The Use of Donabedian Quality Model to Implement Quantification of Blood Loss: Preventing Maternal Hemorrhage

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Objectives

- Relate the incidence and significance of maternal hemorrhage to maternal mortality throughout the US and world and the importance of recognition and response to treatment.
- Formulate management strategies through Donabedian’s Quality Model to implement quantification of blood loss during birth.
- I have no conflict of interest with Sigma Theta Tau International and received no funding for this project.
Maternal Mortality in the US

• The United States spends $98 billion annually on hospitalization for pregnancy and childbirth, but the US maternal mortality rate has doubled in the past 25 years. The U.S. ranks 50th in the world for maternal mortality, meaning 49 countries were better at keeping new mothers alive.

http://www.facethefactsusa.org/facts/more-us-mothers-dying-despite-expensive-care#sthash.h1sWAMmC.dpuf
US Maternal Mortality Rates

- Maternal mortality ratio has doubled from 12 to 28 maternal deaths per 100,000 births
- USA higher ratio than high-income countries
- 120,000 women die yearly
- 60,000 suffer complications
1990-2015: Maternal Mortality

(WHO, 2015)
Why

• Inconsistent obstetric practice
• Increase in chronic disease (hypertension, diabetes, obesity)
• Lack of consistent data
Preventing Maternal Death

The goal of all labor and delivery units is a safe birth for both newborn and mother. A previous Alert(1) reviewed the causes of death and injury among newborns with normal birth weight and suggested risk reduction strategies. This Alert addresses the equally tragic loss of mothers. Unfortunately, current trends and evidence suggest that maternal mortality rates may be increasing in the U.S., despite the rarity of the incidence of maternal death — deaths that occur within 42 days of birth or termination of pregnancy. Since 1996, a total of 84 cases of maternal death have been reported to The Joint Commission’s sentinel event database, with the largest numbers of events reported in 2004, 2005 and 2006. According to the National Center for Health Statistics of the Centers for Disease Control and Prevention, in 2006, the national maternal mortality rate was 13.3 deaths per 100,000 live births. (2) “Although the current maternal mortality rate may reflect increased identification of women who died during or shortly after pregnancy (3), there clearly has been no decrease in maternal mortality in recent years, and we are not moving toward the U.S. government’s Healthy People 2010 target of no more than 3.3 maternal deaths per 100,000 live births (4),” says William M. Callaghan, M.D., M.P.H., senior scientist, Division of Reproductive Health, Centers for Disease Control and Prevention.
The AWHONN Postpartum Hemorrhage Project

A Multi-Hospital Quality Improvement Program

Women are the cornerstone of a healthy and prosperous world—we must act now to eliminate preventable deaths and injuries.

Reducing the number of women who bleed to death during or after pregnancy and birth is the goal of the AWHONN Postpartum Hemorrhage (PPH) Project. The project is designed to improve clinicians’ recognition of, readiness for, and response to postpartum hemorrhage.

Percentage of maternal hemorrhage-related deaths that could have been prevented with improved clinical response
OB Hemorrhage Toolkit

The CMQCC OB Hemorrhage Expert Task Force, co-chaired by David Lagrew, MD and Audrey Lyndon, PhD, RN, has developed an Obstetric (OB) Hemorrhage Toolkit, "Improving Health Care Response to Obstetric Hemorrhage" as a resource for health care providers to improve readiness, recognition, response and reporting of hemorrhage. Obstetric hemorrhage is a leading cause of pregnancy-related morbidity and mortality but has major opportunities for improved outcomes.

The toolkit has four sections:
1. Compendium of Best Practices
2. Care Guidelines: Checklist, Flowchart, Table Chart
3. Hospital Level Implementation Guide
4. Slide Set for Professional Education

You can download the complete toolkit (.pdf, 26.2MB) or individual sections (including individual Best Practices). To download a file to your computer, click on the link below. You will be directed to that page which lists the title of the section or article(s); select "Download" next to the title of interest. You will see a pop-up window: "You have chosen to open..."; you can open the .pdf document using the default (typically Adobe Acrobat Reader) or save the file to your computer. The Obstetric Hemorrhage Toolkit is available as a single downloadable .pdf (26.2MB).

Complete Toolkit
Best Practice articles and Tools
Hospital Level Implementation Guide
Care Guidelines: Checklist, Flowchart, Table Chart
Slide Set for Clinician Education

All the CMQCC Toolkits are distributed for free. Some parts of the Hemorrhage toolkit look best when printed in color. If you would like to receive a discount code for printing these documents from FedEx Kinkos, please contact Valerie Cape at cape@cmqcc.org or call (505) 725-6108.

