Safety Action Series

Calculating Cumulative Blood Loss Quantification Methods and Implementation Strategies
Speakers

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Disclosures

- Dena Goffman, MD, FACOG has no real or perceived conflicts of interest.

- Colleen A. Lee, MS, RN has no real or perceived conflicts of interest.
Objectives

• Understand the importance of accurate assessment of blood loss within the Obstetric Hemorrhage Patient Safety Bundle.

• Discuss the concept of cumulative blood loss.

• Identify methods for quantifying blood loss and potential strategies to implement for all deliveries.
• Hemorrhage most common cause of severe maternal morbidity and preventable mortality

• Rates of obstetric hemorrhage are on the rise in US and other developing countries

• Obstetric hemorrhage bundles offer evidence-based recommendations for practice and care processes to improve outcomes
Hemorrhage Bundle

**READINESS**
Every unit
- Hemorrhage cart with supplies, checklist, and instruction cards for intraterine 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/unmatched)
- 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 event
- 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
**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)
Unit Standard, Stage-Based Obstetric Hemorrhage Emergency Management Plan

- California Maternal Quality Care Collaborative (CMQCC)\(^2\) has free resources available online
- Stages based on blood loss
- Cumulative blood loss

<table>
<thead>
<tr>
<th>Stage 0</th>
<th>Assessments</th>
<th>Meds/Procedures</th>
<th>Blood Bank</th>
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</thead>
<tbody>
<tr>
<td>Every woman in labor/giving birth</td>
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<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Blood loss: &gt; 500ml vaginal or &gt; 1000 ml Cesarean, or VS changes (by &gt;15% or HR &lt; 110, BP &lt; 85/45, O2 sat &lt; 95%)</th>
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<tbody>
<tr>
<td>Stage 1 is short: activate hemorrhage protocol, initiate preparations and give Methergine IM</td>
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<tr>
<td>Activate OR Perihaemorrhage Protocol and Checklist</td>
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<tr>
<td>Notify Charge nurse, OBGYN, Anesthesiologist</td>
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<tr>
<td>VS, O2 Sat 95</td>
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<tr>
<td>Record cumulative blood loss 0-15</td>
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<tr>
<td>Weigh bloody materials</td>
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<tr>
<td>Careful inspection with gloved examiner of vaginal vault, cervix, uterine cavity, placenta</td>
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<tr>
<td>IV Access: at least 18 gauge</td>
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<tr>
<td>Increase IV fluid LR and Oxytocin rate, and repeat fundal massage</td>
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<tr>
<td>Methergine 0.2mg IM (if not hypertensive) May repeat if good response to first dose, BUT otherwise move on to 2nd level uterine tampon (see below)</td>
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<tr>
<td>Empty bladder: straight cath or place Foley with urinary</td>
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<tr>
<td>T&amp;C 2 Units PRBCs (if not already done)</td>
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<tr>
<th>Stage 2</th>
<th>Continued bleeding with total blood loss under 1500ml</th>
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<tr>
<td>Stage 2 is focused on sequentially advancing through medications and procedures, mobilizing help and Blood Bank support, and keeping advance with volume and blood products</td>
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<tr>
<td>Ob back to bedside (if not already there)</td>
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<tr>
<td>Extra help: 2nd OB, Rapid Response Team (per hospital), assign roles</td>
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<tr>
<td>VS &amp; cumulative blood loss 15-10 min</td>
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<tr>
<td>Weigh bloody materials</td>
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<tr>
<td>Complete evaluation of vaginal vault, cervix, placenta, uterine cavity</td>
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<tr>
<td>Send additional labs, including DIC panel</td>
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<tr>
<td>IV in Postpartum: Move to L&amp;D/OR</td>
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<tr>
<td>Evaluate for special cases: Uterine inversion, Amn. Fluid Embolism</td>
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<tr>
<td>Notify Blood Bank of OS Hemorrhage</td>
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<tr>
<td>Bring 2 Units PRBCs to bedside, transfuse per clinical signs — do not wait for lab values</td>
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<tr>
<td>Use blood warmer for transfusion</td>
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<tr>
<td>Consider thawing 2 TFP (takes 35 min), use if transfusing &gt; 2 PRBCs</td>
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<tr>
<td>Determine availability of additional RBCs and other OAG products</td>
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<tr>
<th>Stage 3</th>
<th>Total blood loss over 1500ml or &gt; 2 units PRBCs given or VS unstable or suspicion of DIC</th>
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<tbody>
<tr>
<td>Stage 3 is focused on the massive transfusion protocol and invasive surgical approaches for control of</td>
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<tr>
<td>Mobilize team Advanced OYN surgeon</td>
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<tr>
<td>2nd Anesthesiologist Provider OR staff</td>
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<td>Adult intensivist</td>
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<tr>
<td>Repeat labs including coag and abg’s</td>
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<tr>
<td>- Central line</td>
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<tr>
<td>- Activate Massive Hemorrhage Protocol</td>
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<tr>
<td>- Laparotomy</td>
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<tr>
<td>- Bladder Suture</td>
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<td>- Uterine Artery Ligation</td>
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<td>- Hysterectomy</td>
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<td>- Patient support</td>
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<tr>
<td>- Fluid warmer</td>
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<tr>
<td>- Blood bank warming device</td>
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<tr>
<td>Transfuse Aggressively</td>
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<tr>
<td>Massive Hemorrhage Pack</td>
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<tr>
<td>- Neor 1 PRBC/PFP</td>
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<tr>
<td>- 1 PLT apheresis pack per 4-6 units PRBCs</td>
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<td>- Unresponsive Coagulopathy:</td>
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<tr>
<td>- After 6-10 units PRBCs and full coagulation factor</td>
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Unit Standard, Stage-Based Obstetric Hemorrhage Emergency Management Plan

