

## Simulation Patient Design (August, 2021) Postpartum Hemorrhage in L&D

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### Introduction

Hemorrhage is the most common cause of maternal death in the *developing world*, and it is also an important and leading cause of maternal morbidity and mortality in the *developed world*. Postpartum hemorrhage (PPH) can complicate any pregnancy, with uterine atony being the most common cause, especially in protracted augmented labor.<sup>(1)</sup> At the time of a PPH, other etiologies should also be considered as they could present in addition to uterine atony, or as a single etiology. Effective management of obstetric hemorrhage involves a multidisciplinary team effort, and requires early and aggressive resuscitation with active pharmacologic and surgical management, if indicated.

**Educational Rationale:** This multidisciplinary team simulation is designed to give learners the opportunity to apply their knowledge of team skills and implementation of the PPH bundle, in managing obstetric hemorrhage.<sup>(2)</sup>

**Target Audiences:** Nursing, OB, Anesthesiology, and L&D support staff

**Learning Objectives:** As per Accreditation council for graduate medical education (ACGME) Core Competencies

Upon completion of this simulation (including the debrief) learners will be able to:

- *Medical knowledge:* Describe the pathophysiology of PPH
- *Patient care:* Resuscitate a patient with PPH
- *Practice-based learning and improvement:* Utilize the PPH bundle in the management of massive obstetric hemorrhage
- *Interpersonal and communication skills:* Effectively communicate within teams, lab and blood bank.
- *Professionalism:* Demonstrate mutual respect for each other's expertise
- *Systems-based practice:* Identify existing barriers within the system (such as shortages of equipment, personnel, knowledge gaps, institution specific protocols) that need to be developed or modified in order to improve patient outcome

Scenario-specific learning objectives:

- Identify the 4 stages of PPH as described by the American College of Obstetricians and Gynecologists (ACOG)
- Initiate PPH management bundle
- Describe techniques to quantify blood loss
- Initiate a massive transfusion protocol (MTP)

**Guided Questions:**

- Which factors increase the risk of PPH?
- What is the pharmacological basis of uterotonic drugs used in the treatment of PPH?
- What contents should be included in the hemorrhage cart?
- Which factors should be considered for a PPH bundle specific for your facility?

**Assessment Instruments:**

1. Learner Knowledge Assessment form (Appendix 1)
2. Simulation Activity Evaluation form (Appendix 2)

**Simulation set-up and equipment needed:****Mannequin set-up:**

- Mannequin set-up in L&D suite
- 18g IV in hand with normal saline (should contain an access port)
- Epidural catheter taped
- Atonic uterus simulated with a water-filled balloon secured to the mannequin's abdomen
- Red dye-stained pad placed under mannequin; red stained liquid on floor beside the bed
- Mannequin should be covered with blankets so the apparent bleeding is concealed

**Monitors required:**

x	Non-invasive BP cuff
x	Arterial line, set up
x	5 lead EKG
x	Temperature probe
x	Pulse oximeter

**Other equipment required:**

- 1) IVs: 18g, 16g, 14g
- 2) Fluids: Crystalloids, colloids, PRBCs, FFP, platelets, cryoprecipitate (mock packs so the learners can verify the patient's name, MRN, and other institution-specific standard checks prior to administration)
- 3) Medications: Oxytocin, methylergonovine (Methergine), prostaglandin F2 alpha (Hemabate), misoprostol (Cytotec), tranexamic acid (TXA)
- 4) Airway equipment: Nasal cannula, face masks, oral airways, LMAs, ETT, laryngoscopes, suction
- 5) Hemorrhage cart
- 6) PPH checklist
- 7) Crash cart

**Other supporting documents:**

Patient's history and physical exam  
Lab investigations

Family member (actor)

A-V equipment

**Participants**

2-3 anesthesiologists (faculty/trainees of varying competencies)  
2-3 obstetricians (faculty/trainees of varying competencies)  
2-3 nurses/nurse midwives

**Time Duration**

Set-up	20 min
Pre brief/consent	10 min
Simulation	20 min
Debrief	15-20 min

**Case Stem**

Ms Jones is a 30-year-old patient (G3P3), with gestational diabetes, induced for over-the-due-date who had a prolonged second stage of labor and a vacuum-assisted delivery for a large baby. She had neuraxial labor analgesia which functioned well. The nurse in the labor room has just called for help as the patient is bleeding.

