

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.

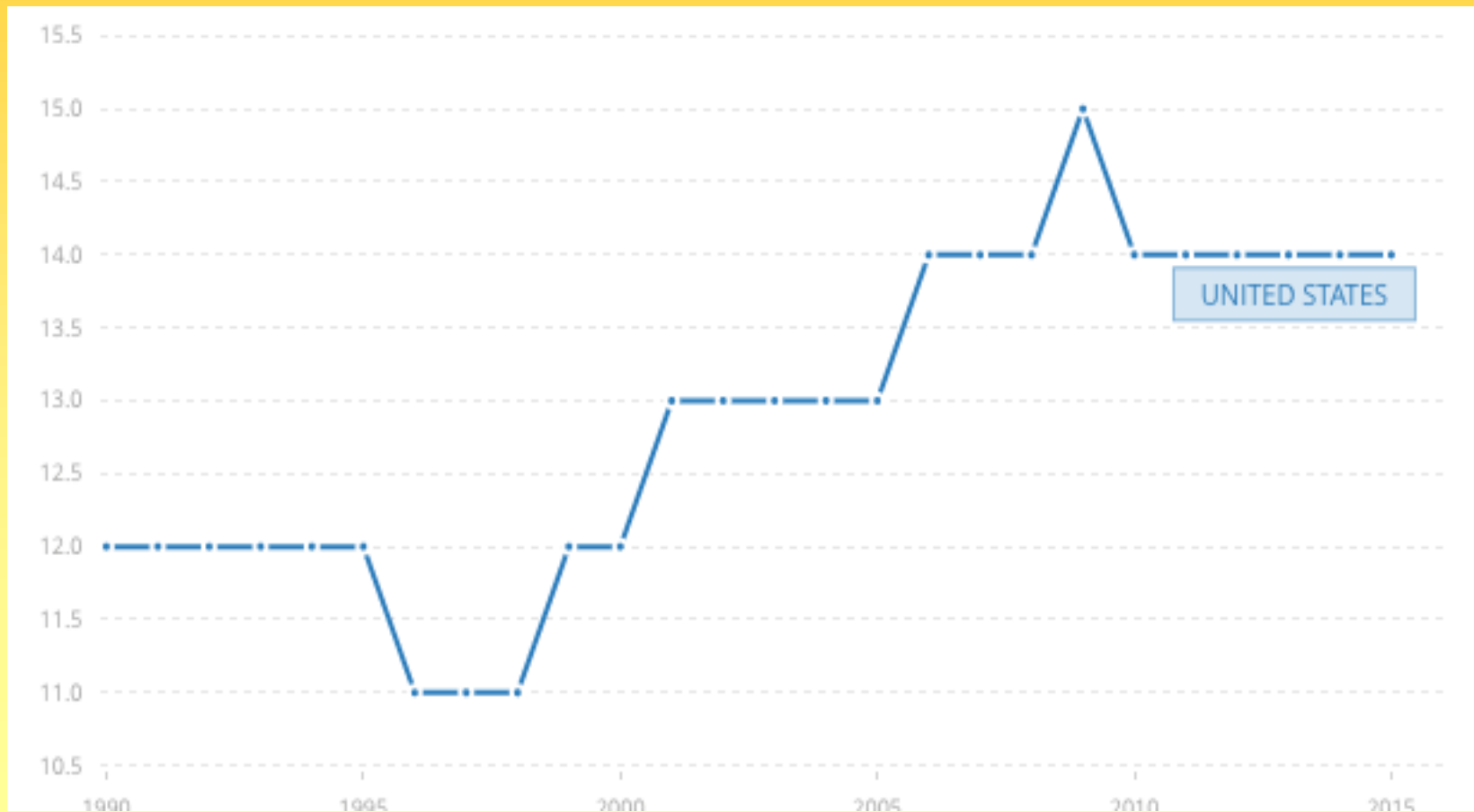
<http://www.facethefactsusa.org/facts/more-us-mothers-dying-despite-expensive-care#sthash.h1sWAMmC.dpuf>

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



Sentinel Event Alert

January 26, 2010

Issue 44, January 26, 2010

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.