Toolkit Webinars were held and are available to review through the links listed below. The webinars outlined the components of the Toolkit and how to use them to more readily recognize and respond to obstetric hemorrhage.

Obstetric Hemorrhage Toolkit Webinar, held July 8, 2010 - hosted by Elliott Main, MD. Click here to replay the webinar.
Obstetric Hemorrhage Toolkit Webinar, held July 15, 2010 - hosted by David Lagrew, MD. Click here to replay the webinar.

OB Hemorrhage Collaborative
(click here to go to Collaborative page)
ACOG Recommendations

- Optimizing Protocols in Obstetrics
  MANAGEMENT of OBSTETRIC HEMORRHAGE
  SERIES 2
  ACOG
  THE AMERICAN CONGRESS OF OBSTETRICIANS AND GYNECOLOGISTS
  DISTRICT II
Topic & Significance

- Obstetric hemorrhage is a leading cause of maternal mortality worldwide (Stafford, Dildy, Clark, Belfort, 2008; WHO, 2010)
- 93% of obstetric hemorrhage is preventable (Bingham, 2012; Berg et al, 2005; & Della Torre et al, 2011)

Failure to recognize excessive blood loss
Inaccurate blood loss assessment
Underestimation of blood loss
(Dildy, Paine, George, & Velasco, 2004; TJC, 2010)

Do not receive early response to treatment
(Berg et al, 2005; Della Torre et al, 2011)
Local Issue

Hemorrhage is rising in the US
Lack of maternal morbidity and mortality review boards (Texas just received)
Rate at hospital – 1.1%

Diversity Considerations
Different care based on geological location
(Amnesty International, 2011)

African-American women ↑ death (Berg, 2005)
↑ in inductions; ↑ primary Cesarean Section (Berg, 2005)
Problem & Purpose

Primary & Secondary Problems

• Lack of current use of evidence leading to a break in quality (IOM, 2000)
  • Blood loss assessment
  • National guidelines (AWHONN, ACOG, CMQCC)

• Inaccurate definition of hemorrhage (Haeri & Dildy, 2012)
  • Blood loss assessment is subjective & unreliable
Facilitate a change in behavior from visual estimation to an objective method of quantification of blood loss
Theoretical Framework: Donabedian Quality Model

Structure
- Materials
- Organizational

Process
- Technical
- Interpersonal

Outcome
- Margin of Error
- Lab Work
- Practice Change
DONEBEDIAN: STRUCTURE
**Major Facilitators**

Blood Management program
Hospital/nursing administration
Good communication between RN & MD
Simulation education to nurse
(hemorrhage)

**Major Barriers**

RN difficulty estimating blood loss
Accurate data collection
Change project-resistance
Review of the Evidence

PICO

For obstetric delivery, is the gravimetric estimation of blood loss versus visual estimation more accurate therefore affecting an identification of maternal hemorrhage?
Review of the Evidence

• Nursing Estimation
  - Registered Nurse’s overestimate (Higgins, 1982)
  - CNM underestimated when blood loss > 500mL (Glover, 2003; Kayle et al, 2006)

• Visual Estimation During Vaginal Delivery
  - Blood loss underestimated by 30% (Kadari, Anazi & Tamim, 2011)
  - Underestimation increased with loss > 300mL (Prasesrtcharoenksuk, Swadpanich & Lumbiganon, 2000; Duthies, Ven, Yung, Chan & Ma, 1990; Razvi, 1996)
Review of Evidence

• Visual Estimation During Cesarean Birth
  • Overestimation of blood loss when blood loss was low (Larsson, Saltvedt, Wilkund, Pahlem & Andolf, 2006)
  • Underestimation of blood loss when there was increasing blood loss (Stafford, Dildy, Clark & Belfort, 2008)

• Laboratory Methods
  • Hematocrit not significant change for blood loss <500ml (Gharoro & Enabudoso, 2009)
  • Visual estimated blood loss is inaccurate by alkaline hematin method (Kayle et al, 2006; Larson et al 2006; Duthie, Ghosh, Ng, & Ho, 1992)
Review of the Evidence