The patient has a history of asthma with no past surgical history.

Current medications and allergies:

NKDA

Pre-natal vitamins

Physical examination:

Weight, height: 165 lbs (75 Kg), 5'4" (163 cm) (BMI 28)

Airway: MP II

Lungs: Clear

Heart: Normal

## Scenario

Trigger	Patient's condition	Action	Done	Time	Comments
<p>Patient delivered: vacuum-assisted</p> <p>Brisk bleeding</p>	<p>Patient's VS: HR 108 bpm BP 105/70 mm Hg Sat 99% RR 16 bpm</p>	<ol style="list-style-type: none"> <li>1. Nurse calls for help</li> <li>2. Designate leader, assign tasks</li> <li>3. Recognize + assess ongoing risk of PPH + review QBL</li> <li>4. Repeat maternal vital signs q1-2 min</li> <li>5. OB performs bimanual fundal massage + requests the oxytocin infusion rate to be increased (currently running at a standard rate)</li> <li>6. Place 2<sup>nd</sup> IV (large-bore, 14-16 g)</li> <li>7. Administer 1000 mL IV crystalloid bolus</li> <li>8. Administer 2<sup>nd</sup>-line uterotonic drug</li> <li>9. Send labs – which tests?</li> <li>10. Bring hemorrhage cart + PPH checklist</li> </ol>			
<p>Hypotension + tachycardia</p> <p>OB describes uterine tone as 'adequate', however patient continues to bleed</p>	<p>Confederate verbalizes QBL 1100 mL</p> <p>Patient's VS: HR 115 bpm BP 88/42 mm Hg Sat 97% RR 18 bpm</p>	<ol style="list-style-type: none"> <li>1. Recognize worsening PPH</li> <li>2. Review PPH checklist items</li> <li>3. 100% oxygen via non-rebreather face mask</li> <li>4. Communicate with blood bank + order MTP</li> <li>5. Multidisciplinary team discussion - differential diagnosis of etiology: retained products, laceration, DIC</li> <li>6. Repeat labs - which tests (role of lactate)?</li> <li>7. Administer tranexamic acid?</li> <li>8. Consider moving to the OR</li> <li>9. Assess urine output</li> </ol>			
<p>In the OR</p> <p>Worsening hypotension</p> <p>OB identifies deep cervical laceration –</p>	<p>Confederate verbalizes QBL 2200 mL</p> <p>Patient's VS: HR 128 bpm BP 78/42 mm Hg Sat 95% RR 22 bpm</p>	<ol style="list-style-type: none"> <li>1. Cautiously dose epidural catheter</li> <li>2. MTP arrived (if not, administer albumin 5%)?</li> <li>3. Active patient warming – monitor temperature</li> <li>4. Transfuse + optimize ratio of blood products</li> <li>5. Fibrinogen replacement (human-derived fibrinogen concentrate or</li> </ol>			

<p>difficult + lengthy repair</p>	<p>Hb 7.9 g/dL HCT 24% Platelets 132 K INR 1.3 Fib 195 mg/dL (verbalized by facilitator)</p>	<p>cryoprecipitate) 6. Consider invasive monitors, cell saver, rapid transfusion set-up 7. Order 2<sup>nd</sup>/3<sup>rd</sup> MTP? 8. Repeat labs – which tests? 9. Evaluate acid-base balance and electrolytes (e.g. calcium) 10. Asses urine output 11. Consider calling Gyn-Onc, interventional radiology, ICU 12. List treatment options: Repair of laceration, embolization, hysterectomy 13. Consideration for general anesthesia or continue dosing the epidural catheter?</p>			
<p>Resolution</p>	<p>Patient's VS: HR 92 bpm BP 108/62 mm Hg Sat 96% RR 18 bpm  Patient responsive</p>	<p>1. Importance of maintaining uterine tone despite other etiology of PPH 2. Concern for correction of coagulopathy 3. When to remove epidural catheter? 4. Disposition - where to? 5. Communicate with patient + support person 6. Counselling and assess for postpartum depression?</p>			

