

# Every Drop Counts: Every Life Matters

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MEDICINE**

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DIRECTOR OF OBSTETRICS, QUALITY, SAFETY  
AND PERINATAL HIV PROGRAM**

May 2019

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HEALTH SYSTEM

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# Ms. P

- 37 y.o. P1011, CS, myomectomy, IVF,
- Anterior Placenta Previa suspected accreta
- Jehovah Witness- No blood transfusion- accepts cell saver and other fractions
- Anemia
- Plan to admit at 32 weeks

- At 31 weeks, had an episode of bleeding- mild
- Admitted to optimize status and manage her anemia- IV Iron and Procrit- with hematology co-Rx →
- Multidisciplinary Meeting
- On 7/31 at 34 weeks → Surgery

- Central lines, cell saver, Midline abd incision, cystoscopy/ ureteric stents
- OB→ Classical CS, baby born 2185g, scores 9/9→ GYO hysterectomy
- EBL2000mL, cell saver 450mL
- Hbg 8.5
- Stable recovering on postpartum floor

# Ms. T

- 28 y.o. P0010
- Hx of severe recurrent PID
- Referred on Friday 6/8/18 for concern about placenta accreta, posterior placenta previa @ 33 wks
- US- did not confirm diagnosis but concern about adnexal mass

- Consults obtained, plans were for delivery at 32 weeks after Multidisciplinary care meeting
- Friday 6/8- evening- started vaginal bleeding → CS, smooth placental delivery. GYO → Right tuboovarian abscess → Rt salpingo-oophorectomy
- Smooth course

# Alison Young, USA TODAY

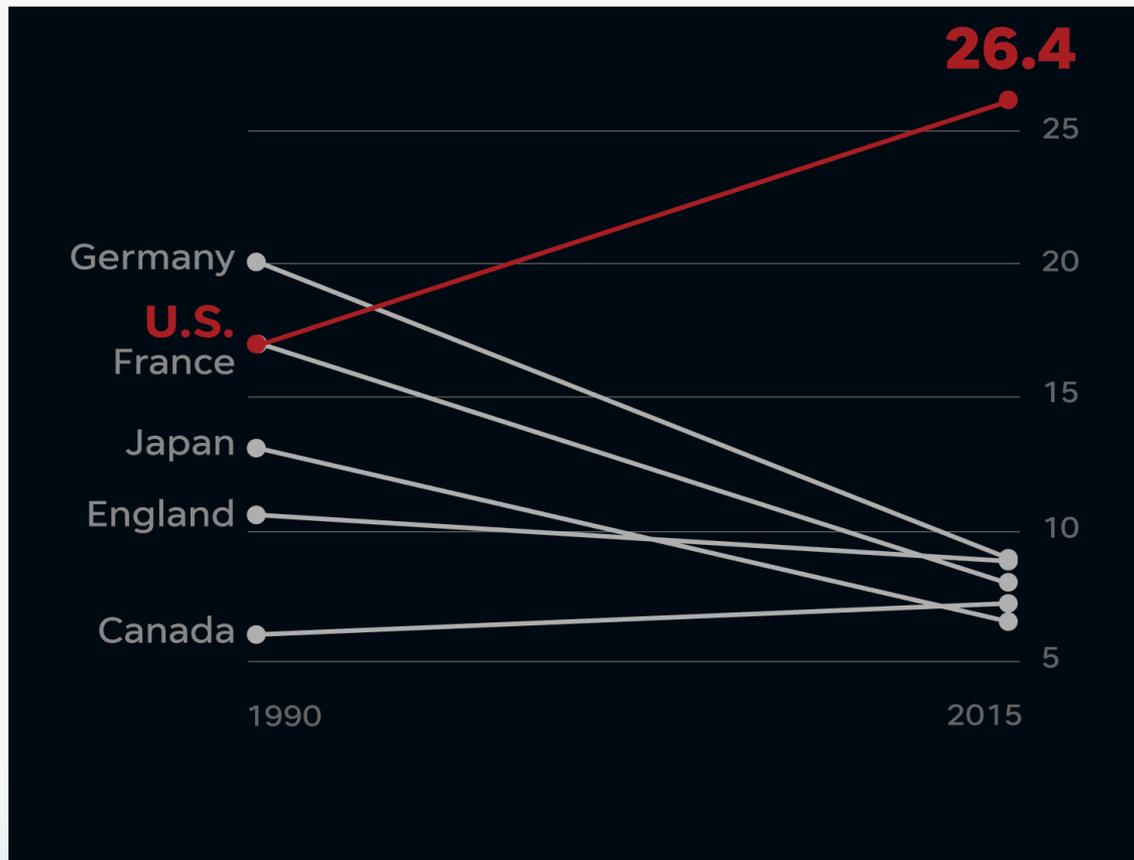
July 27, 2018

- Every year, thousands of women suffer life-altering injuries or die during childbirth because hospitals and medical workers skip safety practices known to head off disaster, a USA TODAY investigation has found

- As a result, women are left to **bleed** until their organs shut down. Their **high blood pressure** goes untreated until they suffer **strokes**. They die of preventable **blood clots** and **untreated infections**. Survivors can be left paralyzed or unable to have more children.

- But each year, more than 50,000 are severely injured. **About 700 mothers die.**
- The best estimates say that **half of these deaths could be prevented** and half the injuries reduced or eliminated with better care.

# One exception in the U.S.: California



# Dr. Steven Clark, Baylor

- “Our medicine is run by **cowboys** today, where everyone is riding the range doing whatever they’re wanting to do,” said. While there are hospitals that follow best safety practices, change is happening slowly, he said. **“It’s a failure at all levels, at national organization levels and at the local hospital leadership levels as well.”**

# Frustrations of the 50,000

- Who suffer severe injuries after surviving potentially deadly deliveries

# Women want answers

- ...who nearly bled to death after giving birth in 2015, said it would have been helpful to know upfront whether hospitals follow best **safety practices**.
- young and healthy...when complications arose ~ delivery, she was transferred to a bigger hospital.
- **“Even if you have a normal pregnancy, you want them to be prepared for anything,” she said.**

# Objectives

- 1. Review trends of maternal mortality in US and State of Florida
- 2. Discuss causes of change in maternal mortality
- 3. Present evidence based modalities of management postpartum hemorrhage
- Review the Placental Implantation Pathology Program and Florida Obstetric Hemorrhage initiative

# Financial Disclosure

- None to disclose

# Special Recognition

- California Maternal Quality Care Collaborative
  - [cmqcc.org](http://cmqcc.org)
- Florida Perinatal Quality Collaborative
  - [fpqc@health.usf.edu](mailto:fpqc@health.usf.edu)
- Patient Safety in Obstetrics- Educational Symposia, Nov 2013
- Communications and slides from Drs. Alfred Abuhamad and Mary D'Alton
- *AND TO ALL OF YOU FOR ADVOCATING FOR THE WELL BEING OF OUR MOTHERS and babies!!*

# Why?

## Postpartum:

PP  
EG: G5P4013 s/p post C/S Hyst. POD#  
s/p 3750cc EBL total (PPH + surg)  
s/p 8 units PRBCs, 8 FFP, 1 Cryo postop Hgb 9.1/27.1

Sicy  
FR: P4004 s/p C/S Hyst. POD#1  
EBL 4L  
s/p 10 units PRBC's,

NF G1P1 s/p 1<sup>st</sup> LTCS for arrest. POD#0  
PPH: 1700 s/p Pit, Meth, Hem, Cytotec, Compression sutures  
Hgb 132 → 9.7



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# Maternal Mortality California

- 1996 to 2006, maternal death rate in California nearly **tripled from 6 per 100,000 to 17** per 100,000. In African-American women, rate was far higher: 28.7 to 54.9 per 100,000 live births .
- Postpartum hemorrhage (**PPH**) is a **leading cause of maternal mortality** and is increasing in incidence.

Two recent studies confirm nationwide increases in PPH over approximately 10-year periods: 26% increase between 1994 and 2006 and 27.5% increase between 1995 and 2004.

- Concurrently, **blood transfusions increased 92%** during delivery hospitalizations nationwide (1997 to 2005). The California Pregnancy Related Maternal Mortality Review (CA-PAMR) found that:
- Obstetric (OB) hemorrhage was one of the leading causes for maternal death and a major contributor to maternal morbidity (publication pending).

Tragically, **deaths from hemorrhage** consistently rank at the **top of the most preventable list**: with **70-92%** of deaths judged preventable.

