Postpartum Hemorrhage:
Diagnosis, Treatment and The Michigan Approach

July 2021
I have no conflicts of interest to disclose.

Tom Klumpner, MD
Clinical Assistant Professor
Anesthesiology and Obstetrics and Gynecology
Assistant Director, Informatics and Systems Improvement
Maternal Mortality Rates Per 100,000 Live Births


Figure adapted from NPR.org, https://www.npr.org/2017/05/12/528098789/u-s-has-the-worst-rate-of-maternal-deaths-in-the-developed-world
Accessed: July 31, 2019
Maternal Mortality Rates Per 100,000 Live Births


*Per 100,000 live births

Accessed: June 15, 2021
Postpartum hemorrhage (PPH) is a leading cause of maternal death.
Postpartum hemorrhage (PPH) is a leading cause of maternal death in Michigan.

Figure 2. Causes of Pregnancy-Related Deaths in Michigan, 2012-2016


• Death from postpartum hemorrhage is often **preventable**

Death from postpartum hemorrhage is often preventable and is often related to delayed and ineffective care.

We are at a turning point.
Outline

• Epidemiology and definition
  • Risk Factors
• Diagnosis
  • Early Identification
• Pathogenesis
• Treatment
  • Transfusion Management
• Preparation
Incidence

- In the US: 3%
- Worldwide: 6-11%


Incidence

- In the US: 3%
- Worldwide: 6-11%

- Incidence is increasing
  - 26% increase in US between 1994-2006
  - Severity is also increasing


Risk Factors

Before Pregnancy
- Maternal Age <19
- Maternal Age >35
- Grand Multiparity (≥ 5 births)
- Prior Cesarean Delivery
- Placenta Previa/Abruption
- Multiple Gestation
- Macrosomia (>4,000g)
- Fibroids

Antepartum
- Hypertensive Disease of Pregnancy
- Diabetes
- Polyhydramnios
- Infection
- Medical Induction of Labor
- Instrumental Vaginal Delivery
- Cesarean Delivery

Intra/Post-partum
- Placenta Previa/Abruption
- Multiple Gestation
- Macrosomia (>4,000g)
- Fibroids

Risk Factors

• Not all risk factors are equal

Risk Factors

- Not all risk factors are equal
  - Multiple Gestation – OR 2.8 (2.6 - 3.0)
  - Amnionitis – OR 2.9 (2.5 - 3.4)
  - Preeclampsia – OR 3.1 (2.9 - 3.3)
  - Eclampsia – OR 5.1 (4.3 - 6.2)

Risk Factors

- Risk factors are not completely predictive

Risk Factors

- Risk factors are not completely predictive
- 40% of PPH occurs in low risk women
Diagnosis
Definition

• Traditionally:
  • Vaginal Delivery: 500cc of blood lost
  • Cesarean Delivery: 1000cc of blood lost

• Recently:
  • 1000cc blood lost
  • Blood loss accompanied by signs or symptoms of hypovolemia


Visual Estimation of Blood Loss
- Most frequently practiced
- Most people receive no formal training in estimating EBL
- Training might not improve estimation
- Often underestimates blood loss
- Underestimation increases as blood loss increases

Quantitative Methods
- More sensitive
- Not always rapidly available
• Signs or symptoms of hypovolemia with blood loss
  • Increased blood volume in pregnancy limits sensitivity
Diagnosis

- Signs or symptoms of hypovolemia with blood loss
  - Increased blood volume in pregnancy limits sensitivity

<table>
<thead>
<tr>
<th>Estimated Blood Loss</th>
<th>Clinical Signs</th>
</tr>
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<tbody>
<tr>
<td>&lt;1000cc</td>
<td>--</td>
</tr>
<tr>
<td>&gt;1000-1500cc</td>
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<td>&gt;1500cc</td>
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- Signs or symptoms of hypovolemia with blood loss
  - Increased blood volume in pregnancy limits sensitivity
  - **Early recognition is key!**

### Estimated Blood Loss vs. Clinical Signs

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Table 1. The Maternal Early Warning Criteria

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<td>Oxygen saturation on room air, at sea level, %</td>
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Pathogenesis
Pathogenesis – The Four T’s

