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CASE EXAMPLE

32 year old G 4 P 3003 at 39 weeks

SVD
Atony

EBL ~ 800 mL
EBL ~ 300 mL
Heavy Lochia

Restless
Pale
SpO2 86%

CPR
“All obstetric units and practitioners must have the facilities, personnel, and equipment in place to manage this emergency properly.”
POSTPARTUM HEMORRHAGE

I Introduction, Definition & Incidence
II Maternal Morbidity & Mortality
III Etiologies & Risk Factors
IV Placenta Accreta/Percreta
V Blood Loss & Estimating Blood Loss
VI Treatment - General
VII Treatment - Medical
VIII Treatment - Tamponade
IX Treatment - Surgical
X Treatment – Transfusion, Autotransfusion, RF7, TXA, etc
XI Treatment – SAE, MAST, etc
XII Programs, Protocols, Policies & Pearls
Postpartum Hemorrhage

I

Introduction, Definition & Incidence
ACOG PB #76 (2006)

“There is no single, satisfactory definition of postpartum hemorrhage. An estimated blood loss in excess of 500 mL following a vaginal birth or a loss of greater than 1,000 mL following cesarean birth often has been used for the diagnosis…”
POSTPARTUM HEMORRHAGE
Definition

WHO (2009)

“PPH is generally defined as blood loss greater than or equal to 500 mL within 24 hours after birth, while severe PPH is blood loss greater than 1000 mL within 24 hours.”
POSTPARTUM HEMORRHAGE
Definition


“Traditionally, postpartum hemorrhage has been defined as the loss of 500 mL of blood or more after completion of the third stage of labor. This is problematic because half of all women delivered vaginally shed that amount of blood or more when losses are measured quantitatively…”
POSTPARTUM HEMORRHAGE

Definition and Incidence

PPH DEFINITION
• 10% change in Hct
• or RBC transfusion

Postpartum Hemorrhage

II

Maternal Mortality & Morbidity
Territory size shows the proportion of deaths of women worldwide while pregnant or within 6 weeks of pregnancy and partly due to it, that occur there.

http://www.worldmapper.org/
<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complications of preeclampsia</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>Amniotic fluid embolism</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Obstetric hemorrhage</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Cardiac disease</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Pulmonary thromboembolism</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Non-obstetric infection</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Obstetric infection</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Accident/suicide</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Medication error or reaction</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Ectopic pregnancy</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>95</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Postpartum Hemorrhage

III

Etiologies & Risk Factors
POSTPARTUM HEMORRHAGE

Etiologies

• Postpartum hemorrhage is a sign, not a diagnosis
• Etiologies of postpartum hemorrhage*
  – Uterine atony (most common cause)
  – Lower genital tract lacerations
  – Retained placenta
  – Uterine rupture
  – Placenta accreta
  – Uterine inversion
  – Coagulopathy

Postpartum Hemorrhage

IV

Placenta Accreta/Percreta
POSTPARTUM HEMORRHAGE

Placenta Percreta
PLACENTA PERCRETA
Ultrasound Diagnosis

G4 P3003 with previous C/S x 3.

May 2000
BCM Placenta Accreta Program

Frequency of Placenta Accreta, Increta and Percreta referred to BCM tertiary centers from 2000 to 2013

- Percreta
- Increta
- Accreta

2000: 1 Accreta
2001: 1 Accreta
2002: 1 Accreta
2003: 1 Accreta, 1 Increta
2004: 2 Accretas, 1 Increta
2005: 1 Accreta, 2 Increta
2006: 1 Accreta, 4 Increta
2007: 1 Accreta, 2 Increta
2008: 2 Accretas
2009: 1 Accreta
2010: 5 Accretas
2011: 7 Increta, 3 Percreta
2012: 11 Increta, 7 Percreta
2013: 5 Increta, 5 Percreta
Postpartum Hemorrhage

Blood Loss & Estimating Blood Loss
ESTIMATED BLOOD LOSS
Mode of Delivery

# ACUTE HEMORRHAGE Categorization

<table>
<thead>
<tr>
<th></th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBL (%)</td>
<td>15</td>
<td>15-30</td>
<td>30-40</td>
<td>&gt; 40</td>
</tr>
<tr>
<td>Pulse</td>
<td>&lt; 100</td>
<td>&gt; 100</td>
<td>&gt; 120</td>
<td>&gt; 140</td>
</tr>
<tr>
<td>Pulse P</td>
<td>N</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
</tr>
<tr>
<td>BP</td>
<td>N or ↑</td>
<td>↓</td>
<td>↓</td>
<td>↓</td>
</tr>
</tbody>
</table>