# Hemorrhage Remains a Major Cause of Obstetric Morbidity and Mortality

- In 1997, **2.4% of all live births in California** were complicated by postpartum hemorrhage.(2)
- Nationwide, **blood transfusions increased 92%** during delivery hospitalizations between 1997 and 2005.(3)

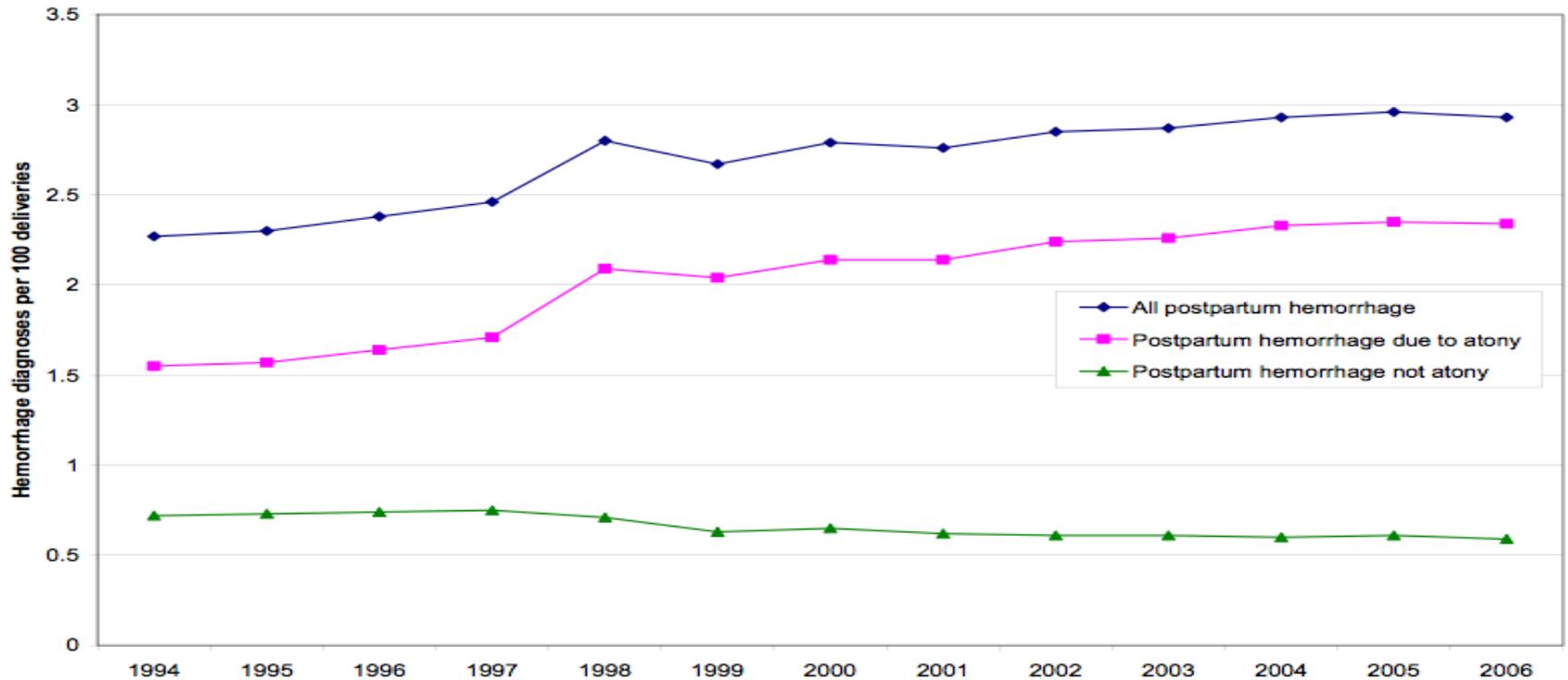
1. Department of Public Health, Maternal, Child, and Adolescent Health Division Public Released Data available at: [www.cmqcc.org](http://www.cmqcc.org)
2. Lu MC, Fridman M, Korst LM, et al. Variations in the incidence of postpartum hemorrhage across hospitals in California. *Maternal Child Health Journal*. September 2005;9(3):297-306.
3. Kuklina E, Meikle, S., Jamieson, D., Whiteman, M., Barfield, W., Hillis, S., Posner, S. Severe Obstetric Morbidity in the US, 1998-2005. *Obstetrics and Gynecology*. 2009;113:293-299.

# Doctor's Company Review

## Closed Claim Review of Maternal Deaths from PPH

- **DENIAL**: “Catch up” phenomenon: Initial manifestations of hemorrhage were VS  $\Delta$ 's (hypotension and/or tachycardia), NOT frank vaginal bleeding.
- **DELAY**: in delivery of products from the blood bank to the labor and delivery operating room.
- **DELAY**: of administration to patient once products arrived at L+D.
- **DELAY**: Mobilization of equipment.
- **DELAY**: Waiting for cross-matched blood instead of utilizing O negative or type specific blood.
- **“Underutilization”-- DELAY** in administering additional amounts *and* types of blood products (i.e. FFP, platelets, and cryoprecipitate)

# Annual Postpartum Hemorrhage Rates, United States, 1994-2006

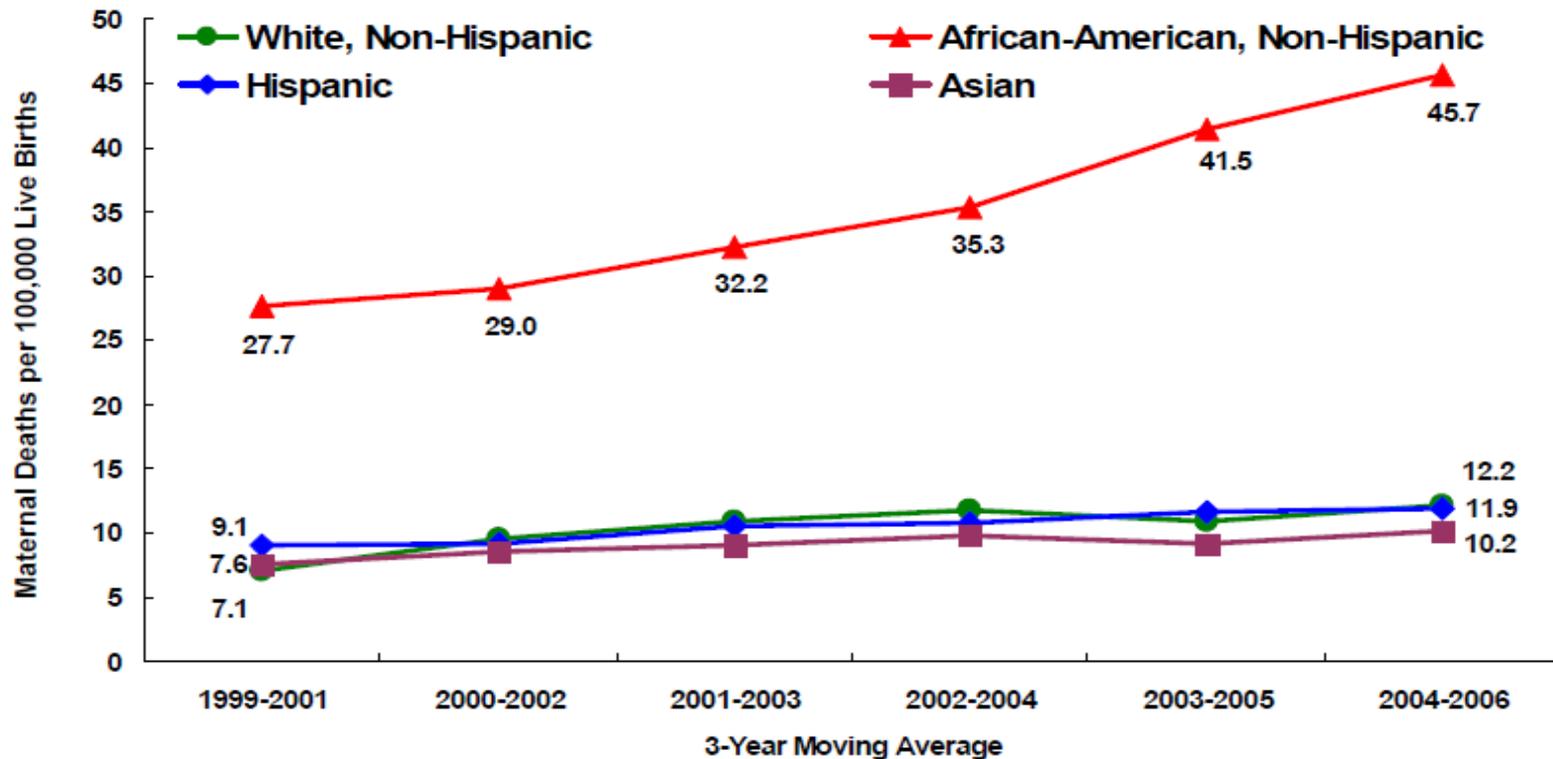


Callaghan. Trends in postpartum hemorrhage. *Am J Obstet Gynecol* 2010.