- ACOG District II Safe Motherhood Initiative (SMI)³ Obstetric Hemorrhage Checklist (available for free download online)
- Based on blood loss
Cumulative Blood Loss

Success with the use of a Stage-Based Obstetric Hemorrhage Emergency Management Plan depends on accurate real-time assessment of cumulative blood loss.
Case

- A healthy woman with an uncomplicated pregnancy and no prior medical history is scheduled for a repeat Cesarean delivery.
- Surgery is performed by her own physician at approximately 3pm.
- EBL for the procedure is 1200 mL. Mild atony responded to usual measures.
- Upon cleaning/transferring to the stretcher in the OR, an additional 500 mL of vaginal bleeding is noted.
- While in PACU around 5pm, patient loses an additional 600 mL for which she is seen and assessed by the provider and found to be stable. Misoprostol is administered with good effect.
- Towards the end of her stay in PACU, the patient loses another 800 mL.
- She is returned to the OR at which point she is hypotensive and tachycardic, requiring pressors. She is in hypovolemic shock and is coagulopathic. The MTP is activated and the patient undergoes a hysterectomy and is admitted to the ICU for monitoring.
Case Debriefing

• Opportunities for improvement:
  – Cumulative blood loss was not documented on the I&O flowsheet
  – Multiple hand-offs, the big picture was not appreciated
  – Each bleeding incident of bleeding was managed in isolation; there was no global picture of the actual blood loss
Measuring Blood Loss: Estimating vs. Quantifying

- **Underestimating** blood loss leads to delayed recognition of hemorrhage and initiation of life-saving measures.
- **Overestimating** can lead to unnecessary and costly treatments.
- **Quantification** of blood loss more accurate and reduces likelihood of delays in recognition and treatment.
Estimating Blood Loss: Can it be done? Should it be done?

• Healthcare providers are generally inaccurate when it comes to estimating blood loss\textsuperscript{5}
• Training providers in visual EBL improves ability to estimate blood loss, but only temporarily\textsuperscript{6}
• A visual aid depicting known volumes of blood loss can improve accuracy\textsuperscript{7}
• Accuracy of EBL significantly improved with use of graduated drape\textsuperscript{8}
• Many providers admit to not using the drape, but judging the severity of hemorrhage based on amount of blood flow and patient’s condition \textsuperscript{5}
Quantitative Blood Loss

- Quantification of blood loss is a formal measurement using weighing and blood collection devices to determine the actual amount of blood loss.
- Methods to quantify blood loss, such as weighing, are significantly more accurate than EBL.
- The use of a calibrated drape had an error rate of less than 15%.
AWHONN video link

https://www.youtube.com/watch?v=F_ac-aCbEn0&t=5s
AWHONN video summary

• US is 47\textsuperscript{th} in the world in maternal mortality.
• One of the leading causes of preventable maternal mortality is postpartum hemorrhage
• Failure to recognize/late recognition of hemorrhage lead to late or inadequate interventions
• QBL is the best strategy for identifying and appropriately treating postpartum hemorrhage
Weighing Sponges

• 1 gram = 1 mL
• Determine dry weights of commonly used items (laps, raytecs, chux, etc.)
• Use the equipment you already have (infant scale)
Components of QBL

• Vaginal delivery:
  – Utilize a graduated collection drape
  – Note the amount of fluid just prior to delivery (amniotic fluid, urine, etc.)
  – After delivery of the placenta, note the amount in the graduated drape and subtract the pre-delivery amount
  – Weigh any bloody sponges
Simple Formula

