pregnancy and Postpartum Taskforce. Visit: [www.CMQCC.org](http://www.CMQCC.org) for details
Clinical Uses of BNP in Pregnancy

- **Diagnosis of heart failure**
  - In pregnant women with dilated CMP, higher BNP predicts adverse cardiovascular outcomes

- **Asymptomatic left ventricular function**
  - Useful to evaluate shortness of breath

- **Predictor of cardiovascular outcome**
  - In pregnant women with congenital heart disease, higher BNP levels are associated with poor outcomes

Key Clinical Pearls

- First presentation of cardiovascular disease may be during pregnancy or early postpartum.
- The highest risk period for CVD worsening is between 24-28 weeks or postpartum.
- CVD symptoms or vital sign abnormalities should not be ignored in pregnant/postpartum women.
- New onset or persistent asthma may be a sign of heart failure.
- Bilateral infiltrates on chest x-ray may be due to heart failure rather than pneumonia.
Key Clinical Pearls (continued)

- Pregnancy or postpartum women with significant risk factors should be counseled regarding future CVD risk.
- Women with known CVD should receive pre- & inter-conception counseling by an experienced perinatologist and cardiologist.
- Contraception choices should be tailored to the individual.
- Provider and patient education is essential.
- High index of suspicion, early diagnosis, appropriate referrals and follow up are the key elements to a successful outcome.
Postpartum Presentations to the ED, PCP or OB Provider

When a woman presents in the postpartum period with complaints of shortness of breath, ask if she has experienced:

- Worsened level of exercise tolerance
- Difficulty performing activities of daily living; Unexpected fatigue
- Symptoms that are deteriorating, especially chest pain, palpitations, or dizziness
- New onset of cough or wheezing
- Leg edema and if it is improving or deteriorating
- Inability to lay flat; if this is a change; how many pillows she uses to sleep
- Failure to lose weight or unusual weight gain, and how much
- A history of cardiac or pulmonary conditions
- A history of substance abuse and/or cigarette use
- Or has been seen by other providers or in other Emergency Departments since giving birth.
Postpartum Presentations to the ED, PCP or OB Provider

Key Points (1)

- Symptoms related to physiologic changes of pregnancy should be improving in the postpartum period.
- Any visits to Emergency Department for dyspnea should raise suspicion for cardiovascular disease.
- Women of childbearing age should be questioned about recent pregnancies, in addition to their last menstrual period (LMP).
- Postpartum dyspnea or new onset cough is concerning for cardiovascular disease.
Postpartum Presentations to the ED, PCP or OB Provider

Key Points (2)

- New onset asthma is rare in adults.
- Bilateral crackles on lung examination are most likely associated with Congestive Heart Failure (CHF).
- Improvement of dyspnea with bronchodilators does not confirm the diagnosis of asthma, as CHF may also improve with bronchodilators. Likewise, a lack of response to bronchodilators should prompt the entertainment of a diagnosis other than asthma.
Racial Disparities in CVD
Clinical Implications

- **Listen to women.** Take patient complaints seriously, and maintain a high index of suspicion for CVD especially in ALL African-American women.
- Any co-morbidity should further heighten the clinical index of suspicion.
- African-American women with chronic or gestational hypertension, high BMI (>35) who present with symptoms suggestive of CVD or vital signs indicated in the CVD Assessment Algorithm should be evaluated carefully and thoroughly for potential CVD.
Guide to Contraception Information for Women with Cardiovascular Disease

Patients with cardiovascular disease including hypertension, congenital heart defects, arrhythmia and heart failure should be educated about contraceptive choices to improve overall health and prevent unwanted pregnancy.

- **Non-hormonal methods** are the preferred contraception in patients with cardiovascular disease, given the minimal risk of thromboembolism with their use.
- **Hormonal methods** containing estrogen products and depot medroxy-progesterone acetate injection should be used with caution in patients who have multiple risk factors or a history of cardiovascular disease.
Lifetime Risks of Heart Disease After Pregnancy Complications

- Pregnancy complications increase heart disease (CVD) risk:
  - Gestational hypertension, preeclampsia and HELLP syndrome
  - Gestational diabetes
  - Preterm birth.
- Women are often unaware of their CVD risk but are enthusiastic to learn more.
- Hypertension and diabetes in pregnancy = wake-up call for women and families.
- Future CVD risk can be reduced by 4-13% with healthy lifestyle changes.
FROM BIRTH TO THE COMPREHENSIVE POSTPARTUM VISIT

READINESS

Every woman
- Engages with her provider during prenatal care to develop a comprehensive personalized postpartum care plan that includes designation of a postpartum medical home, where the woman can access care and support during the period between birth and the comprehensive postpartum visit.
- Receives woman-centered counseling and anticipatory guidance regarding medical recommendations for breastfeeding in order to make an informed feeding decision.
- Receives woman-centered counseling regarding medical recommendations for birth spacing and the range of available contraceptive options.
- Identifies a postpartum care team, inclusive of friends and family, to provide medical, material, and social support in the weeks following birth.