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# Maternal Mortality Rates by Race/Ethnicity, California Residents; 1999-2006

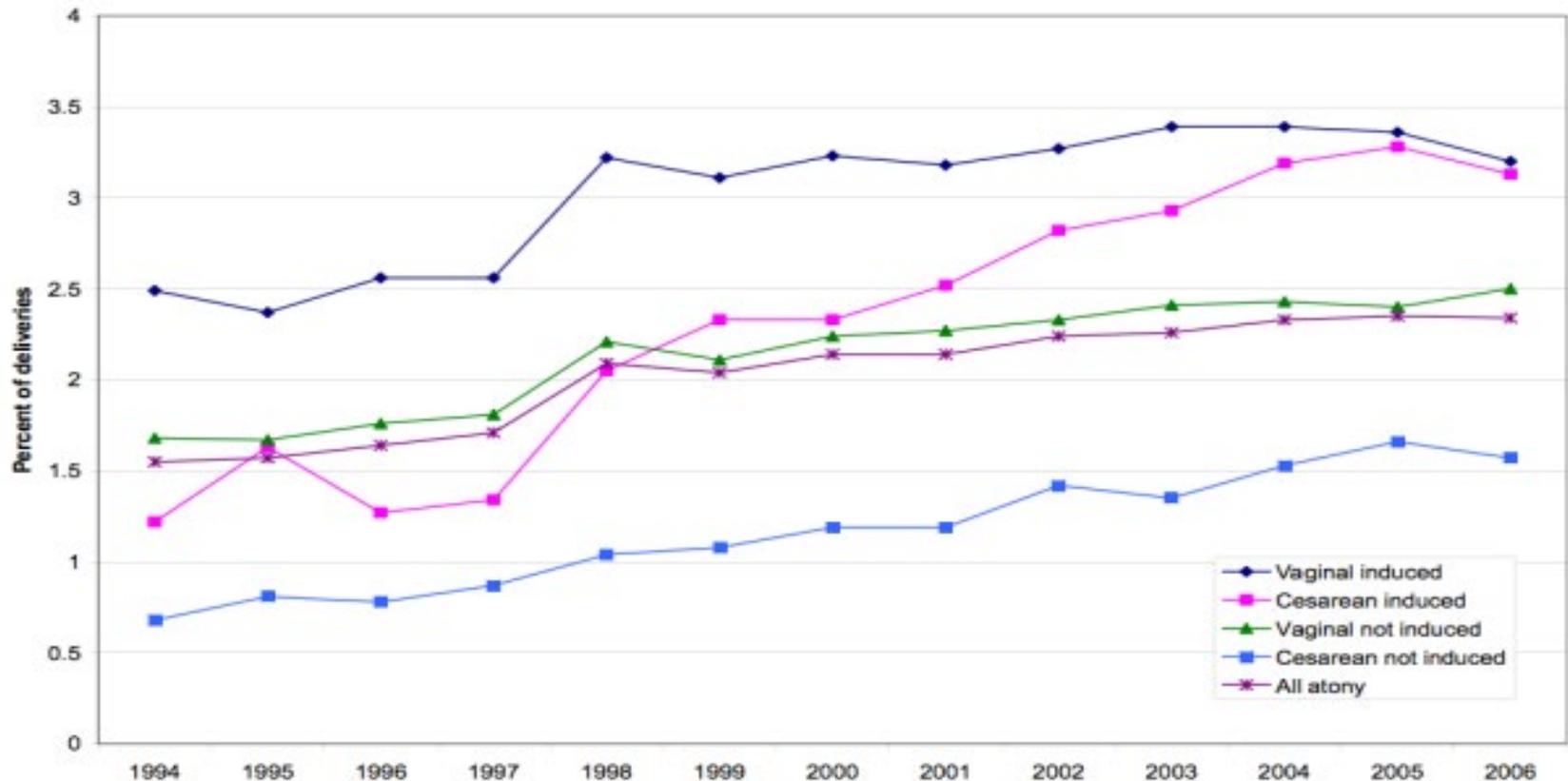


SOURCE: State of California, Department of Public Health, California Birth and Death Statistical Master Files, 1999-2006. Maternal mortality for California calculated beginning 1999 using ICD-10 cause of death codes A34, O00-O95, O98-O99. Maternal single race code used 1990-1999; multirace code used beginning 2000. Produced by California Department of Public Health, Maternal, Child and Adolescent Health Program, March, 2010.

# Leading Causes of Pregnancy-Related Deaths in California

- Hemorrhage
- Preeclampsia/Eclampsia/HELLP
- Amniotic fluid embolism (often with DIC)
- Infections
- Venous embolism complications
- Preliminary data from 2002-2003 California Pregnancy Associated Maternal Review Committee (CA-PAMR, N=98)

# Annual rates of postpartum hemorrhage caused by atony, by mode of delivery, and by induction status (US, 1994–2006)



Callaghan. Trends in postpartum hemorrhage. *Am J Obstet Gynecol* 2010.

# New York State

- Has one of the highest mortality rates in US
- 18.9/100, 000 1999- to 2006
- Rate of 65.2 deaths/ 100,000 in 2010 in African American mothers
- Top # CAUSES(2001-5) NYC:
  - EMBOLISM 17.4%
  - HEMORRHAGE 15.5%
  - HTN 14.2%

# Factors Increasing Mortality and Morbidity

- Maternal age
- Obesity
- Cesarean delivery
- More pregnancies with significant medical conditions
  - HTN
  - Pregestational diabetes
  - Congenital heart disease
  - Organ transplant
    - Mary D'Alton- 2013

# Overview: 1999-2010 Florida Pregnancy-Related Mortality

- **PAMR screening committee selected 756 pregnancy-associated deaths for investigation during 1999-2010**
- **Identified 470 (62%) deaths as pregnancy-related**

# Risk Factors for Maternal Death NYC

- **“Advanced” Maternal Age**
  - Women older than **40** were **2.5** times to suffer **maternal death**
- **Obesity**
  - **49%** of women who died from pregnancy related cause were **obese**
- **Co-morbidities**
  - **56%** of women who died had a **chronic** health condition
- **Racial disparities**

# Florida Pregnancy Associated Mortality Review FL PAMR

Hemorrhage is one of the top two causes of maternal mortality from 1999 to 2010 (15% of deaths) in Florida

## Causes:

- Uterine atony/postpartum bleeding
- Placenta accreta, percreta or increta
- Retained placenta
- Ruptured ectopic pregnancy

# Hemorrhage-Related Deaths Florida 1999-2010

## Hemorrhage by Cause

- HTN 72
- Hemorrhage 71
- Infection 61
- Non-cardiovascular condition 55
- Cardiomyopathy 51
- PE 46
- CV conditions 41
- AF embolism 33
- CV 16
- Unknown 17
- Ectopic 32%
- Atony 11%
- Accreta 11%
- Retained placenta 10%
- Other 35%

# Hemorrhage-Related Deaths Florida 1999-2010

## Hemorrhage pre-delivery through 42 days post-delivery

- **Before delivery 42%**
- < 1 day after delivery 28%
- 1-7 days after delivery 24%
- 8-42 days after delivery 6%

# Peri/Post partum Hemorrhage Pregnancy-Related Deaths by Hospital Characteristic, Florida, 2006-2011

## Hospital Level:

- Level 3: 61%
- Level 2: 21%
- Level 1: 8%

## Maternal Death Rates by Hospital size:

- Large (>2460): 20/100,000
- Mid-large (1375-2460): 18/100,000
- Small- (75-400): 15/100,000

# US Maternal Mortality Trend

- Rose from 10 to 14.5/100,000 (1990 to 2006)
- Not decreasing despite advancements in medicine
- **Severe morbidity** (1998-2009):
  - Increased by 75% and 114% 98/9 vs 08/9
  - Increase in shock, ARF, RDS, acute MI, blood transfusion, aneurysm, cardiac surgery
  - Overall mortality in postpartum period increased by 66%
  - Impacts > 500,000 women per year
    - Berg et al , Seminar Perinatol 2006; Callaghan et al, Obstet Gynecol 2012

## PLACENTA ACCRETA AND PERCRETA: INCIDENCE, RISKS, DIAGNOSIS, COUNSELING AND PREPARATION FOR DELIVERY (R. Lee, MD USC)

- Rapidly rising numbers of cesarean births. in California shows that 31% of all births are by cesarean section. (1)
- The University of Chicago showed that between 1982-02 (before the greatest rise in cesarean births) the overall incidence of placenta accreta was 1/533 del (2)

# Placenta Previa and Placenta Accreta by Number of Cesarean Deliveries

- **First** 398 13 (3.3%) 2 (0.03%)
- **Second** 211 23 (11%) 26 (0.2%)
- **Third** 72 29 (40%) 7 (0.1%)
- **Fourth** 33 20 (61%) 11 (0.8%)
- **Fifth** 6 4 (67%) 2 (0.8%)
- **≥6** 3 2 (67%) 4 (4.7%)