## Appendix 1

### Obstetric Interdisciplinary Team Simulation

Name of simulation: \_\_\_\_\_

Date: \_\_\_\_\_

OB Nursing Anes

Consult PG Yr 1234 Med st staff

Each item has two components. The “Before the simulation” column (left side) examines your perspective at the beginning of the simulation. The “End of Simulation” column (right side) is to evaluate your perspective at the completion of the simulation. Think carefully about your responses and mark them accordingly.

#### 1. How would you rate your ability to apply the bundles of care to resuscitate a patient with PPH?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Poor							Excellent						
Poor							Excellent						

#### 2. How would you rate your knowledge of the uterotonic pharmacology?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Poor							Excellent						
Poor							Excellent						

#### 3. How would you rate your ability to access emergency resuscitation equipment and a hemorrhage cart during a PPH?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Poor							Excellent						
Poor							Excellent						

#### 4. How would you rate your ability to select appropriate labs to be ordered in a PPH?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Poor							Excellent						
Poor							Excellent						

#### 5. How would you rate your ability to use closed-loop communication when managing an obstetric crisis?

BEFORE THE SIMULATION							END OF SIMULATION						
1	2	3	4	5	6	7	1	2	3	4	5	6	7
Poor							Excellent						
Poor							Excellent						

## Appendix 2

### SIMULATION ACTIVITY EVALUATION FORM

DATE OF SIMULATION: \_\_\_\_\_

YOUR OCCUPATION: Consultant PG Yr1234 STUDENT NURSE MIDWIFE OTHER

SPECIALTY: \_\_\_\_\_ YEARS IN PRACTICE: \_\_\_\_\_

Please rate the following aspects of this training program using the scale listed below:  
1 = poor      2= suboptimal      3 = adequate      4 = good      5 = excellent

Use "N/A" if you did not experience or otherwise cannot rate an item.

#### **INTRODUCTORY MATERIALS**

Orientation to the simulation	1	2	3	4	5	N/A
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#### **PHYSICAL SPACE**

Realism of the simulation space	1	2	3	4	5	N/A
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#### **EQUIPMENT**

Satisfaction with the mannequin	1	2	3	4	5	N/A
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#### **SCENARIOS**

Realism of the scenarios	1	2	3	4	5	N/A
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Ability of the scenarios to test technical skills	1	2	3	4	5	N/A
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Ability of the scenarios to test behavioral skills	1	2	3	4	5	N/A
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Overall quality of the debriefings	1	2	3	4	5	N/A
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#### **DID YOU FIND THIS USEFUL?**

To improve your clinical practice?	1	2	3	4	5	N/A
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To improve your teamwork skills?	1	2	3	4	5	N/A
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To improve your VERBAL communication?	1	2	3	4	5	N/A
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To improve your NONVERBAL communication?	1	2	3	4	5	N/A
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#### **FACULTY**

Quality of instructors	1	2	3	4	5	N/A
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Simulation as a teaching method	1	2	3	4	5	N/A
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#### **COMMENTS/SUGGESTIONS**

## References

1. Bateman BT, Berman MF, Riley LE, Leffert LR. The epidemiology of postpartum hemorrhage in a large, nationwide sample of deliveries. *Anesth Analg.* 2010;110:1368-73
2. Main EK, Goffman D, Scavone BM, Low LK, Bingham D, Fontaine PL, et al. National Partnership for Maternal Safety: Consensus bundle on obstetric hemorrhage. *J Obstet Gynecol Neonatal Nurs.* 2015;44:462-70