Tone

E. Mavrides, S. Allard, E. Chandraharan, et al., on behalf of the Royal College of Obstetricians and Gynaecologists
Prevention and management of postpartum haemorrhage. BJOG (2016)
Pathogenesis – The Four T’s

Tone

Trauma

Pathogenesis – The Four T’s

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Tissue

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Uterine Atony: Overdistention, Muscle Fatigue, GA, Chorioamnionitis

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- **Tone**: Uterine Atony: Overdistention, Muscle Fatigue, GA, Chorioamnionitis
- **Trauma**: Genital Tract Laceration, Uterine Inversion, Surgical Misadventure
- **Tissue**: Thrombin

Pathogenesis – The Four T’s

**Tone**
- Uterine Atony: Overdistention, Muscle Fatigue, GA, Chorioamnionitis

**Trauma**
- Genital Tract Laceration, Uterine Inversion, Surgical Misadventure

**Tissue**
- Retained Placenta, Invasive Placenta, Placental Abruption

**Thrombin**

## Pathogenesis – The Four T’s

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<td>Thrombin</td>
<td>Placental Abruption, Pre-Eclampsia, Coagulopathy</td>
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Pathogenesis – The Four T’s

**Tone**

Uterine Atony: Overdistention, Muscle Fatigue, GA, Chorioamnionitis

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Pathogenesis – The Four T’s

**Tone**

**Uterine Atony: Overdistention, Muscle Fatigue, GA, Chorioamnionitis**

Uterine atony causes 80% of PPH

Treatment
Management of Postpartum Hemorrhage

EBL > 1000cc, brisk bleeding, or signs of hypovolemia

- Resuscitate
- Determine Cause and Treat
Management of Postpartum Hemorrhage

Resuscitate

- Call for help
- Establish (multiple) large-bore IV access
- Obtain baseline laboratory studies: CBC, INR, fibrinogen, viscoelastic testing (if available)
- Type and Screen/Type and Cross
- Correct hypovolemia
- Escalate monitoring
- Monitor urine output
- Move to the OR quickly
- Maintain normothermia, electrolyte management, etc

Determine Cause and Treat
Management of Postpartum Hemorrhage

Resuscitate

• Call for help
• Establish (multiple) large-bore IV access
• Obtain baseline laboratory studies: CBC, INR, fibrinogen, viscoelastometric testing (if available)
• Type and Screen/Type and Cross
• Correct hypovolemia
• Escalate monitoring
• Monitor urine output
• Move to the OR quickly
• Maintain normothermia, electrolyte management, etc

Determine Cause and Treat

- Tone
- Trauma
- Tissue
- Thrombin
Treatment

- Oxytocin
  - First line therapy
- Methylergonovine (Methergine)
  - Judicious use in patients with HTN
- Carboprost (Hemabate)
  - Judicious use in patients with reactive airway disease
- Misoprostol (Cytotec)

Determine Cause and Treat

- Tone
- Trauma
- Tissue
- Thrombin
Treatment

Determine Cause and Treat

- Uterine massage
- Intrauterine balloon tamponade
- Uterine compression sutures

Tone
Trauma
Tissue
Thrombin
Treatment

- Evaluation by obstetric team
- Laceration repair
- Uterine exploration
- Manual removal of placenta
- Curettage
Treatment

Determine Cause and Treat

- Tone
- Trauma
- Tissue
- Thrombin

- Evaluation of clotting
- Replace clotting factors, platelets
- Hematology consult for congenital clotting disorders to target treatment
Management of Postpartum Hemorrhage

Resuscitate

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- Establish (multiple) large-bore IV access
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Determine Cause and Treat

- Tone
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Transfusion Management
pRBC : FFP - Fixed ratio?
1:1?
pRBC : FFP - Fixed ratio?
1:1?