*†Increased risk with increasing number of cesarean deliveries;  $P < .001$*

# ? Novel Pathologic Entity

- First described in the 20<sup>th</sup> century
- First reports in 1930s
- Suggests that the entity did not exist or was quite rare before the 1930s
  - Surgery Gynecol Obstet 1937
- Morbidly adherent placenta: Accreta 75%, Increta 18%, Percreta 7%
- Am J Obstet Gynecol 1997

# Risk factors

- Maternal Age
- Multiparity
- Prior uterine surgery
- Prior uterine curettage
- Prior uterine irradiation
- Endometrial ablation
- Asherman syndrome
- Uterine leiomyomata
- Uterine anomalies
- Hypertensive disorders of pregnancy
- Smoking
  - AM J Obstet Gynecol 2010

# Incidence & Pathogenesis

- Overall is around 3/1000
- Increase over past several decades
- Was estimated at 1/10,000 in the 1960s
- Main reason for increase is change in CS rates

## **PATHOGENESIS THEORIES:**

- 1. Primary defect of trophoblastic function → Invasion
- 2. Failure of normal decidualization (scar) → Invasion
- 3. Localized hypoxia/ scar → 2 & 1 → Invasion

J Obstet Gyencol Br Emp 1959; Placenta 1987 & 2008; Cell 1992; Am J Obstet Gynecol 2011

# Recommendations

## SCREEN

Screen all women with prior cesarean birth for placenta previa with ultrasound. (C), for accreta,(B) ?MRI

## COUNSEL

Counsel patients with placenta accreta about delivery risks/ complications and future infertility if hysterectomy is performed. (C)

## PREPARE

- 1. **Multi-disciplinary** approach for delivery, including emergent surgery prior to scheduled delivery.
  - a. Planning should include primary OB surgeon, Blood Bank, perinatologist, anesthesiologist, gynecologic oncologist/experienced pelvic surgeon, radiology interventionist, vascular surgery, labor & delivery nursing, operating room personnel, nursery and pediatric teams. (C)
- 2. Consider **early delivery (32-36 weeks)** before labor and after pretreatment with betamethasone for fetal lung maturity. (C)
- 3. Perform the delivery surgery in **main OR** with a surgical scrub team. (C)
- 4. **Actively involve** surgeon(s) with advanced skills for controlling heavy pelvic bleeding and repairing bladder or ureteral injury. (C)
- 5. **Strongly consider** hysterectomy (without removal of placenta) if no further children desired. (C)
- 6. Notify **blood bank for** potential of massive hemorrhage and ensure immediate availability of 4-6 units of PRBC, FFP, and platelets. (C)
- 7. The Committee was **divided on** the desirability for pre-placement of internal iliac artery balloon catheters with a recent large case control study (UC Irvine/Long Beach Memorial) showing no benefit. (B)

# Additional Screening & Planning

1. von Willebrand Disorder: Mild forms can be treated with desmopressin acetate (DDAVP) but more severe forms require vWF and VIII factor replacement. (7) DDAVP challenge testing can identify whether patients will respond to this medication.
2. Hemophilia A/B: Concentrates of clotting factor VIII (for hemophilia A) or clotting factor IX (for hemophilia B) are slowly dripped in or injected into a vein. Consider DDAVP adjunctive therapy.
3. Hemophilia C: FFP is the first product used to treat patients with hemophilia C. The main advantage of FFP is its availability. Disadvantages of its use include the large volumes required, the potential for transmission of infective agents and the possibility of allergic reactions.
4. Factor XI activity: Factor XI concentrates provide the best source for factor XI replacement.
5. Refer patients for **genetic counseling** regarding possible testing and evaluation of the fetus and newborn.
6. Develop **intrapartum and postpartum management plans** well in advance of the anticipated date of birth so specific medications and blood components are available at the time of delivery and given in consultation with a **hematologist**:

# Placental Implantation Abnormality

- Identify
- US diagnosis
- Role of MRI
- Previa, anterior/ previous Surgery
- Accreta (adjacent), Increta (intramyometrial), Pericreta (through myometrium)
- Adjacent organs

- Previa management w/o moribundly adherent placenta
- Bleeding precautions, pelvic rest, hospitalization etc.
- Other high risk factors
- Discuss..... Discuss.....discuss..... All not so pleasant news patient, family,

- Admit usually 32 weeks
- Multidisciplinary meeting: Nursing, OB/MFM, OR, GYO, Trauma, vascular, Urology, blood bank, radiology, interventional, anesthesiology, neonatology, social work, risk Rx- other specialists if needed
- Plan A and Plan B

- Timing
- First case , main OR
- All specialists are available, but basic OB/ GYO/ Anesthesia/ transfusion, cell saver
- Calling tree- plan B – 24/7

# Outcomes

- 2-4 cases a month
- >150 cases in 5 years
- Referral center
- Never refuse any patient
- Records- reassess to confirm (5 cases this year, Dx not confirmed)

# Briefings

- Course
- Lessons learned

# RECOMMENDATIONS; HULL, A., LAGREW, D, 2009

- 1. **Active management of third stage of labor** for all vaginal births including routine administration of oxytocin with shoulder delivery, cord traction and uterine massage.
- 2. Inclusion of active management of third stage of **labor techniques** in standard policies and procedures by institutions and education of all providers on proper administration of techniques, including appropriate protocols for timing and method of oxytocin administration.
- 3. **Case-reviews** of excessive maternal hemorrhage should incorporate assessments of timing, documentation and performance of active management of the third stage compared to institutional protocols.
- **EVIDENCE GRADING**
- **Level of Evidence: IA.**

# California Pregnancy-related Mortality Review

## QI Opportunities and Learning Points from the above composite case: How to reduce Mortality and Morbidity from OB Hemorrhage?

- Need a medical indication for induction
- No documentation of actual blood loss, e.g., *what does “more bleeding” mean?*
- Only a few treatments tried, e.g., Methergine and D&C, even when they were ineffective
- Underestimation of blood loss
- Delay in administration of blood
- Lack of working equipment
- Delay in response from other team members
- Delays in adequate resuscitation
- Lack of an organized approach

# Quality Improvement Opportunities for OB Hemorrhage

- Reduce Risks of hemorrhage
- Perform admission risk assessments
- Reduce Denial, Delay...
- Quantify blood loss
- Follow a step-by-step plan
- Increase use of non-pharmacologic treatments
- Improve treatments with blood products
- “Too little, too late”—Resuscitation v. Treatment
- “Old wine in new bottles”—“Whole blood” v. PRBCs
- Enhance Teamwork and Communications!

# Four Major Recommendations for California Birth Facilities:

- Improve **readiness** to hemorrhage by implementing standardized protocols (general and massive).
- Improve **recognition** of OB hemorrhage by performing on-going objective quantification of actual blood loss during and after all births.
- Improve **response** to hemorrhage by performing regular on-site multi-professional hemorrhage drills.
- Improve **reporting** of OB hemorrhage by standardizing definitions and consistency in coding and reporting.

# Methods to Estimate Blood Loss

## Quantifying blood loss by weighing

- Establish dry weights of common items
- Standardize use of pads
- Build weighing of pads into routine practice
- Develop worksheet for calculations

## Quantifying blood loss by measuring

- Use graduated collection containers (C/S and vaginal deliveries)
- Account for other fluids (amniotic fluid, urine, irrigation)

# Establish Dry Weights

## Dry Weights

Item	Weight in Grams
Standard Bundle (2 lg chux, 1 ice pack peripad, 2 small peripads)	398
Small Chux (16 in X 24 in)	22
Large Chux ( 24 in X 34 in)	98
Large Peripad (peach backing)	26
Small Peripad (from OB Pack)	15
Ice Pack Peripad	172
Cloth Towel (blue)	88 - 115
Vag Packing (from OB Pack)	18
Ray-tec Sponge	4

## Procedure

- Weigh all bloody items in grams
- Subtract dry weights in grams
- Remaining weight in grams = ml blood loss

1 gram = 1 ml

Posters  
Pocket Cards



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# Active Management of 3<sup>rd</sup> Stage of Labor

**Single best strategy to prevent postpartum hemorrhage**

Involves:

1. Use of uterotonics within 1 min of delivery,
2. Delivery of placenta with controlled cord traction,
3. Massage of the uterus after delivery of placenta