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The AWHONN Postpartum Hemorrhage Project


http://www.pphproject.org/

Google Scholar Google Apple - One to One Apple Yahoo! Google Maps YouTube Wikipedia News (1,415) Popular

The AWHONN Postpartum Hemorrhage Project

A Multi-Hospital Quality Improvement Program

PROJECT OVERVIEW DC-GA-NJ APPLY NOW RESOURCES TAKE ACTION ABOUT AWHONN



54-93%

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

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.



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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 page that 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 (650) 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
[\(click here to go to Collaborative page\)](#)

Related Resources

- [OB Hemorrhage](#)
- [Definitions/ Incidence](#)
- [Protocols/ Guidelines](#)
- [Active Mgmt 3rd Stage](#)
- [EBL Measurement](#)
- [Medical Treatment](#)
- [Uterine Balloons](#)
- [Surgical Treatment](#)
- [Hemostatic Sutures](#)
- [Embolization](#)
- [Drills/Simulations](#)
- [OB Hemorrhage Care Guidelines: Checklist, Flowchart, Tablechart \(v1.4\)](#)
- [OB Hemorrhage Best Practice Articles \(v1.4; alphabetical order\)](#)

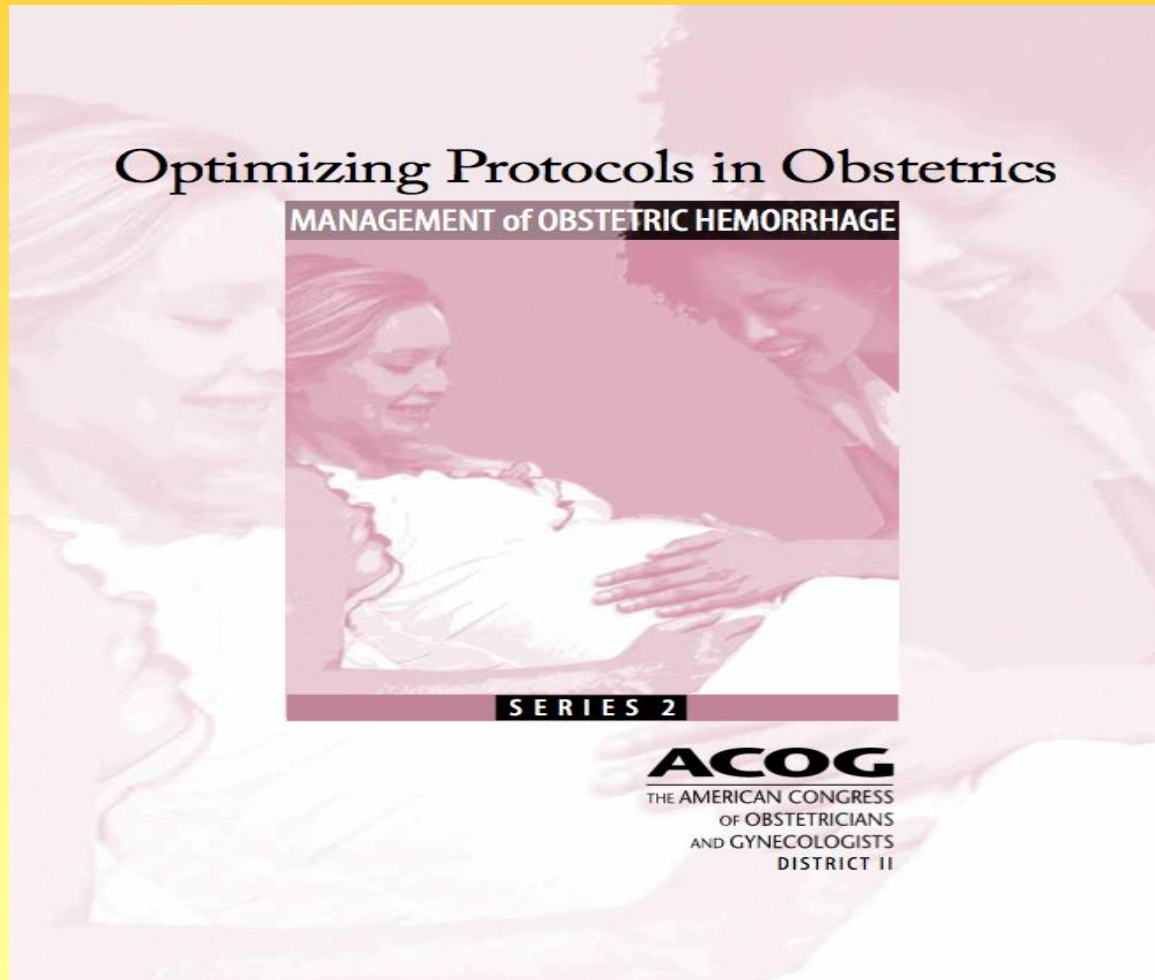
Profile in Improvement



Learn how Mary Campbell Bliss [improved the preterm labor assessment process at Sutter Medical Center Sacramento by utilizing Rapid fetal fibronectin \(R-fFN\)](#).

ACOG Recommendations

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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 geographical location

(Amnesty International, 2011)

African-American women ↑ death (Berg, 2005)

↑ in inductions; ↑ primary Cesarean Section (Berg, 2005)