More than 80% of institutions report using 1:1 ratio

Hypofibrinogenemia is associated with PPH

Table 1  Studies investigating the association between fibrinogen and progression of postpartum haemorrhage

<table>
<thead>
<tr>
<th>Study</th>
<th>N</th>
<th>Time of fibrinogen assay</th>
<th>Study design</th>
<th>Descriptive statistic reported</th>
<th>Fibrinogen g/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charbit02</td>
<td>129</td>
<td>Infusion of uterotonic after manual exploration of uterus</td>
<td>Invasive procedure to control bleeding, fall in Hb ≥4 g/L or ≥4 units RBC</td>
<td>Median (IQR)</td>
<td>4.4 (3.7-5.1)</td>
</tr>
<tr>
<td>Cortet02</td>
<td>738</td>
<td>Diagnosis of PPH</td>
<td>Invasive procedure to control bleeding, fall in Hb ≥4 g/L, ≥4 units RBC or admission to ITU</td>
<td>Mean (SD)</td>
<td>4.2 (1.2)</td>
</tr>
<tr>
<td>Poujade03</td>
<td>98</td>
<td>Variable time before embolisation</td>
<td>Success of radiological embolisation</td>
<td>Mean (SD)</td>
<td>2.9 (1.3)</td>
</tr>
<tr>
<td>Gayat04</td>
<td>257</td>
<td>Variable time before procedure</td>
<td>Invasive procedure to control bleeding ≥2500 mL blood loss</td>
<td>Median (IQR)</td>
<td>2.7 (2.1-3.5)</td>
</tr>
<tr>
<td>de Lloyd03</td>
<td>240</td>
<td>First clinical concern during PPH</td>
<td>Transfusion of ≥8 units allogeneic blood products</td>
<td>Mean (SD)</td>
<td>4.4 (1.1)</td>
</tr>
<tr>
<td>Collins14</td>
<td>346</td>
<td>1000–1500 mL blood loss</td>
<td>Transfusion of ≥8 units allogeneic blood products PPH requiring manual uterine exploration, RBC transfusion or fall in Hb ≥2 g/L</td>
<td>Median (IQR)</td>
<td>3.9 (3.2-4.5)</td>
</tr>
<tr>
<td>Simon05</td>
<td>797</td>
<td>Before bleeding started</td>
<td>Adverse effects of blood transfusion</td>
<td>Mean (SD)</td>
<td>4.9 (1.0)</td>
</tr>
</tbody>
</table>

Coagulation impairment after 1-2 liters blood loss

Data from Collins et al Blood 124:1727-1726, 2014

From Carlo Pancaro, MD, used with permission.
Effect of empiric FFP administration in PPH

**Abruption**
Fibrinogen <200 mg/dL

FFP contains about 200-250 mg/dL fibrinogen

*Normal fibrinogen (third trimester) = 373 - 619 mg/dL

Collins et al Theoretical modeling of fibrinogen supplementation with therapeutic plasma, cryoprecipitate, or fibrinogen concentrate. BJA 113:585-95 2014.

Effect of empiric FFP administration in PPH

**Abruption**  
Fibrinogen <200 mg/dL

**Uterine Atony/Surgical Bleeding**  
Fibrinogen 400 mg/dL

FFP contains about 200-250 mg/dL fibrinogen.

*Normal fibrinogen (third trimester) = 373 - 619 mg/dL*

Collins et al Theoretical modeling of fibrinogen supplementation with therapeutic plasma, cryoprecipitate, or fibrinogen concentrate. BJA 113:585-95 2014.

Using Viscoelastometric Testing to Guide Transfusion Therapy
Viscoelastometric Testing

Viscoelastometric Testing

**ROTEM® parameters**

- \( \alpha \)-angle (°)
- \( A_5 \) = Clot Firmness (mm) 5 minutes after CT
- \( A_X \) = Clot Firmness (mm) \( x \) minutes after CT
- MCF = Maximum Clot Firmness (mm) ➔ Clot Quality
- CT = Clotting Time (sec)
- CFT = Clot Formation Time (sec)
- Maximum Lysis (%)
Viscoelastometric Testing

- **INTEM**
  - Intrinsic system screening test

- **EXTEM**
  - Extrinsic system screening test

- **FIBTEM**
  - Isolated fibrinogen contribution to clot firmness


link.springer.com
Viscoelastic fibrinogen testing correlates with severity of PPH

Transfusion Management

• No difference in outcome when a goal:
  – FIBTEM A5 > 16mm (300 mg/dL) used as threshold.
  – FIBTEM A5 > 12mm (200 mg/dL) used as threshold.