ICM. FIGO joint statement, 2003; WHO 2006

# What is Active Management of the 3rd Stage?

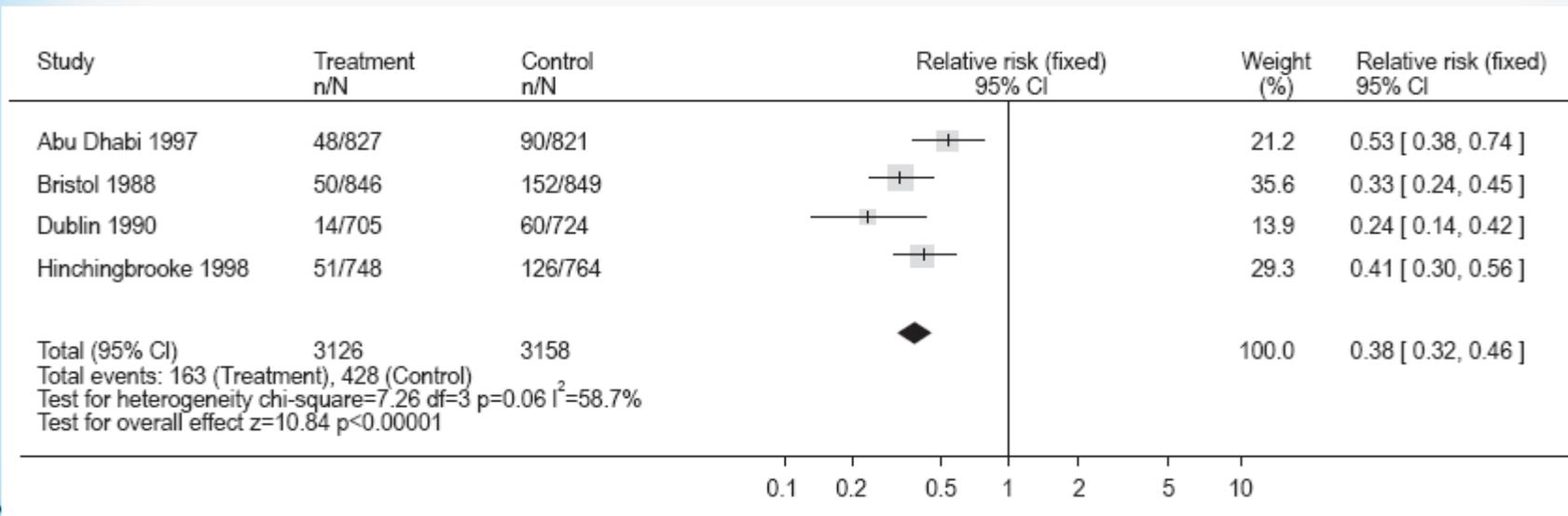
- Oxytocin (10u) IV or IM with delivery of
- infant or placenta
- Controlled cord traction
- Cord clamping not delayed beyond 2 min
- Vigorous fundal massage (at least 15 sec) after placenta

# Meta Analysis of Active vs. Expectant 3rd Stage Management at vaginal birth:

## Outcome of postpartum EBL $\geq 500$ ml

- **62% fewer PPH** in Active Management group versus Expectant Management- less severe hemorrhage, anemia and transfusion

Prendiville et al. *Active versus expectant management in the third stage of labour.*  
Cochrane Syst Rev 2000; 3: CD 000007



# What's New?

- Quantification of blood loss for all births
- Active management of the 3rd stage for all
- Vital sign triggers
- “Move along” on uterotonic medications
- Bakri intrauterine balloon / B-Lynch suture
- A new approach to blood products
- A role for rFactor VIIa?
- The value of a formal protocol

# Florida Perinatal Quality Collaborative

AT THE LAWTON AND RHEA CHILES CENTER FOR HEALTHY MOTHERS AND BABIES



Partnering to Improve Health Care Quality  
for Mothers and Babies

# ACOG

THE AMERICAN CONGRESS OF  
OBSTETRICIANS AND GYNECOLOGISTS



# AWHONN

PROMOTING THE HEALTH OF  
WOMEN AND NEWBORNS



FLORIDA  
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mission to Care. **Vision to Lead.**

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# Mission Statement of the OHI

- Decrease short- and long-term morbidity and mortality related to obstetric hemorrhage in women who give birth in Florida
- Guide and support maternity care providers and hospitals in implementing successful, evidence-based quality improvement programs for obstetric hemorrhage
  - The OHI Toolkit is a resource and not a standard of care. FPQC provides research updates
  - **Hospitals should individualize their protocols based on an assessment of their own resources**

# Florida OHI Hospitals

- **13%** of hospitals do not perform drills
- **32%** of hospitals do not have access to all procedure options (e.g. B-lynch suture, etc)
- **33%** of hospitals do not have a written general hemorrhage policy
- **35%** do not have a massive transfusion protocol
- **42%** do not utilize techniques to quantify blood loss for both vaginal and cesarean births
- **60%** DO NOT perform debriefs after events

# Adoption of California's Four Major Recommendations

- Improve **readiness** to hemorrhage by implementing standardized protocols (general and massive).
- Improve **recognition** of OB hemorrhage by performing on-going objective quantification of actual blood loss during and after all births.
- Improve **response** to hemorrhage by performing regular on-site multi-professional hemorrhage drills.
- Improve **reporting** of OB hemorrhage by standardizing definitions and consistency in coding and reporting.

# IMPROVE READINESS

- Implement standardized protocols
- Hemorrhage Cart
- Procedural Instructions (balloons, stitches)
- Partnership with the blood bank
- Regular unit-based drills (with debriefs)
- Ensure rapid availability of medications
- Special case resources (previa, Jehovah's Witness)
- Unit Education to protocols

# IMPROVE RECOGNITION

- On-going assessment of hemorrhage risk
- Prenatally
- On Admission
- Prior to delivery
- Postpartum
- Early Warning Tools for vital signs and symptoms
- Quantitative CUMMULATIVE blood loss assessment

# IMPROVE RESPONSE

- ✓ Perform regular hemorrhage drills
- ✓ Unit-standard OB Hemorrhage Protocol with checklists
- ✓ Massive transfusion protocols



# Issues with Hemorrhage Response

- Denial
- Delay
- Lack of practice with rare occurrences
- Imperfect estimation/quantification of blood loss
- Poor utilization of blood products
- Insufficient communication

# Prevention & Learning

- Active Management of the 3rd Stage
- Establish a culture of Post-event Debrief/Huddle
- Review of all serious cases for systems issues
- Mini RCA format



# Key Elements of the OHI

1. Develop an Obstetric Hemorrhage Protocol
2. Develop a Massive Transfusion Protocol
3. Antepartum Risk Assessment
4. Active Management of the Third Stage of Labor
5. Quantification of Blood Loss
6. Construct an OB Hemorrhage Cart
7. Ensure Availability of Medications and Equipment
8. Perform Interdisciplinary Hemorrhage Drills
9. Debrief after OB Hemorrhage Events

# 1. Develop an Obstetric Hemorrhage Policy



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# Why a Protocol for Obstetric Hemorrhage?

- Now a complex series of steps that involve many staff members and departments
- Communication – Multidisciplinary Team
- PPH seems to always happens at night or weekends...(when people may be tired or there are less resources)
- We can improve...

# Core Elements of any Protocol

Develop an effective written document for responding to maternal hemorrhage

1. Rapid response to hemorrhage emergency
  2. Coordination among
    - a) physicians
    - b) nurses
    - c) anesthesiologists
    - d) blood bank
- Complete set of prewritten orders to instantly execute
  - Escalation through stages

## 2. Massive Transfusion Protocol



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# Massive Transfusion

- >10 U pRBCs
- Improved outcomes with 1:1 to 1:2 pRBC to FFP
- 42% lower mortality
- Reduction in organ failure
- Increased in ARDS (1.93X)

J Trauma Inj Inf, 2007,

J Trauma 2008

J Trauma 2009

# Lessons from Combat in Iraq



- Lowest losses ever from hemorrhage
- Key: increased FFP:RBC ratio

# Transfusion Guidelines

**“Whole blood” is good for OB hemorrhage**

- After 2u PRBCs, start FFP
- Massive transfusion protocol: 1:1 ratio FFP/RBC
- 6 RBC + 4 FFP + 1Plt pack (Stanford+)
- 4 RBC + 4 FFP, plts and cryo on request (CPMC)--think ahead!
- Keep up!