• Quantifying Blood Loss
  • Quantifying blood loss is accurate (Bingham, 2012; Gabel & Weeber 2012; Kadari, Anazi & Tamim, 2011)
  • Gravimetric blood loss is economic, easy to perform and should be used when blood loss >250 mL (Dutton, Vause, & Samangaya 2011)
  • Gravimetric method is accurate & least time consuming compared to laboratory methods (Buckland & Horner 2007; Bose, Regan, & Patterson-Brown, 2006; Patel, Goudar, Geller, & Kodkany, 2006, & Lee, Ingvertsen, Kirpersteign, Jensen, & Kristensen, 2006)
DONABEDIAN: PROCESS
Approval & Ethical Considerations

IRB

Adult Health IRB approval obtained at UMKC;
Site Approval

TMCP: Human Subject Training; IRB Approval

Ethical Considerations

Minimal risk – expedited
H&H-Standard of care
Patient protection & confidentiality-HIPPA
Data coded
Technical

- Simulation:
  - Taught nurses & physicians quantification of blood loss
- Measured blood loss in deliveries
- Compared EBL vs. QBL among RN & MD
• Process to promote accurate quantification:
  • Data collection and calculation
    - RN, MD, ORT taught about the gravimetric method with return demonstration (simulation)
  • Calculation of amniotic fluid
    • Cesarean deliveries: Two suction containers - all amniotic fluid suctioned prior to suction change over and prior to delivery of placenta
    • Vaginal deliveries: Vaginal drape that collects amniotic fluid - new measurement after delivery, but prior to delivery of placenta.
Evaluation Plan

Outcomes to be Measured with Measurement Instruments

a. Margin of error between visual estimated blood loss and quantitative blood loss

b. Postpartum H&H compared to gravimetric blood loss

c. Number of PPH recognized
Measurement Instruments

- Digital scale - measure kg
- Calculator - calculate twice
- 1 gm of blood loss equal 1 ml of blood (Harvey & Dildy, 2012; Lyndon, LaGrew, Shields, Melsop, Bingham & Main, 2010)
Quality of Data

• National Guideline from AWHONN; ACOG; CMQCC
• N=80
• Avoidance of amniotic fluid mix
• Presence of trained education team
• Project results compared to baseline data on hemorrhage and difference between vEBL & gEBL
DONABEDIAN: OUTCOME
Results

Setting, Time, Participants

• 56 individuals participated
  • 4 individuals excluded
• Conducted at level III hospital in L&D
• Implemented over 6 months
Outcome Data

Visual Estimation

Overall underestimated
RN’s underestimated by 28%
inconsistent in estimation
(p=0.441)

MD’s underestimated by 21%
consistent in estimation
(p=0.0001)
Outcome Data (cont.)

Gravimetric estimation

$g_{EBL} \approx 600\text{ml } (\text{vag}); 1200\text{ mL } (\text{C/S})$

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Outcome Data

• Prediction of Hemorrhage
  • Significant difference exist between pre-operative H&H and post-operative H&H
  • No significant difference between post-operative H&H and gEBL
Limitations

Internal Validity Effects
Amniotic fluid mixture
Education of nurses
Measured twice at end of case (wet vs. dry)
Post-operative H&H

External Validity Effects
Physicians routine vEBL (800 vs 1000 ml)
Forget vaginal measurement drape
Interpretation

Expected and Actual Outcomes

• Physicians underestimated blood loss by 21% vs 30% in other studies
• Average blood loss for is underestimated
• Nurses underestimated but wide margins of error

Intervention’s effectiveness

• Easily performed in any facility
• Gravimetric weight is valid to laboratory methods
Expected and Actual Impact to System, Costs, and Policy

• 6 hemorrhages during study – no transfer to higher level of care due to recognized sooner
• Identification of hemorrhage increased to 2.3% in past 6 months
• No need for post-operative draw of H&H – no significant difference
• Policy change – quantifying all blood loss in all deliveries
Processes to Promote Change as a Result of the Intervention

*Unfreeze*: Education of proposed project & involve nurses and physicians

*Change*: Ease and satisfaction of use – project over 6 months

*Freeze*: Data is presented; policy changed; ongoing quality data of response to maternal hemorrhage
Potential Economic Sustainability for Intervention

- Recognize hemorrhage sooner
- Reduce amount of blood administered
- Decrease in transfer to higher level of care
- Save the life of a woman
Impact to Quality Healthcare

Every child deserves to have a mother and simple procedure of weighing blood loss to prevent a maternal death is priceless.