• No benefit to treat fibrinogen level > 200 mg/dL
Introduction of an algorithm for ROTEM-guided fibrinogen concentrate administration in major obstetric haemorrhage

S. Mallaiah, P. Barclay, I. Harrod, C. Chevannes and A. Bhalla

- EBL > 1500cc with coagulopathy
- 2011-2012: “shock pack”
  - Emphasis on early transfusion
- 2012-2013: “fibrinogen phase”
  - Emphasis on ROTEM guidance
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<thead>
<tr>
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<th>Shock Pack (n = 42)</th>
<th>Fibrinogen (n = 51)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU admission</td>
<td>4 (9%)</td>
<td>1 (2%)</td>
<td>NS</td>
</tr>
<tr>
<td>TACO</td>
<td>4 (9%)</td>
<td>0</td>
<td>0.0367</td>
</tr>
<tr>
<td>TRALI</td>
<td>0</td>
<td>0</td>
<td>NS</td>
</tr>
<tr>
<td>Postpartum hysterectomy</td>
<td>6 (14%)</td>
<td>3 (6%)</td>
<td>NS</td>
</tr>
<tr>
<td>Death</td>
<td>0</td>
<td>0</td>
<td>NS</td>
</tr>
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Anaesthesia. 2015 Feb;70(2):166-75
Point-of-care viscoelastic testing improves the outcome of pregnancies complicated by severe postpartum hemorrhage

Denis Snegovskikh, M.D. a,*, Dmitri Souza, M.D., Ph.D. b, Zachary Walton, M.D., Ph.D. a, Feng Dai, Ph.D. c, Rachel Rachler d, Angelique Garay e, Victoria V. Snegovskikh, M.D. f, Ferne R. Braveman, M.D. e, Errol R. Norwitz, M.D., Ph.D. g

- Retrospective cohort study: 2011-2015
- Before and after study
  - standard massive transfusion protocol vs. point-of-care ROTEM-based protocol
- ROTEM-guided administration of:
  - Cryoprecipitate (FIBTEM)
  - FFP (CT)
  - Platelets (MCF)

Transfusion Management

- Reduction in:
  - pRBC, FFP and platelet administration
  - Length of hospital stay
  - ICU admissions
- Reduction in hysterectomies

### Table 3
Cost of hospitalization for patients with severe postpartum hemorrhage managed with or without PCVT\(^a\).

<table>
<thead>
<tr>
<th></th>
<th>PCVT  ((n = 17))</th>
<th>Non-PCVT ((n = 37))</th>
<th>Total  ((n = 54))</th>
<th>(P)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect</td>
<td>$5746.65 ($2458.16)</td>
<td>$8585.65 ($4412.28)</td>
<td>$7691.89 ($4101.13)</td>
<td>0.004</td>
</tr>
<tr>
<td>Direct</td>
<td>$6056.29 ($2519.45)</td>
<td>$11,833.43 ($7182.55)</td>
<td>$10,014.70 ($6655.29)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$11,802.94 ($4936.91)</td>
<td>$20,419.08 ($11,550.47)</td>
<td>$17,706.59 ($10,690.84)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
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\(^a\) Data are expressed as mean (SD).
Tranexamic Acid
Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial

- Randomized controlled trial, 2010-2016
- 193 hospitals, 21 countries, 20,060 women
- 1g tranexamic acid vs. placebo at clinical diagnosis of hemorrhage
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<th>Tranexamic acid group (n=10,036)</th>
<th>Placebo group (n=9985)</th>
<th>RR (95% CI)</th>
<th>p value (two-sided)</th>
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<tr>
<td><strong>Bleeding</strong></td>
<td>155 (1.5%)</td>
<td>191 (1.9%)</td>
<td>0.81 (0.65-1.00)</td>
<td>0.045</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>15 (0.1%)</td>
<td>15 (0.1%)</td>
<td>0.90 (0.56-1.43)</td>
<td>0.72</td>
</tr>
<tr>
<td>Organ failure</td>
<td>25 (0.3%)</td>
<td>18 (0.2%)</td>
<td>1.38 (0.75-2.53)</td>
<td>0.29</td>
</tr>
<tr>
<td>Sepsis</td>
<td>15 (0.2%)</td>
<td>8 (0.1%)</td>
<td>1.87 (0.79-4.40)</td>
<td>0.15</td>
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<tr>
<td>Eclampsia</td>
<td>2 (0.02%)</td>
<td>8 (0.1%)</td>
<td>0.25 (0.05-1.17)</td>
<td>0.057</td>
</tr>
<tr>
<td>Other</td>
<td>20 (0.2%)</td>
<td>20 (0.2%)</td>
<td>0.99 (0.54-1.85)</td>
<td>0.99</td>
</tr>
<tr>
<td>Any cause of death</td>
<td>227 (2.3%)</td>
<td>256 (2.6%)</td>
<td>0.88 (0.74-1.05)</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Table 2: Effect of tranexamic acid on maternal death