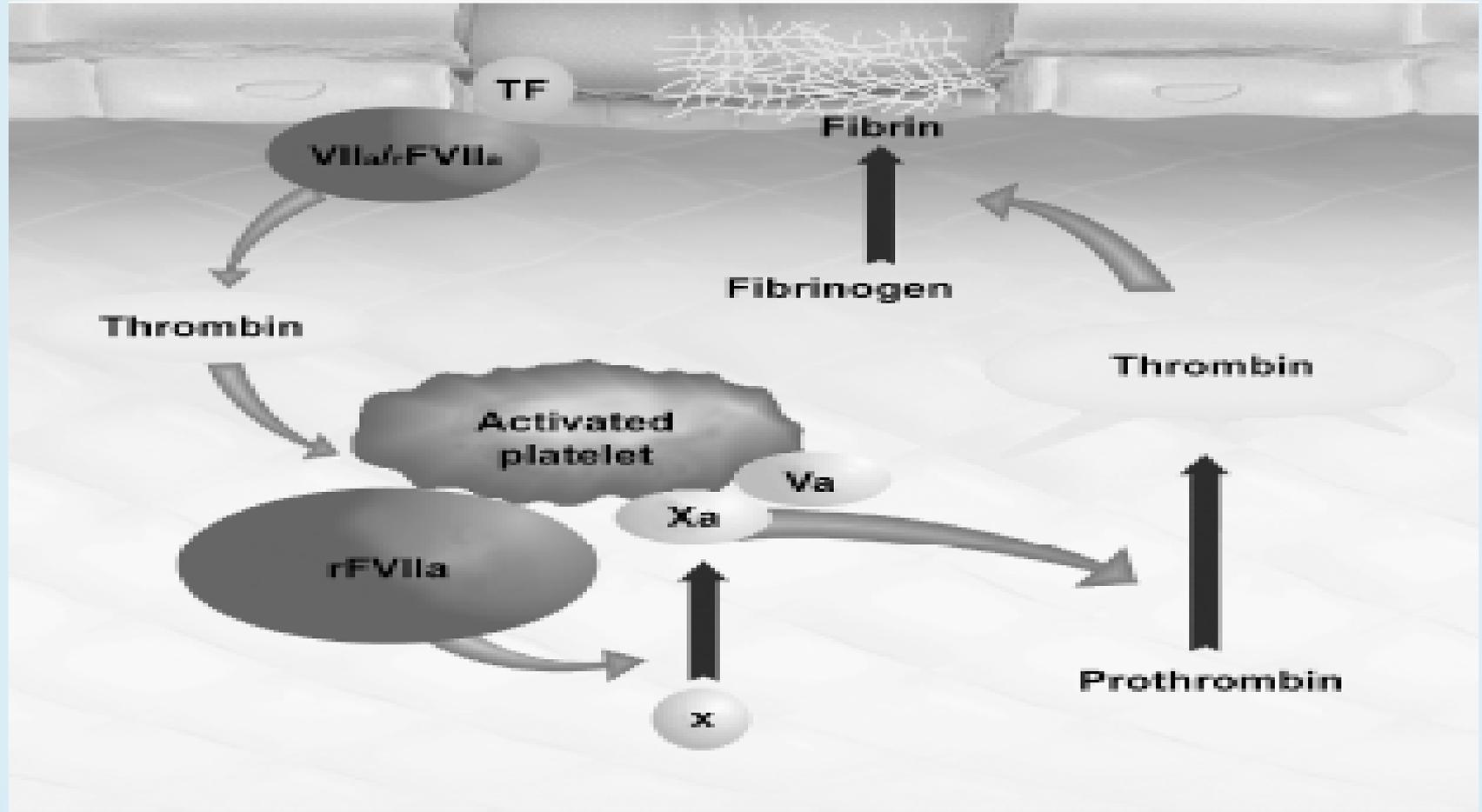
**Two Stages: Resuscitation and Treatment**

- Resuscitation, transfuse per clinical signs
- DIC treatment, transfuse per lab parameters

**Supportive measures are critical**

- Warm patient (Bair Hugger®, fluid warmer)
- Correct metabolic acidosis

# Recombinant Activated



# rFactor VIIa

- Augments intrinsic clotting pathway
- Converts prothrombin to thrombin
- No RCT, total of 272 cases-  
Effectiveness reported in 85% for  
stopping or reducing bleeding

# R Factor VIIa, Side Effects

## Thrombotic events

1. CVA
2. MI
3. PE
4. Clotting of indwelling devices

- JAMA, 2006

# Recommendations: Massive Transfusion Protocol

## Every OB unit needs one!

- Coordinated with Blood Bank, Anesthesia, and ER/ICU
- Ability to deliver large volumes of RBCs and coagulation products
- Principle: Whole blood out = whole blood in
- Guidelines for coagulation product usage

# 3. Antepartum Risk Assessment

- Risk factor identification
- A prewritten order set for admission to L&D includes “risk scoring” for obstetric hemorrhage
- Definition checklist
- Risk assessment can also occur intrapartum

# Ongoing Hemorrhage Risk Assessment Antepartum - **LOW**

- No previous uterine incision
- Singleton pregnancy
- $\leq 4$  previous vaginal births
- No known bleeding disorder
- No history of PPH

# Antepartum- **Medium**

- Prior cesarean birth(s)
- •Prior uterine surgery
- •Multiple gestation
- •>4 previous vaginal births
- •Hypertension-associated Conditions
- •History of previous PPH
- •Large uterine fibroids
- •Estimated fetal weight greater than 4 kg
- •Morbid obesity (BMI > 35 kgm<sup>2</sup>)
- •Polyhydramnios

# Antepartum- High

- Placenta previa
- Low-lying placenta
- Suspected placenta accreta
- Hematocrit <30
- Platelets <100,000
- Active bleeding at admission
- Known coagulopathy
- Abruptio Placenta

# Intrapartum

- Induction or augmentation of labor
- Protracted labor or arrest disorder
- Chorioamnionitis

## 4. Active Management of the Third Stage of Labor

Oxytocin (10u) IV or IM with delivery of infant or placenta

- Vigorous fundal massage (at least 15 sec) after placenta delivery
- Controlled cord traction is an optional component to be applied by a skilled care provider



## 5. Quantification of Blood Loss

- EBL method used most often is visual estimation
  - Visual estimation is unreliable and inaccurate
  - Underestimated as much as 50% of time
- Institute most accurate methods:

### Quantification of Blood

# QBL

- Accurate QBL prompts the Nurse on critical actions such as mobilizing the team
- Critical decisions are made based on QBL
- QBL leads to earlier interventions & Improved outcomes

# Recommended Methods for Ongoing Quantitative Measurement of Blood Loss

1. Formally estimate blood loss by recording percent (%) saturation of blood soaked items with the use of visual cues such as pictures/posters to determine blood volume equivalence of saturated/blood soaked pads, chux, etc.
2. Formally measure blood loss by weighing blood soaked pads/chux. (1 gram = 1 ml)
3. Formally measure blood loss by collecting blood in graduated measurement containers.

# Methods to Estimate Blood Loss

- **Quantifying blood loss by weighing**
- Establish dry weights of common items
- Standardize use of pads
- Build weighing of pads into routine practice
- Develop worksheet for calculations

Dry Weights Item	Weight in Grams
Standard Bundle (2 lg chux, 1 lg pad, 2 small pads)	388
Small Chux (18 in X 24 in)	82
Large Chux (24 in X 34 in)	88
Large Padded (mesh backing)	75
Small Padded (from OR Pack)	15
Two Fold Padded	172
Cloth Towel (dry)	66 - 118
Wig Picking (from OR Pack)	18
Hy-Loc Sponge	4

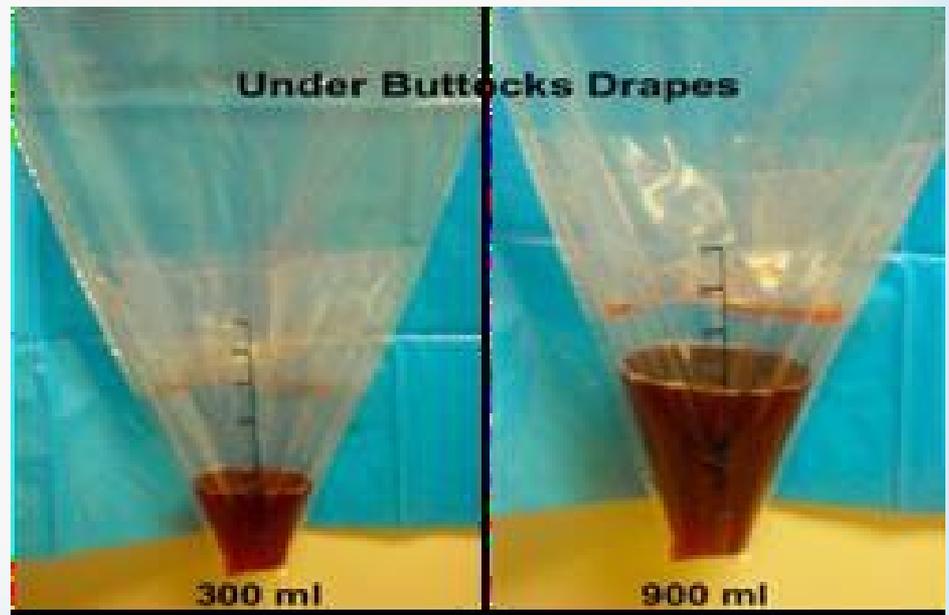
**Procedure**

- Weigh all bloody items in grams
- Subtract dry weights in grams
- Remaining weight in grams = ml blood loss

1 gram = 1 ml



- **Quantifying blood loss by measuring**  
Use graduated collection containers  
(C/S and vaginal deliveries)  Account  
for other fluids (amniotic fluid, urine,  
irrigation)