Problem & Purpose

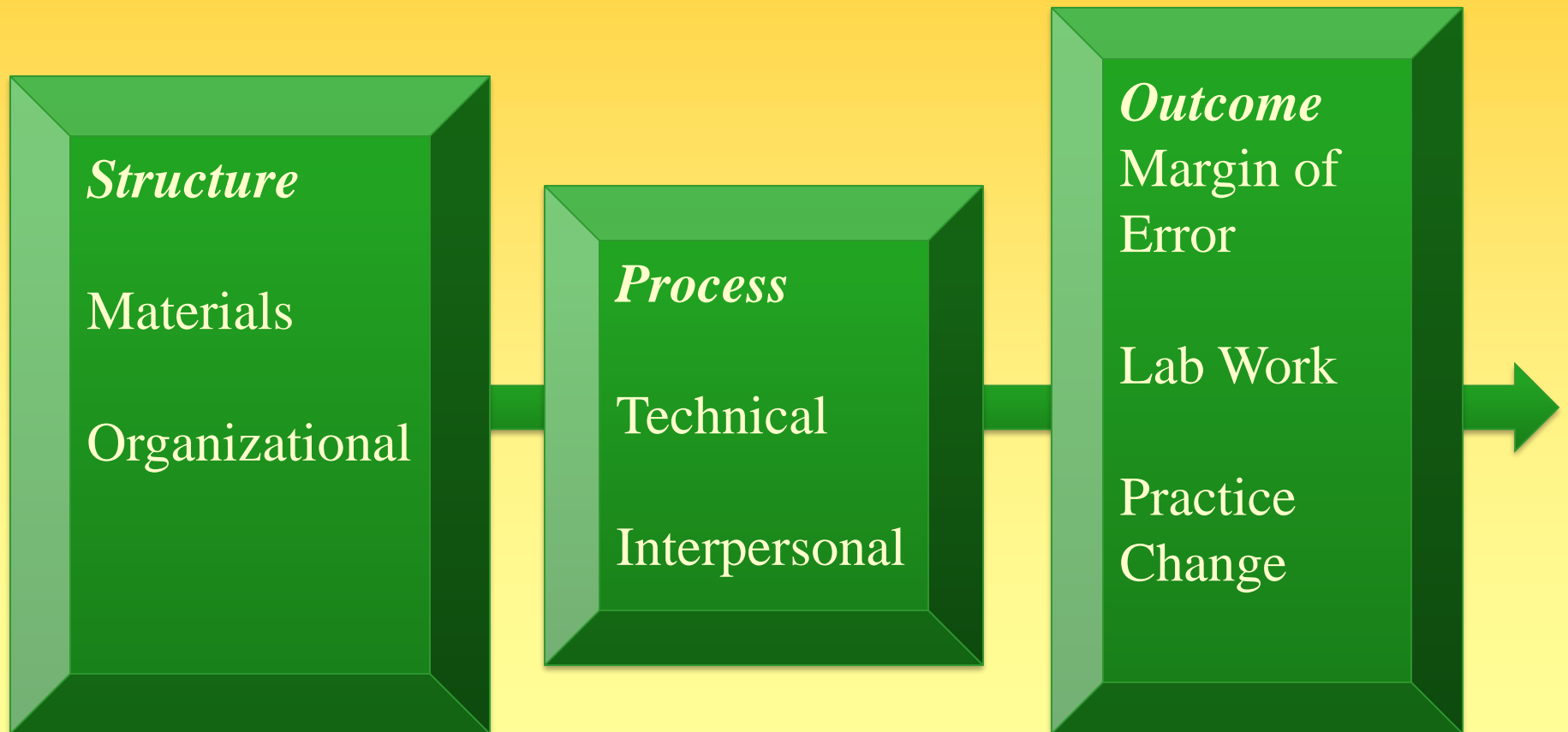
Primary & Secondary Problems

- 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

Purpose of EBP Intervention

Facilitate a change in behavior from
visual estimation to an objective method
of quantification of blood loss

Theoretical Framework: Donabedian Quality Model



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 $>500\text{mL}$
(Glover, 2003; Kayle et al, 2006)
- Visual Estimation During Vaginal Delivery
 - Blood loss underestimated by 30% (Kadari, Anazi & Tamim, 2011)
 - Underestimation increased with loss $>300\text{mL}$
(Prasertcharoenksuk, 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

gEBL –600ml (vag); 1200 mL (C/S)

Pair	95% confidence	t	df	Sig (2-tailed)
vEBLRN & gEBL	160.813	-3.988	51	0.0001
vEBLMD & gEBL	-118.280	-3.934	51	0.0001
vEBLRN & vEBLMD	11.42	-1.763	51	0.084

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

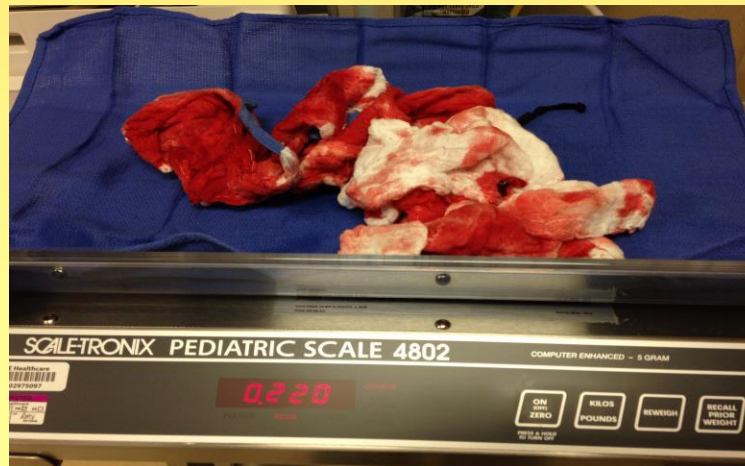
Freeze: Data is presented; policy changed;
ongoing quality data of response to
maternal hemorrhage

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



References

Amnesty International. (2011). Deadly delivery: the maternal health crisis in the USA: One Year Update, Spring 2011. Amnesty International. Retrieved November 2, 2011, from <http://www.amnesty.org/en/library/asset/AMR51/007/2010/en/926e361c-4941-45c5-9368-ab18859254fd/amr510072010en.pdf>.

Berg, C.J., Harper, M.A., Atkinson, S.M., Bell, E.A., Brown, H.L. & Hage, M.L....Callaghan, W.M. (2005). Preventability of pregnancy-related deaths: Results of a statewide review. *Obstetrics & Gynecology*, 116 (6), 1228-1234.doi:10.1097/01.AOG.0000187894.71913.e8.

Bingham, D. (2012). Eliminating preventable, hemorrhage-related maternal mortality and morbidity. *Journal of Obstetrics, Gynecology, & Neonatal Nursing*, 41(4), 529-530.doi:10.1111/j.1552-6909.2012.01371.x

Bose, P., Regan, F., & Paterson-Brown, S. (2006). Improving the accuracy of estimated blood loss at obstetric haemorrhage using clinical reconstructions, *BJOG: An International Journal of Obstetrics and Gynaecology*, 113, 919-924.doi: 10.1111/j/1471-0528.2006.01018.x.