Lancet. 2017 May 27;389(10084):2105-2116
Effect of early tranexamic acid administration on mortality, hysterecmy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial

- Tranexamic acid mortality: 155/10036 - 1.5%
- Placebo mortality: 191/9985 - 1.9%
- Mortality in USA for PPH: 1.7 per 100,000 births
The Michigan Medicine PPH Transfusion Protocol
POSTPARTUM HEMORRHAGE

ONGOING BLEEDING

1 g Tranexamic Acid

FIBTEM A10

< 8 mm
3 g Fibrinogen

< 12 mm
2 g Fibrinogen

≥ 12 mm

EXTEM A10

≥ 43 mm
Platelets

< 43 mm

EXTEM CT

< 80 sec
Crystalloids

≥ 80 sec
Plasma

WATCH
• Ca++
• K+
• Mg++
• Lac
• T°
• UO

TREAT
• Hct < 24
• Platelets < 75
• Fibrinogen < 200
• 1:1:1 if no lab results

Department of Anesthesiology

VON VOIGTLANDER WOMEN'S HOSPITAL
UNIVERSITY OF MICHIGAN HEALTH SYSTEM
Preparation and Response
Maternal Early Warning System
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Maternal Early Warning System
Preparation and Response

Maternal Early Warning System

Respond

Identify Trigger

Monitor

Evaluate

Alert
Preparation and Response


Active Alerts

Low BP=72/45. HR=83.
Acetaminophen given 4.6 hours ago. Please check pain level.
Preparation and Response
Simulation Training
Impact of simulation and team training on postpartum hemorrhage management in non-academic centers

Nicole E. Marshall¹, Jeroen Vanderhoeven¹, Karen B. Eden², Sally Y. Segel¹, and Jeanne-Marie Guise¹,²,³

¹Department of Obstetrics and Gynecology, ²Department of Medical Informatics and Clinical Epidemiology, and ³Department of Public Health and Preventive Medicine, Oregon Health & Science University, Portland, OR, USA

- Effect of simulation and team training on response to simulated hemorrhage
- 6 rural and urban non-academic centers
- Simulated PPH followed by didactic
• Improvement in:
  • Recognition of PPH
  • Time to use oxytocin
  • Time to perform uterine massage
  • Time to use a secondary uterotonic

Table 2. Time of PPH management before and after training.

<table>
<thead>
<tr>
<th>Time from baby’s head out</th>
<th>Before Mean ± SD (s)</th>
<th>After Mean ± SD (s)</th>
<th>Reduction Mean ± SD (s)</th>
<th>p value (paired t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recognized PPH</td>
<td>124.8 ± 51.7</td>
<td>94.5 ± 35.5</td>
<td>30.3 ± 57.7</td>
<td>0.02</td>
</tr>
<tr>
<td>Use first medication*</td>
<td>135.4 ± 42.4</td>
<td>87.3 ± 49.2</td>
<td>48.1 ± 65.9</td>
<td>0.003</td>
</tr>
<tr>
<td>Perform uterine massage†</td>
<td>134.1 ± 34.9</td>
<td>105.7 ± 45.2</td>
<td>28.5 ± 50.0</td>
<td>0.01</td>
</tr>
<tr>
<td>Use second medication†‡</td>
<td>216.0 ± 73.0</td>
<td>147.0 ± 48.2</td>
<td>69.0 ± 71.9</td>
<td>0.0003</td>
</tr>
<tr>
<td>Correct PPH†</td>
<td>404.0 ± 154.5</td>
<td>349.0 ± 110.6</td>
<td>55.0 ± 191.9</td>
<td>0.19</td>
</tr>
</tbody>
</table>

*Oxytocin.
†Misoprostol or carboprost.
‡The single team that did not resolve the scenario in 10 min by using three indicated medications was excluded from this time point.