From *Critical Care Obstetrics 4th Edition*
Adapted from *ATLS – 1993 instructor manual*
Postpartum Hemorrhage

VII

Treatment - Medical
POSTPARTUM HEMORRHAGE

Medical Therapy

- oxytocin
- methylergonovine maleate
- ergonovine maleate
- carboprost tromethamine
- dinoprostone
- misoprostol

Pitocin®
Methergine®
Ergotrate®
Hemabate®
Prostin E2®
Cytotec®
Postpartum Hemorrhage

VIII

Treatment - Tamponade
Postpartum Hemorrhage

Uterine Tamponade

• “When uterotonics fail to cause sustained uterine contractions and satisfactory control of hemorrhage after vaginal delivery, tamponade of the uterus can be effective in decreasing hemorrhage secondary to uterine atony.”
POSTPARTUM HEMORRHAGE
Balloon Tamponade

- Foley catheter(s)
- Sengstaken-Blakemore tube
- Rusch urologic balloon
- Bakri Postpartum Balloon (Cook Medical)
- Condom catheter
- Belfort-Dildy OTS [ebb] (Glenveigh Medical)
- BT-Cath (Utah Medical Products)
Belfort-Dildy OTS [ebb]
• Post-marketing surveillance study
  – 57 enrolled, 55 had PPH, 51 placed per IFU
• Study population:
  – C/S 45% & Twins 24%
  – EBL 2,000 (855 - 8,700) mL
• Delivery-to-Placement was 2.2 (0.3 – 210) hours
  – Bleeding decreased or stopped 98% of cases
  – Hysterectomy avoided in 92% of cases
• Uterine balloon volume >500 mL in 45% of cases

POSTPARTUM HEMORRHAGE
Pelvic Pressure Pack

Postpartum Hemorrhage

IX

Treatment - Surgical
“When uterotonic agents with or without tamponade measures fail to control bleeding in a patient who has given birth vaginally, exploratory laparotomy is indicated.”
POSTPARTUM HEMORRHAGE

Surgical Therapy

- Uterine curettage
- Uterine artery ligation
- Hypogastric artery ligation
- Stepwise uterine artery devascularization
- Compression sutures
- Hysterectomy
POSTPARTUM HEMORRHAGE

B-Lynch Suture

• **Test**: bleeding controlled by bimanual compression

• **Technique**: #2 chromic on a 75 mm heavy round bodied needle

### Table 2 – Uterine compression sutures.

<table>
<thead>
<tr>
<th>Technique</th>
<th>Number of subjects (n)</th>
<th>% Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-Lynch et al.</td>
<td>5</td>
<td>100% successful, (0)</td>
</tr>
<tr>
<td>B-Lynch et al.</td>
<td>1600</td>
<td>98.8% successful, (19)</td>
</tr>
<tr>
<td>Cho et al.</td>
<td>23</td>
<td>100% successful, (0)</td>
</tr>
<tr>
<td>Hayman et al.</td>
<td>3</td>
<td>100% successful, (0)</td>
</tr>
<tr>
<td>Ouahba et al.</td>
<td>21</td>
<td>95% successful, (1)</td>
</tr>
<tr>
<td>Marasinghe et al.</td>
<td>17</td>
<td>75% successful, (4)</td>
</tr>
<tr>
<td>Zheng et al.</td>
<td>9</td>
<td>100% successful, (0)</td>
</tr>
</tbody>
</table>

Postpartum Hemorrhage

X

Treatment – Transfusion, etc.
MASSIVE TRANSFUSION
Postpartum Hemorrhage

- Stanford Univ Med Ctr
- Blood products
  - 6 U PRBC
  - 4 U FFP or LP
  - 1 U aPLT
- Lab assessment
  - CBC & PLT
  - PT / PTT / Fibrinogen
- Recombinant Factor VIIa

Postpartum Hemorrhage
Massive Transfusion

- Handheld analyzers
- TEG / ROTEM
- Continuous SpHb monitoring
POSTPARTUM HEMORRHAGE

Autotransfusion

- Collect blood by suction
- Anticoagulated
- Filtered (25 um)
- Differential centrifugation
- Reinfused (40 um filter)
Recombinant Activated Factor VII
Northern European Registry

• METHODS:
  – Data from 9 European countries between 2000-2004
  – Describe the effect of rFVIIa administration using two mutually exclusive categories: 1) bleeding reduced or 2) bleeding unchanged or worse

• RESULTS:
  – A total of 113 forms were returned (88%)
  – 97 (86%) classified as “treatment” and 16 (14%) as “secondary prophylaxis”
  – Improvements noted after a single dose for 80% of women in the treatment group and for 75% in the secondary “prophylaxis” group. Failed in 15 cases (14%).
  – SAE were four cases of VTE, one MI, and one skin rash.