Buckland, S.S. & Homer, C.S.E. (2007). Estimating blood loss after birth: Using simulated clinical examples, *Women and Birth*, 20, 85-88.doi:10.1016/j.wombi.2007.01.001.

Dildy, G.A., Paine, A.R., George, N.C., & Velasco, C. (2004). Estimating blood loss: Can teaching significantly improve visual estimation? *Obstetrics & Gynecology*, 104(3), 601-606.doi:10.1097/01.AOG.0000137873.07820.34.

Donabedian, A. (1966). Evaluating the quality of medical care. *Milbank Memorial Fund Quarterly*, 44(3), 166-206.

Duthie S.J., Ven, D., Yung, G.L.K., Chan, S.Y.W., & Ma, H.K. (1990). Discrepancy between laboratory determination and visual estimation of blood loss during normal delivery. *European Journal of Obstetrics, Gynecology, Reproductive Biology*, 38(2), 119-124

Dutton, P.J., Vause, S., Samangaya, R.A. (2011). Comparison between gravimetric measurement and visual estimation of postpartum blood loss. *Archives of Disease in Childhood-Fetal and Neonatal Edition*, 96, Fa86. doi:10.1136/archdischild.2011.300162.38.

Gabel, K.T. & Weeber, T.A. (2012). Measuring and communicating blood loss during obstetric hemorrhage. *Journal of Obstetrics, Gynecology, & Neonatal Nursing*, 41(4), 551-558.doi:10.1111/j.1552-6909.2012.01375.x.

Gharoro, E.P. & Enabudoso, E.J. (2009). Relationship between visually estimated blood loss at delivery and postpartum change in haematocrit, *Journal of Obstetrics and Gynaecology*, 29(6), 517-520. Doi: 10.1080.01443610903003159.

Glover, P. (2003). Blood loss at delivery: How accurate is your estimation? *Australian Journal of Midwifery*, 16(2), 21-24

. Higgins, P.G. (1982). Measuring nurses' accuracy of estimating blood loss. *Journal of Advanced Nursing*, 7, 157-162.

Kadari, H.M.F. & Anazi, B.K. (2011). Visual estimation versus gravimetric measurement of postpartum blood loss: a prospective cohort study. *Archives of Gynecology & Obstetrics*, 283, 1207-1213.doi:10.1007/s00404-010-1522-1.

Kayle, J.A. Khalfan, S.S. Stoltzfus, R.J. Witter, F., Tielsch, J.M., & Caulfield, L.E. (2006). Measurement of blood loss at childbirth and postpartum. *International Journal of Gynecology Obstetrics*, 95(1), 24-28.

Kuklina, E.V., Meikle, S.F., Jamieson, D.J., Whiteman, M.K., Barfield, W.D., Hills, S.D. & Posner, S.F. (2009). Severe obstetric morbidity in the United States: 1998-2005. *Obstetrics & Gynecology*, 113, 293-299.doi:10.1097/AOG/0b013e3181954e5b

Larsson, C., Saltvedt, S., Wilkund, I., Pahlen, S. & Andolf, E. (2006). Estimation of blood loss after cesarean section and vaginal delivery has low validity with a tendency to exaggeration. *Acta Obstetricia et Gynecologica Scandinavica*, 85(12), 1448-1452.doi10.1080/00016340600985032.

Lee, M.H., Inguertsen, B.T., Kirpensteijn, J., Jenson, A., & Kristensen, A.T. (2006). Quantification of surgical blood loss. *Veterinary Surgery*, 35(4), 388-393.

Patel, A., Goudar, S.S., Geller, S.E., Kodkany, B.S., Edlavitch, K.W., Patted, S.S....Derman, R.J.(2006). Drape estimation vs. visual assessment for estimating postpartum hemorrhage, *International Journal of Gynecology and Obstetrics*, 93, 204-224.doi:10.1016/j.ijgo.2006.02.014.

Stafford, I., Dildy, G.A., Clark, S.L., & Belfort, M.A. (2008). Visually estimated and calculated loss in vaginal and cesarean delivery. *American Journal of Obstetrics and Gynecology*, 199, 519.e1-519.e7.