Postpartum Hemorrhage Protocols
Use of a postpartum hemorrhage management protocol is recommended by ACOG
Preparation and Response – PPH Protocol

PATIENT SAFETY SERIES

Comprehensive maternal hemorrhage protocols reduce the use of blood products and improve patient safety

Laurence E. Shields, MD; Suzanne Wiesner, RN; Janet Fulton, RN, PhD; Barbara Pelletreau, RN

• Comprehensive PPH protocol across 29 hospitals comprising 60,000 births annually.
• 2010-2012

Preparation and Response – PPH Protocol

- **PPH protocol:**
  - hemorrhage risk assessment
  - early escalation of care and monitoring
  - sending laboratory studies
  - uterotonic administration
  - transfusion guidance

- **26% reduction in blood product administration.**

---

# STAGE 2
## OB Hemorrhage

### MOBILIZE

**Primary Nurse:**
- Activate OB Hemorrhage Protocol
- Call/Birth Center Page Team Leader and Anesthesiology to room

**Team Leader or designee:**
- Bring Hemorrhage Cart to patient’s location if not in OR
- Notify Charge Nurse
- Assign designees to continue Blood Bank communication
- Designate a provider, nurse, or SW as family support person

**OR Team Leader:**
- Prepare OR & staff for patient transfer if not already there

### ACT

**OB/Nurse/Anesthesia Team Leaders**
- Continue IV oxytocin, IV crystalloid, uterine massage
- Obtain and document quantitative blood loss q 10 minutes
- Continue uterotonic medication per protocol (Virtual Hemorrhage Pack in Pyxis)*
- Administer mephergine 0.2 mg IM (if not hypertensive); may repeat dose q 2 hr
- Administer misoprostol 800 mcg buccal or rectal
- Administer hemabate 0.25 mg IM (if not asthmatic); may repeat dose q 15 min

*Don’t delay other interventions while waiting for response. Consider move to OR.*
- Vital signs, including O2 sat & level of consciousness (LOC) q 5 minutes
- Administer oxygen to maintain O2 sats at > 95% & keep patient warm
- Empty bladder; straight cath or place Foley with urimeter
- Transfusion
- Bring 2 units PRBCs to bedside (mobile refrigerator on unit or blood bank)
  - Consider activation of Massive Transfusion Protocol
  - Transfuse PRBCs based on clinical signs & response; don’t wait for lab results
- Order labs STAT (CBC, CMP, Coag/Fibrinogen, Point-of-care labs)

**Second nurse or OR techs:**
- Obtain portable light and OB procedure tray
- Assist with transfer to OR (if indicated)

### THINK

**Vaginal birth**
- Trauma (vaginal, cervical, or uterine)
  - Visualize & repair
- Retained placenta
  - D&C
- Uterine atony/LUS bleeding
  - Bakri
- Other
  - Arterial embolization (IR)

**Cesarean Section**
- Atony
  - B-Lynch, Intrauterine Balloon
- Uterine Inversion
  - Anesthesia & uterine relaxation for manual reduction
- Amniotic Fluid Embolism
  - Maximally aggressive respiratory, vasopressor, and blood product support
- VS worse than blood loss
  - consider uterine rupture or broad ligament tear with internal bleeding
  - move to laparotomy

Once stabilized:
- Postpartum Debrief
- Update Postpartum Risk Assessment: Modified postpartum management with increased surveillance

---

Ongoing bleeding and/or vital sign instability, and < 1500 ml cumulative blood loss (EBL/QBL)

Cumulative blood loss (EBL/QBL) > 1500 ml, > 2 units PRBCs given, VS unstable or suspicion for DIC? Proceed to STAGE 3
# STAGE 2
## OB Hemorrhage