With kind permission of Bev VanderWal, CNS

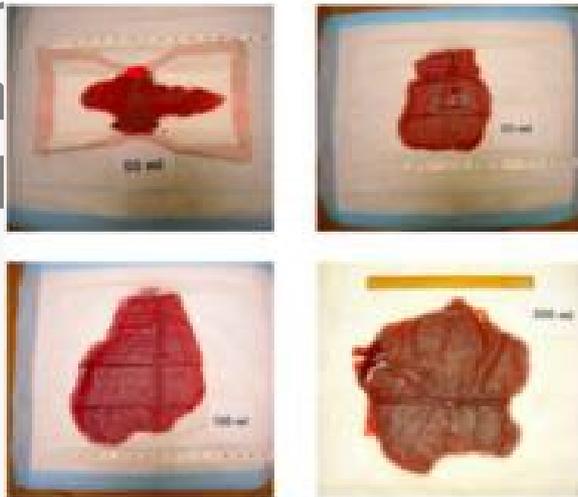
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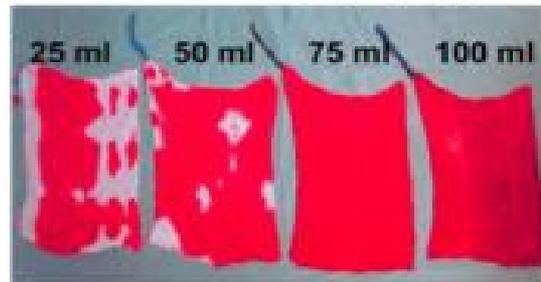
# Methods to Estimate Blood Loss

- Develop Training Tools: Visual aids  
**Training Tools**

Posters



18 X 18 inch Dry Lap Sponges



- 25 ml saturates about 50% area
- 50 ml saturates about 75% area
- 75 ml saturates entire surface
- 100 ml will saturate and drip

s can be

# Recommendations

- **Teach** clot size using posters showing known blood quantities on common materials or compared to common volumes (e.g a Coke can=350ml)
- **Weigh** wet materials (with known dry weight); this can be done by gathering a group of pads and weighing them all together
- **Measure** what can be suctioned at CS (less irrigation+AF)  
Use calibrated under-buttock drapes (at vaginal birth, note the volume of amniotic fluid, urine and stool after birth but before the placenta)
- **What we don't know:** How to estimate the blood loss that we don't see... (i.e. intra-abdominal)

## 6. Construct an Immediate Access Obstetric Hemorrhage Cart



# Hemorrhage Carts, Kits and Trays

## **Standardize Checklist of medications and procedures**

- Diagrams depicting various procedures
- B-Lynch
- Uterine artery ligation
- Balloon placement
- Set of vaginal retractors
- Sponge Forceps
- B-Lynch sutures
- Vaginal Packs
- Uterine Balloons
- Banjo curettes
- Uterine forceps
- Long needle holder

## 7. Assure Availability of Medications and Equipment



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# OB Hemorrhage Medication Kit Automated Dispensing/Refrigerator

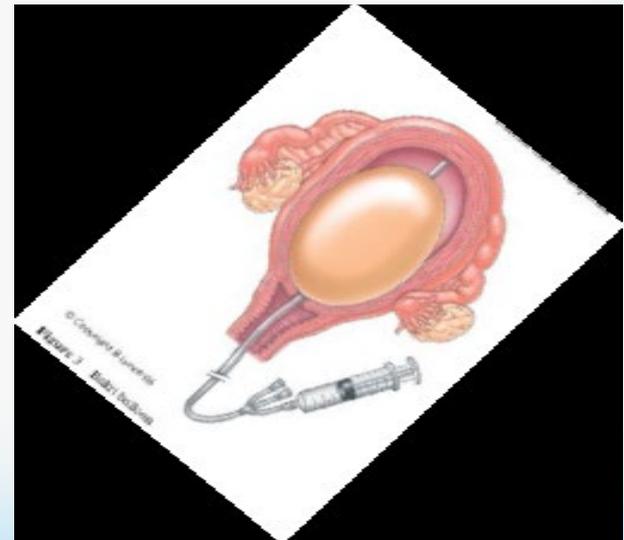
- Pitocin 20 units per liter NS 1 bag
- Hemabate 250 mcg/ml 1 ampule
- Methergine 0.2 mg/ml 2 ampule
- Cytotec\* 200mg tablets 5 tabs

\*There is no strong evidence that misoprostol is useful as primary or adjunctive therapy of postpartum hemorrhage in addition to standard injectable uterotonics.

# Cook “Bakri” Intrauterine Balloon

There are now several balloons, but the most available in the US is the Cook “Bakri” Balloon

- Specifically designed for this purpose
- Double lumen (for drainage from above)
- Silicone (non-latex)
- Uterine contour shape
- Good filling capacity (saline)
- Inexpensive
- Easy to use



# Successful Applications of the Intrauterine Balloon

- Low-lying placental implantation site, esp with placenta previa
- Poorly contracting lower uterine segment
- Uterine atony
- Placenta accreta / percreta
- Cervical implantation
- DIC at term or after 2nd trimester loss
- In combination with Compression Suture at hysterotomy (“Sandwich technique”)
- Vaginal sidewall lacerations

# Intrauterine Balloon

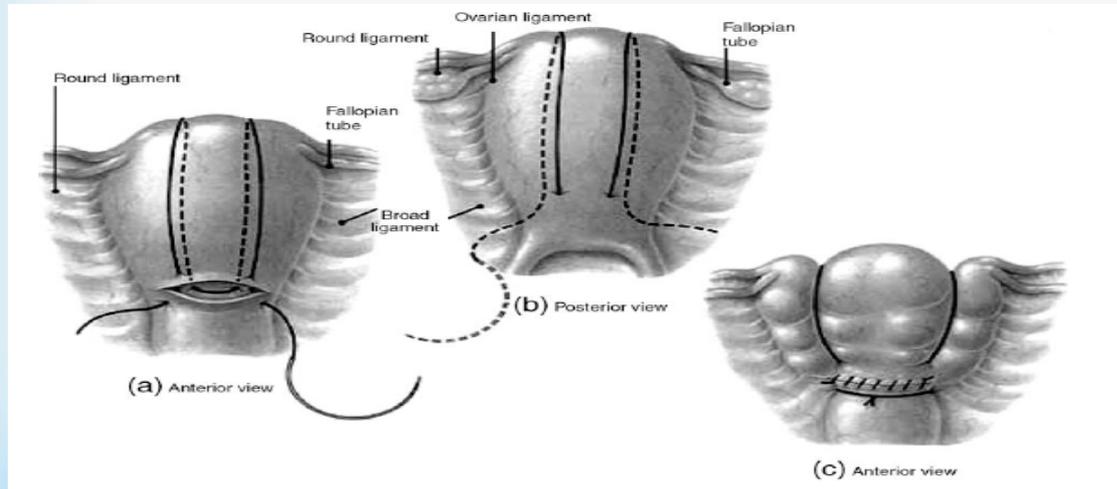
- Low-tech, fast, inexpensive, easy to utilize on any L&D Unit
- Least morbidity of any “next step”
- Can be used as “Tamponade Test” to temporize, determine needs and mobilize other resources

## **There is some user learning—**

- How much to fill? (150-500ml is a big range).  
usually 250-300ml is sufficient unless the uterus is very “floppy”
- There can be “hour-glassing” of the balloon thru the cervix into the vagina.

# B-Lynch Suture

- Every Obstetrician should know how to do this (diagrams are in each OR)
- Quick (<2 minutes) and easy!
- Ideal at time of Cesarean birth for atony
- Can be combined with an intrauterine balloon for “Sandwich technique”



# B-Lynch Compression Suture “Belt and Suspenders



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# What to Do When Medical Treatment Fails: A Systematic Review

Doumouchsis SK, et al *Obstet Gynecol Surv* 2007; 62: 540-7.

Success rates of surgical and radiological measures in the management of PPH

Method	No. Cases	Success Rates (%)	95% CI (%)
B-Lynch/compression sutures	108	91.7	84.9–95.5
Arterial embolization	193	90.7	85.7–94.0
Arterial ligation/pelvic devascularization	501	84.6	81.2–87.5
Uterine balloon tamponade	162	84.0	77.5–88.8

There was no statistically significant difference between the 4 groups ( $P = 0.06$ ).

# 8. Perform Hemorrhage Drills



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# 9. Debrief after OB Hemorrhage Event



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# Debriefs

- After major OB hemorrhage event or simulation drill, provides opportunity to:
- Decompress
- Discover areas for improvement
- Benefit from immediate feedback
- Enhances retention of information
- Increases learner engagement
- Leads to higher staff confidence
- Is a learning opportunity, not punitive

# Debriefing

- Led by facilitator (primary RN and primary MD)
- Includes:
  - Recap of the situation
  - Key events that occurred
  - What worked
  - What did not work e.g. communication, lack of necessary equipment
  - Discussion of what can be done differently
  - Completion of a debrief form

# Stages of Obstetric Hemorrhage Care

## Summary: **STAGE 0**

- Every woman in labor/giving birth
- Focuses on **risk assessment**
- Focuses on active management of the third stage

## Prenatal Assessment & Planning

- Identify and prepare for patients with special considerations: Placenta Previa/Accreta, Bleeding Disorder, or those who Decline Blood Products
- Screen and aggressively treat severe anemia: if oral iron fails, initiate IV Iron Sucrose Protocol to reach desired Hgb/Hct, especially for at risk mothers.