• CONCLUSION: Data suggest improvement for more than 80% of women after rFVIIa administration and few adverse effects.

Antifibrinolytic Therapy
Tranexamic Acid

The WOMAN Trial (World Maternal Antifibrinolytic Trial). A study with 15,000 women will have over 90% power to detect a 25% reduction from 4% to 3% in the primary endpoint of mortality or hysterectomy.

Postpartum Hemorrhage

XI

Treatment – SAE, MAST, etc
## POSTPARTUM HEMORRHAGE

### Selective Arterial Embolization

<table>
<thead>
<tr>
<th>SERIES</th>
<th>M &amp; M</th>
<th>SUCCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vedantham 1997</td>
<td>lit. review</td>
<td>65 / 67</td>
</tr>
<tr>
<td>Pelage 1998</td>
<td>case series</td>
<td>27 / 27</td>
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<tr>
<td>Oei 1998</td>
<td>case report</td>
<td>1 / 1</td>
</tr>
<tr>
<td>Hansch 1999</td>
<td>case series</td>
<td>4 / 5</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>97 / 100</strong></td>
</tr>
</tbody>
</table>
Postpartum Hemorrhage

XII

Programs, Protocols, Policies & Pearls
ACOG Educational Bulletin
Number 243, January 1998

Postpartum Hemorrhage

To define postpartum hemorrhage, one must first define normal blood loss at delivery. In a classic study by Pritchard and colleagues, average blood losses at vaginal delivery, cesarean delivery, and repeat cesarean delivery plus hysterectomy were approximately 500 ml., 1,000 ml., and 1,500 ml., respectively (1).

Excessive blood loss, or hemorrhage, may be difficult to define clinically, because the diagnosis usually is based on subjective observations. Postpartum hemorrhage has been defined as either a 10% change in hematocrit between admission and the postpartum period or a need for erythrocyte transfusion (2). Based on these definitions, vaginal delivery has been associated with a 3.9% incidence (2) and cesarean delivery has been associated with a 6.4% incidence of postpartum hemorrhage (3).

Postpartum hemorrhage occurs during the first 24 hours after delivery, whereas late postpartum hemorrhage occurs after 24 hours but before 6 weeks after delivery. Early postpartum hemorrhage is far more common than late postpartum hemorrhage, and it is associated with a greater degree of blood loss and morbidity.

Several additional factors regarding postpartum hemorrhage should be considered by the obstetrician. First, blood loss is often clinically underestimated by up to 30-50%, sometimes resulting in a delay in addressing an important problem. Second, the blood volume expansion that occurs during pregnancy compensates for normal blood loss at delivery. This expansion occurs to a lesser degree in preeclamptic women, who also experience greater blood loss at delivery than do normotensive women. Third, postpartum hemorrhage is likely to recur in subsequent pregnancies.

Role in Maternal Mortality

The maternal mortality rate was 7.1 per 100,000 live births in the United States during 1995 (4). Embolism and hypertensive disease are the two most common causes of direct maternal mortality in advanced gestations, with hemorrhage usually ranking third (5-7). In a study of maternal mortality in Massachusetts from 1984 to 1985, a decline was observed in hemorrhage-related maternal deaths. This decline was thought to be secondary to a reduction in the incidence of anemia, anemia, and more timely blood transfusions.

ACOG Practice Bulletin
Number 76, October 2006

Postpartum Hemorrhage

Severe bleeding is the single most significant cause of maternal death worldwide. More than half of all maternal deaths occur within 24 hours of delivery, most commonly from excessive bleeding. It is estimated that worldwide, 140,000 women die of postpartum hemorrhage each year—40 every 4 minutes (8). In addition to death, severe morbidity may follow postpartum hemorrhage. Sequelae include adult respiratory distress syndrome, coagulopathy, shock, loss of fertility, and maternal access to health care (9).

Although many risk factors have been associated with postpartum hemorrhage, it often occurs without warning. All obstetric units and practitioners must have the facilities, personnel, and equipment to manage this type of emergency (10). Clinical trials to enhance the management of maternal hemorrhage have been recommended by the Joint Consultation on Accreditation of Health Care Organizations (11). The purpose of this bulletin is to review the etiology, evaluation, and management of postpartum hemorrhage.