Every provider
- Ensures that each woman has a documented postpartum care plan and care team identified in the prenatal period.
- Develops and maintains a working knowledge of evidence-based evaluation and management strategies of common issues facing the mother-infant dyad.

Every clinical setting
- Develops and optimizes models of woman-centered postpartum care and education, utilizing adult-learning principles when possible and embracing the diversity of family structures, cultural traditions, and parenting practices.
- Develops systems to connect families with community resources for medical follow up and social and material support.
- Optimizes counseling models, clinical protocols, and reimbursement options to enable timely access to desired contraception.
- Develops systems to ensure timely, relevant communication between inpatient and outpatient providers.
- Develops protocols for screening and treatment for postpartum concerns, including depression and substance abuse disorders, and establishes relationships with local specialists for co-management or referral.
MATERNAL MENTAL HEALTH: PERINATAL DEPRESSION AND ANXIETY

READINESS

Every Clinical Care Setting
- Identify mental health screening tools to be made available in every clinical setting (outpatient OB clinics and inpatient facilities).
- Establish a response protocol and identify screening tools for use based on local resources.
- Educate clinicians and office staff on use of the identified screening tools and response protocol.
- Identify an individual who is responsible for driving adoption of the identified screening tools and response protocol.

RECOGNITION & PREVENTION

Every Woman
- Obtain individual and family mental health history (including past and current medications) at intake, with review and update as needed.
- Conduct validated mental health screening during appropriately timed patient encounters, to include both during pregnancy and in the postpartum period.
- Provide appropriately timed perinatal depression and anxiety awareness education to women and family members or other support persons.
RESPONSE
Every Case
- Initiate a stage-based response protocol for a positive mental health screen.
- Activate an emergency referral protocol for women with suicidal/homicidal ideation or psychosis.
- Provide appropriate and timely support for women, as well as family members and staff, as needed.
- Obtain follow-up from mental health providers on women referred for treatment. This should include the necessary release of information forms.

REPORTING/SYSTEMS LEARNING
Every Clinical Care Setting
- Establish a non-judgmental culture of safety through multidisciplinary mental health rounds.
- Perform a multidisciplinary review of adverse mental health outcomes.
- Establish local standards for recognition and response in order to measure compliance, understand individual performance, and track outcomes.

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February 2016
Everyone's Health Care

**Every patient/family needs a
provide education to promote understanding of opioid use disorder (OUD) as a chronic disease:**

- Emphasize that substance use disorders (SUDs) are chronic medical conditions, treatment is available, family and peer support is necessary and recovery is possible.
- Emphasize that opioid pharmacotherapy (e.g., methadone, buprenorphine) and behavioral therapy are effective treatments for OUD.

**Obstetric Care for Women with Opioid Use Disorder**

- Engage appropriate partners (e.g., social workers, case managers) to assist patients and families in the development of a "plan of safe care" for mom and baby.
- Establish specific prenatal, intrapartum and postpartum clinical pathways for women with OUD that incorporate care coordination among multiple providers.
- Provide training regarding trauma-informed care.
- Avoidance of mixed agonist-antagonist opioid analgesics.
- Provide Pain control protocols that account for increased pain sensitivity and avoidance of mixed agonist-antagonist opioid analgesics.
- Every clinical setting/health system provides staff wide (clinical and non-clinical) staff education on SUDs.
- Emphasize that SUDs are chronic medical conditions that can be treated.
- Interventions to decrease NAS severity (e.g., breastfeeding, smoking cessation).
- Awareness of the signs and symptoms of NAS and newborn care.
- Prevention education regarding neonatal abstinence syndrome (NAS) and withdrawal symptoms.

- Know state reporting guidelines regarding the use of opioid pharmacotherapy and identification of illicit substance use during pregnancy.
Know federal (Child Abuse Prevention Treatment Act - CAPTA), state and county reporting guidelines for substance-exposed infants.