### Mobilize

<table>
<thead>
<tr>
<th>Primary Nurse:</th>
<th>ACT</th>
<th>THINK</th>
</tr>
</thead>
<tbody>
<tr>
<td>❑ Activate OB Hemorrhage Protocol</td>
<td>❑ Continue IV oxytocin, IV crystalloid, uterine massage</td>
<td>❑ Postpartum Debrief</td>
</tr>
<tr>
<td>❑ Call/Birth Center Page Team Leader and Anesthesiology to room</td>
<td>❑ Obtain and document quantitative blood loss q 10 minutes</td>
<td>❑ Update Postpartum Risk Assessment: Modified postpartum management with increased surveillance</td>
</tr>
</tbody>
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<tr>
<th>Team Leader or designee:</th>
<th>ACT</th>
<th>THINK</th>
</tr>
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<tr>
<td>❑ Bring Hemorrhage Cart to patient’s location if not in OR</td>
<td>❑ Continue uterotonic medication per protocol (Virtual Hemorrhage Pack in Pyxis)*</td>
<td>❑ Trauma (vaginal, cervical, or uterine) 🡪 Visualize &amp; repair</td>
</tr>
<tr>
<td>❑ Notify Charge Nurse</td>
<td>❑ Administer methergine 0.2 mg IM (if not hypertensive); may repeat dose q 2 hr</td>
<td>❑ Retained placenta 🡪 D&amp;C</td>
</tr>
<tr>
<td>❑ Assign designees to continue Blood Bank communication</td>
<td>❑ Administer misoprostol 800 mcg buccal or rectal</td>
<td>❑ Uterine atony/ LUS bleeding 🡪 Bakri</td>
</tr>
<tr>
<td>❑ Designate a provider, nurse, or SW as family support person</td>
<td>❑ Administer hemabate 0.25 mg IM (if not asthmatic); may repeat dose q 15 min</td>
<td>❑ Other 🡪 Arterial embolization (IR)</td>
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<table>
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<tr>
<th>OR Team Leader:</th>
<th>ACT</th>
<th>THINK</th>
</tr>
</thead>
<tbody>
<tr>
<td>❑ Prepare OR &amp; staff for patient transfer if not already there</td>
<td>❑ Vital signs, including O2 sat &amp; level of consciousness (LOC) q 5 minutes</td>
<td>❑ Cesarean Section 🡪 Atony 🡪 B-Lynch, Intrauterine Balloon</td>
</tr>
<tr>
<td></td>
<td>❑ Administer oxygen to maintain O2 sats at &gt; 95% &amp; keep patient warm</td>
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<td>❑ Order labs STAT (CBC, CMP, Coag/Fibrinogen, Point of care labs)</td>
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⚠️ Cumulative blood loss (EBL/QBL) > 1500 ml, > 2 units PRBCS given, VS unstable or suspicion for DIC? Proceed to STAGE 3
### STAGE 2

**OB Hemorrhage**

Ongoing bleeding and/or vital sign instability, and < 1500 ml cumulative blood loss (EBL/QBL)

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### ACT

- Give once, if no response, move to next agent
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Proceed to STAGE 3
STAGE 2
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Ongoing bleeding and/or vital sign instability, and < 1500 ml cumulative blood loss (EBL/QBL)

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Proceed to STAGE 3
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

Provider Education Preview

The SOAP Education Committee has assembled the materials below to serve as resources for your practices. Some materials are for SOAP members only and require you to be logged in to access. If you are not a member, we encourage you to join SOAP today to take advantage of these resources!

Access the SOAP Members Only Provider Education

Learning Modules: Practical information and worksheets covering specific clinical and non-clinical topics. Great for getting a program off the ground or to tailor a program that is up and running! Current modules include maternal cardiac disease, hemorrhage, communication, and simulation

Video Based Learning: Short videos aimed at discussing topics in brief. Current content is centered around Point of Care Ultrasound (POCUS).

View a sample video on Probes/Knopology

https://soap.org/
Preparation and Response – Quality Measures?

ASPIRE Obstetric Anesthesia Subcommittee Meeting
Take Home Points
Conclusion

- Maternal mortality in the US is rising, while it is decreasing in other developed countries.
- Improving our response to PPH may reverse this trend.
- Early identification of PPH is important.
- Get involved early.
- Quickly escalate care.
- Consider viscoelastic testing/send labs early.
- PPH protocols improve outcomes.
Please join us for the OB panel.