## Admission Assessment & Planning

- Verify Type & Antibody Screen from prenatal record  
*If not available,*
- Order Type & Screen (lab will notify if 2<sup>nd</sup> clot needed for confirmation)
- If prenatal or current antibody screen positive (if not low level anti-D from Rho-GAM),*
- Type & Crossmatch 2 units PRBCs
- All other patients,*
- Send Clot to blood bank

- Evaluate for *Risk Factors* (see below)
- If medium risk:*
- Order Type & Screen
  - Review Hemorrhage Protocol
- If high risk:*
- Order Type & Crossmatch 2 units PRBCs
  - Review Hemorrhage Protocol
  - Notify OB Anesthesia
- Identify* women who may decline transfusion
- Notify OB provider for plan of care
  - Early consult with OB anesthesia
  - Review Consent Form

## Ongoing Risk Assessment

- Evaluate for development of additional risk factors in labor:
  - Prolonged 2<sup>nd</sup> Stage labor
  - Prolonged oxytocin use
  - Active bleeding
  - Chorioamnionitis
  - Magnesium sulfate treatment
- Increase Risk level (see below) and convert to Type & Screen or Type & Crossmatch
- Treat multiple risk factors as High Risk

## Admission Hemorrhage Risk Factor Evaluation

Low (Clot only)	Medium (Type and Screen)	High (Type and Crossmatch)
No previous uterine incision	Prior cesarean birth(s) or uterine surgery	Placenta previa, low lying placenta
Singleton pregnancy	Multiple gestation	Suspected Placenta accreta or percreta
≤4 previous vaginal births	>4 previous vaginal births	Hematocrit <30 AND other risk factors
No known bleeding disorder	Chorioamnionitis	Platelets <100,000
No history of PPH	History of previous PPH	Active bleeding (greater than show) on admit
	Large uterine fibroids	Known coagulopathy
	Estimated fetal weight greater than 4 kg	
	Morbid obesity (BMI >35)	

## STAGE 0: All Births: Prevention & Recognition of OB Hemorrhage

### Active Management of Third Stage

- Oxytocin infusion: 10-20 units oxytocin/1000ml solution titrate infusion rate to uterine tone; or 10 units IM; do not give oxytocin as IV push
- Vigorous fundal massage for at least 15 seconds

### Ongoing Quantitative Evaluation of Blood Loss

- Using formal methods, such as graduated containers, visual comparisons and weight of blood soaked materials (1gm = 1ml)

### Ongoing Evaluation of Vital Signs

**If: Cumulative Blood Loss >500ml vaginal birth or >1000ml C/S -OR-**

**Vital signs >15% change or HR ≥110, BP ≤85/45, O2 sat <95% -OR-**

**Increased bleeding during recovery or postpartum,**

**proceed to STAGE 1**

# Vital Signs are Often Ignored: Concept of “Triggers”

Triggers identify patients that need more attention (from on-call physician, in-house physician, or rapid response team (RRT))

- Prevent such patients from being ignored
- Independent of diagnosis, useful for all OB emergencies
- Used in many areas of hospital medicine
- Do not wait for lab results before acting

# General Maternal Alerts (Triggers)

- Systolic BP, mmHg <90 or >160
- Diastolic BP, mmHg >100
- Heart rate; <50 or >120 –beats per min
- Respiratory rate; <10 or >30 –Breaths per min
- Oxygen saturation, % <95 –Room air, sea level
- Oliguria; <30 –mL/hr for 2 hours

# Obstetric Hemorrhage Care

## Summary: **STAGE 1**

- Blood Loss > 500 ml vaginal or > 1000 ml C/S
- VS changes/triggers by >15% or
- HR >110,
- BP <85/45,
- O2 sat < 95%

**Activate OB Hemorrhage Protocol and Checklist**

# Obstetric Hemorrhage Care

## Summary: **STAGE 2**

- Continues bleeding with total QBL under 1500 ml
- OB back to bedside (if not already there)
- Patient to OR (vaginal birth)
- Extra help – 2nd OB, Rapid Response Team
- Escalating treatment
- Sequentially advancing through
- Medication
- Mobilize Blood Bank
- Procedures
- Keep ahead with volume and blood products

# Steadily Moving Up the Protocol

- If there has been little/no response to Methergine, do not give the second dose but MOVE ON to the prostaglandin second medication.
- Second medication - Hemabate
- If Hemabate has had little/no effect, move on to non-pharmacologic methods
- Little value in giving both hemabate and misoprostol, as the mechanism of action is the same

<p><b>Stage 3</b></p>	<p><b>Total blood loss over 1500ml, <u>or</u> &gt;2 units PRBCs given <u>or</u> VS unstable <u>or</u> suspicion of DIC</b></p>		
<p><i>Stage 3 is focused on the Massive Transfusion protocol and invasive surgical approaches for control of bleeding.</i></p>	<ul style="list-style-type: none"> <li>• Mobilize team           <ul style="list-style-type: none"> <li>-Advanced GYN surgeon</li> <li>-2<sup>nd</sup> Anesthesia Provider</li> <li>-OR staff</li> <li>-Adult Intensivist</li> </ul> </li> <li>• Repeat labs including coags and ABG's</li> <li>• Central line</li> <li>• Social Worker/ family support</li> </ul>	<ul style="list-style-type: none"> <li>• Activate Massive Hemorrhage Protocol</li> <li>• Laparotomy:           <ul style="list-style-type: none"> <li>-B-Lynch Suture</li> <li>-Uterine Artery Ligation</li> <li>-Hysterectomy</li> </ul> </li> <li>• Patient support           <ul style="list-style-type: none"> <li>-Fluid warmer</li> <li>-Upper body warming device</li> <li>-Sequential compression stockings</li> </ul> </li> </ul>	<p><b>Transfuse Aggressively</b>  <b>Massive Hemorrhage Pack</b></p> <ul style="list-style-type: none"> <li>• Near 1:1 PRBC:FFP</li> <li>• 1 PLT pheresis pack per 6units PRBCs</li> </ul> <p><b>Unresponsive Coagulopathy:</b>        After 10 units PRBCs <u>and</u> full coagulation factor replacement: may consider <b>rFactor VIIa</b></p>

California Maternal Quality Care Collaborative (CMQCC): Hemorrhage Taskforce (2008) visit: [www.CMQCC.org](http://www.CMQCC.org) for details  
 Programs funded by grants from the California Department of Public Health, Center for Family Health, Maternal, Child and Adolescent Health Division

**Every hospital will need to customize the protocol-  
 but the point is every hospital needs one**

# FPQC Obstetric Hemorrhage Guidelines Algorithm

- **Pre Admission Identify patients with special consideration:**
  - Placenta previa/accreta, Bleeding disorder, or those who decline blood products
  - Follow appropriate workups, planning, preparing of resources, counseling and notification

# Center of Excellence/ Placental Implantation Pathology

- Response to increase of cases and risks
- 90 cases
- Lessons learned
- Multidisciplinary Care
- Assess/ counseling/ Consultation
- Care Planning
- Controlled care
- Improved Outcome

## Time of **Admission** Screen All Admissions for hemorrhage risk: Low Risk, Medium Risk and High Risk

- **Low Risk:** Hold blood
- **Medium Risk:** Type & Screen, Review Hemorrhage Protocol,
- **High Risk:** Type & Cross match 2 Units PRBCs; and Review Hemorrhage Protocol

# Can we lower the frequency and morbidity/mortality of OB Hemorrhage



## Lower the incidence strategies:

- Reduce the cesarean birth rate (both primary and repeat)
- Reduce chorioamnionitis
- Fewer multiple gestations
- Reduce long inductions of labor
- Reduce long second stages
- Respond rapidly to OB hemorrhage:
- Use the new techniques and respond in an organized, well-executed, timely fashion
- Keep a small hemorrhage from evolving into a massive hemorrhage

# Florida Perinatal Quality Collaborative OHI Aims



Partnering to Improve Health Care Quality  
for Mothers and Babies

- Reduce the number of massive hemorrhages and the number of major complications from massive hemorrhage, including transfusions and hysterectomies, for all birthing women in participating hospitals by 50% by December 31, 2014
- All collaborative participants develop and implement a multidisciplinary team response to every massive obstetric hemorrhage by December 31, 2014

# Systems Approach to Obstetric Hemorrhage

- Organize your unit and your response
- Recognize Denial and Delay
- Get help
- Get exposure to perform thorough exams and identify the source of bleeding
- Do not get behind
- Well Defined Process Is Most Important!
- **We Can Make a Difference**

*THANK YOU*  
*GRACIAS*  
*MERCI*

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