- Understand “Plan of Safe Care” requirements.
- Know state, legal and regulatory requirements for SUD care.
- Identify local SUD treatment facilities that provide women-centered care.

- Ensure that OUD treatment programs meet patient and family resource needs (i.e. wrap-around services such as housing, child care, transportation and home visitation).
- Ensure that drug and alcohol counseling and/or behavioral health services are provided.
- Investigate partnerships with other providers (i.e. social work, addiction treatment, behavioral health) and state public health agencies to assist in bundle implementation.

**RECOGNITION & PREVENTION**

Every provider/clinical setting

- Assess all pregnant women for SUDs.
- Utilize validated screening tools to identify drug and alcohol use.
- Incorporate a screening, brief intervention and referral to treatment (SBIRT) approach in the maternity care setting.
- Ensure screening for polysubstance use among women with OUD.
- Screen and evaluate all pregnant women with OUD for commonly occurring co-morbidities.
- Ensure the ability to screen for infectious disease (e.g. HIV, Hepatitis and sexually transmitted infections (STIs)).
- Ensure the ability to screen for psychiatric disorders, physical and sexual violence.
- Provide resources and interventions for smoking cessation.
- Match treatment response to each woman’s stage of recovery and/or readiness to change.
RESPONSE

Every provider/clinical setting/health system

- Ensure that all patients with OUD are enrolled in a woman-centered OUD treatment program.
- Establish communication with OUD treatment providers and obtain consents for sharing patient information.
- Assist in linking to local resources (e.g., peer navigator programs, narcotics anonymous (NA), support groups) that support recovery.
- Incorporate family planning, breastfeeding, pain management and infant care counseling, education and resources into prenatal, intrapartum and postpartum clinical pathways.
- Provide breastfeeding and lactation support for all postpartum women on pharmacotherapy.
- Provide immediate postpartum contraceptive options (e.g., long acting reversible contraception (LARC)) prior to hospital discharge.
- Ensure coordination among providers during pregnancy, postpartum and the inter-conception period.
- Provide referrals to providers (e.g., social workers, psychiatry, and infectious disease) for identified co-morbid conditions.
- Identify a lead provider responsible for care coordination, specify the duration of coordination and assure a “warm handoff” with any change in the lead provider.
- Develop a communication strategy to facilitate coordination among the obstetric provider, OUD treatment provider, health system clinical staff (i.e., inpatient maternity staff, social services) and child welfare services.
- Engage child welfare services in developing safe care protocols tailored to the patient and family’s OUD treatment and resource needs.
- Ensure priority access to quality home visiting services for families affected by SUDs.
Every clinical setting/health system

- Develop mechanisms to collect data and monitor process and outcome metrics to ensure high quality healthcare delivery for women with SUDs.
- Develop a data dashboard to monitor process and outcome measures (i.e. number of pregnant women in OUD treatment at specified intervals).
- Create multidisciplinary case review teams to evaluate patient, provider and system-level issues.
- Develop continuing education and learning opportunities for providers and staff regarding SUDs.
- Identify ways to connect non-medical local and community stakeholders with clinical providers and health systems to share outcomes and identify ways to improve systems of care.
- Engage child welfare services, public health agencies, court systems and law enforcement to assist with data collection, identify existing problems and help drive initiatives.
SIRS Criteria Comparison

**Adult Screening Criteria**
- Temp > 38°C (100.4°F) or < 36°C (96.8°F)
- HR > 90 bpm
- Resp Rate > 20 breaths/minute
- WBC >12,000, < 4,000 or >10% immature neutrophils
- Blood glucose > 140 mg/dl in the absence of diabetes
- New mental status change

**Perinatal Screening Criteria**
- Temp > 38°C (100.4°F) or < 36°C (96.8°F)
- HR > 110 bpm
- Resp Rate > 24 breaths/minute
- WBC > 15,000 or < 4,000 or > 10% immature neutrophils
- Blood glucose > 140 mg/dl in absence of diabetes
- Mental status change
Summary

- There are various ways direct care nurses can get involved and improve care for pregnant women and newborns.

- Nurses are the front line providers of patient care and have an essential role in quality improvement.

- Utilizing a patient safety bundle can be an effective way to improve care and patient outcomes.

- Standardization is encouraged however it’s up to YOU and your colleagues to meet the needs and goals of your organization.
Nurses are a valuable source of information and support for women and their families

Thank You!

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