Background

The physiologic changes over the course of pregnancy, including a plasma volume increase of approximately 40% and a net cell mass increase of approximately 25%, cause an anticipation of the blood loss that will occur at delivery (8). There is no single, satisfactory definition of postpartum hemorrhage. An estimated blood loss of excess of 500 ml. following vaginal birth or a loss of greater than 1,000 ml. following cesarean birth often is used for the diagnosis, but the average volume of blood lost at delivery can approach these amounts (4, 5). Estimates of blood loss at delivery are nonintrusive, accurate, and safe, but underestimate the blood loss that will occur at delivery (9). Therefore, an estimated blood loss of 500 ml. following vaginal birth or a loss of greater than 1,000 ml. following cesarean birth is considered a normal finding. The diagnosis of postpartum hemorrhage should be considered in any patient with an estimated blood loss of greater than 500 ml. following vaginal birth or a loss of greater than 1,000 ml. following cesarean birth (4, 5).
• Uterotonic agents should be the first-line treatment for postpartum hemorrhage due to uterine atony.

• Management may vary greatly among patients, depending on etiology and available treatment options, and often a multidisciplinary approach is required.

• When uterotonics fail following vaginal delivery, exploratory laparotomy is the next step.

• In the presence of conditions known to be associated with placenta accreta, the obstetric care provider must have a high clinical suspicion and take appropriate precautions.
POSTPARTUM HEMORRHAGE
International Guidelines

- American Congress of Obstetricians & Gynecologists (ACOG)
- Royal College of Obstetricians & Gynaecologists (RCOG)
- Society of Obstetricians & Gynaecologists of Canada (SOGC)
- World Health Organization (WHO)
2. Identify specific triggers for responding to changes in the mother’s vital signs and clinical condition and develop and use protocols and drills for responding to changes, such as hemorrhage and pre-eclampsia. Use the drills to train staff in the protocols, to refine local protocols, and to identify and fix systems problems that would prevent optimal care.
CMQCC PPH Toolkit

- Compendium of Best Practices
- Care Guidelines: Checklist, Flowchart, Table Chart
- Hospital Level Implementation Guide
- Slide Set for Professional Education

http://www.cmqcc.org/ob_hemorrhage
POSTPARTUM HEMORRHAGE

Other Resources


ISBN: 978-0-9552282-7-8

http://www.sapienspublishing.com/postpartum_hemorrhage.php
PPH 10 Most Common Mistakes

1. Treating “Postpartum Hemorrhage” as a diagnosis (as opposed to a sign) and not identifying underlying cause(s)
2. Underestimating blood loss
3. Inattention to vital sign trends
4. Delay in laboratory assessment for developing anemia and coagulopathy
5. Delay in instituting blood component therapy
6. Delay in surgical intervention
7. Not making the mental shift from “normal delivery” to “life-threatening emergency”
8. Poor perioperative communication between the Obstetrician and Anesthesiologist regarding who will primarily manage blood loss estimation, laboratory assessment, and blood component therapy
9. Poor postpartum communication between Nurse and Obstetrician regarding estimated blood loss, patient vital signs and other clinical indicators
10. Lack of preoperative preparation for massive hemorrhage (e.g. placenta previa with prior cesareans and suspected placenta accreta)

Dildy et al. HCA online PPH course, Advanced Practice Strategies
Preventing Maternal Death
10 Clinical Diamonds

- Angiographic Embolization Is Not Meant to Be Used for Acute, Massive Postpartum Hemorrhage
- If More Than A Single Dose of Medication Is Necessary to Treat Uterine Atony, Go to the Patient’s Bedside Until the Atony Has Resolved
- Never Treat “Postpartum Hemorrhage” Without Simultaneously Pursuing an Actual Clinical Diagnosis

Preventing Maternal Death
10 Clinical Diamonds

• In the Postpartum Patient Who Is Bleeding or Who Recently Has Stopped Bleeding and Is Oliguric, Furosamide Is Not the Answer

• Any Woman With Placental Previa and One or More Cesarean Deliveries Should Be Evaluated and Delivered in a Tertiary Care Medical Center

• If Your Labor and Delivery Unit Does Not Have a Recently Updated Massive Transfusion Protocol Based on Established Trauma Protocols, Get One Today

CASE EXAMPLE

21 year old G 1 P 0000 at 40 weeks

- Forceps
- Atony +
- Vag Lacs

SBP, Pulse, HCT
POSTPARTUM HEMORRHAGE
Conclusions

- Significant maternal morbidity and mortality
- Usually secondary to uterine atony
- Blood loss is inaccurately (under)estimated
- Early lab assessment and blood component Rx
- There are new diagnostic & therapeutic options
- *Semper preparatus*...Guidelines & Education