Post-placenta fluid $=$ pre-delivery fluid $+$ sponge weight $=$ QBL
Cesarean Delivery

- Weigh sponges and lap pads
- Measure amount of blood in suction canister. Ideally, use a separate canister to collect blood after amniotomy and delivery of infant so it is more accurate. If same canister used throughout, apply same method as for vaginal delivery (subtract pre from post)
Automated Systems for Quantification

• Triton System (Gauss Surgical)
  • relatively new iPad-based system with ability to scan laps and sponges to determine amount of blood loss
  • able to differentiate between blood and other fluids (amniotic fluid, irrigation)
• Several studies have shown Triton to be highly accurate in measurement of Hgb loss as compared with traditional methods (EBL or gravimetric)⁹⁻¹¹
Triton System
Opportunities to Incorporate Objective Data

• If strict QBL is not feasible, there are still ways to incorporate objective data

• Semi-quantitative blood loss:
  – Drape
  – Canister
  – Blood volume per lap or sponge
Surface Area Covered to Estimate Amount of Blood\textsuperscript{12}

- 25 mL = 50%
- 50 mL = 75%
- 75 mL = 100%
- 100 mL = 100% + dripping
# Pros & Cons

<table>
<thead>
<tr>
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<th>Pro</th>
<th>Con</th>
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<tbody>
<tr>
<td>QBL All deliveries</td>
<td>Able to accurately assess blood loss</td>
<td>Resource-intensive</td>
</tr>
<tr>
<td>Semi-quantitative</td>
<td>More objective assessment of blood loss</td>
<td>Still relies on some estimation, human factors</td>
</tr>
<tr>
<td>All deliveries</td>
<td></td>
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<tr>
<td>EBL with Triggers for QBL</td>
<td>Once a trigger reached (PPH, volume, provider request), allows for more accurate measurement of blood loss</td>
<td>Relies on EBL and clinical signs/symptoms to trigger</td>
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Is QBL really necessary?

• University of Pennsylvania study 2016\textsuperscript{13}
• July 2015: implementation of hemorrhage bundle including QBL
• Deliveries included had availability of EBL, admission Hgb, and 12 hour postpartum Hgb
• Pre-data: 10/15/13-12/15/13; Post-data: 10/20/15-12/20/15
• Conclusions:
  – All deliveries: QBL does not predict Hgb drop more accurately than EBL in pre or post.
  – When evaluating only deliveries with EBL >1000 mL, QBL tends to be more accurate.
  – May be prudent to perform QBL only on deliveries where EBL is greater than 1000 mL in order to balance benefit of accuracy with consequences of resource intensive process
How NYP/MSCH implemented QBL

• All vaginal deliveries
• Cesarean deliveries with recognized hemorrhage
• Barriers:
  – Staffing: difficult to have 2 RNs in every Cesarean delivery due to typically high census
Strategies for Success

• Start small with most straightforward process first (uncomplicated vaginal deliveries).

• Once QBL has been implemented for all vaginal deliveries, add scheduled C-sections.

• Enlist frontline team members to come up with ways to manage QBL during more complex cases (emergent C-section, PPH).

• Be flexible... and patient.
References


5. Hancock A, Weeks AD, Lavender DT, BMC 2015- review


Q&A Session

Press *1 to ask a question

You will enter the question queue
Your line will be unmuted by the operator for your turn

A recording of this presentation will be made available on our website:
www.safehealthcareforeverywoman.org
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Notes</th>
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<tbody>
<tr>
<td>EARLY POSTPARTUM HEMORRHAGE</td>
<td>Cumulative blood loss of $\geq 1000$ml or blood loss accompanied by sign/symptoms of hypovolemia within 24 hours following the birth process (includes intrapartum loss).</td>
<td>Signs/symptoms of hypovolemia may include tachycardia, hypotension, tachypnea, oliguria, pallor, dizziness, or altered mental status. Cumulative blood loss of 500-999ml alone should trigger increased supervision and potential interventions as clinically indicated. A fall in hematocrit of $&gt;10%$ can be supportive data but generally does not make the diagnosis of postpartum hemorrhage alone. Further research is needed on blood loss for late postpartum hemorrhage</td>
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http://www.acog.org/About-ACOG/ACOG-Departments/Patient-Safety-and-Quality-Improvement/reVITALize-Obstetric-Data-Definitions
Next Safety Action Series

Patient, Family, and Staff Support: Managing Medical Trauma

March 13, 2017
11:00 a.m. Eastern

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Xavier University

Patrice M. Weiss MD
Chief Medical Officer
Executive Vice President
Carilion Clinic
Professor of OB/Gyn
Virginia Tech Carilion School of Medicine

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