New Mexico Perinatal Collaborative: Obstetric Hemorrhage and Maternal Mortality

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Disclosures

Consultant:
CSL Behring, Octapharma, Bayer, Cerus

Speaker:
Octapharma, TEM Systems, Inc.

Honoraria:
CSL Behring, Octapharma, TEM Systems, Inc.

Research Support (reagents):
TEM Systems, Inc.

Objectives

- Review evidence-based recommendations for elements of obstetric hemorrhage protocols.
- Recognize fibrinogen levels consistent with hypofibrinogenemia in obstetric patients and its association with progression to severe postpartum hemorrhage.
- Discuss the current data on antifibrinolytic therapy and fibrinogen replacement in postpartum hemorrhage.
- Discuss the New Mexico Perinatal Collaborative's goals for addressing maternal mortality and obstetric hemorrhage in the state of New Mexico.

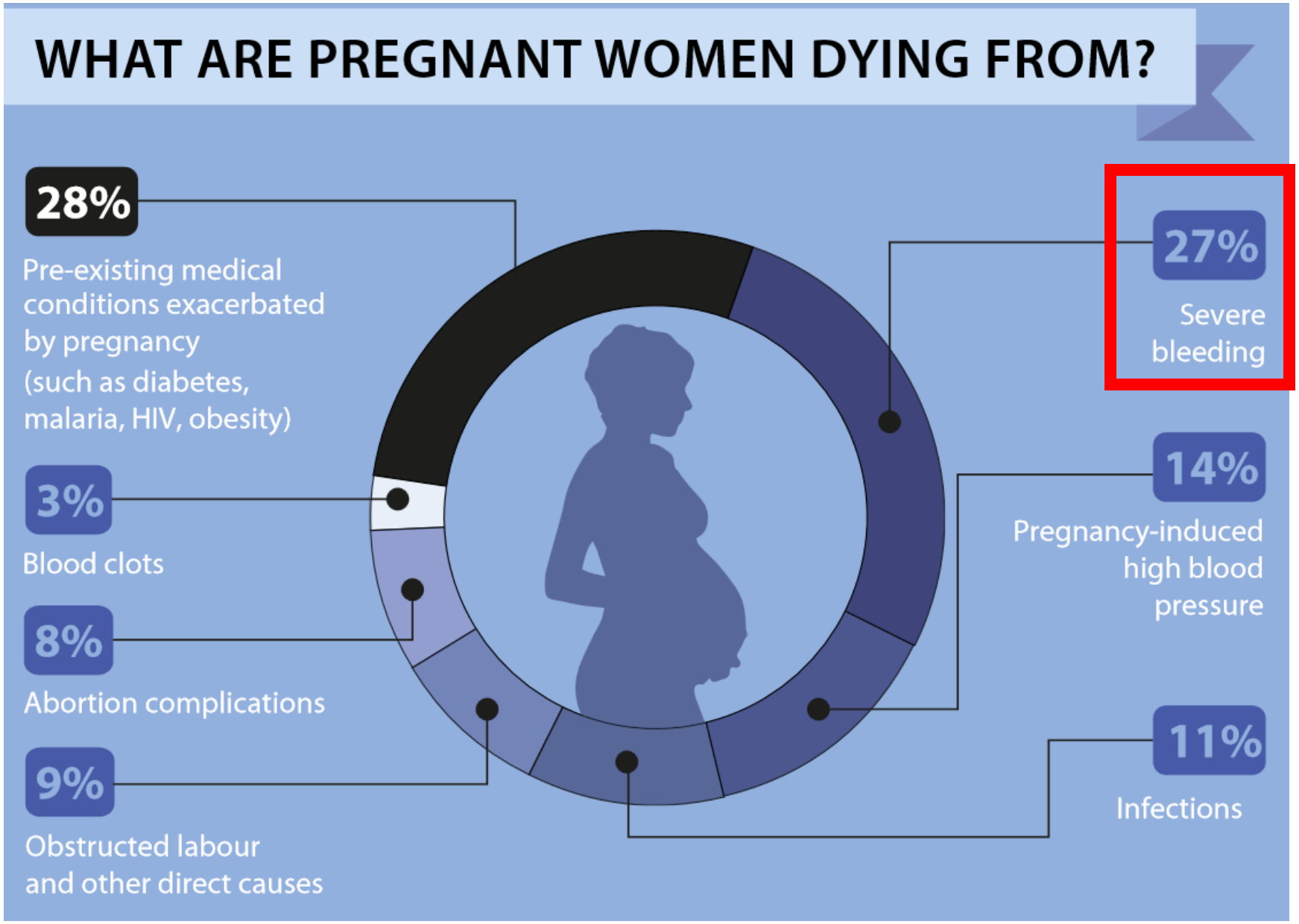
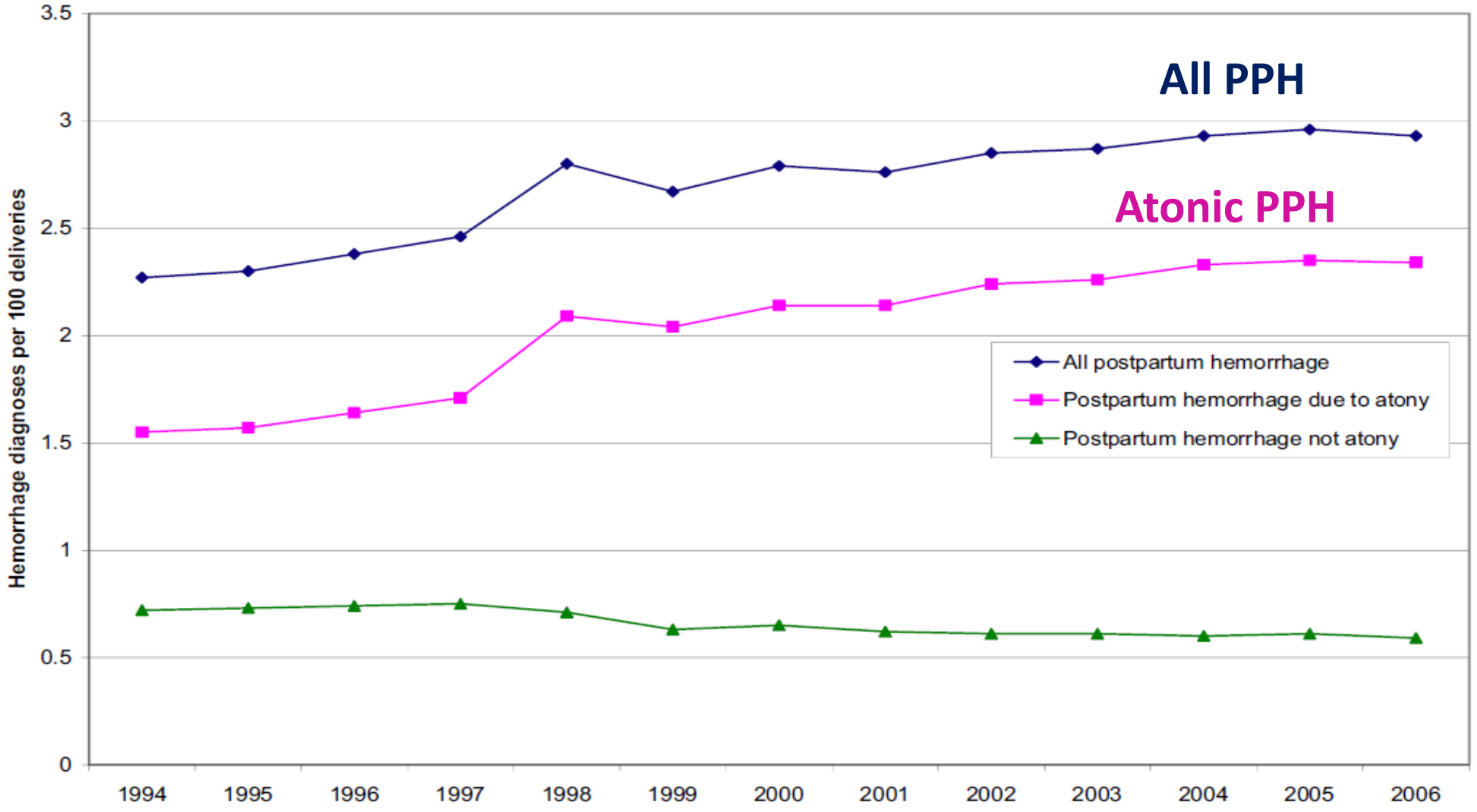


Image from World Health Organization infographic;
URL: http://www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-infographic_part2.pdf?ua=1, last accessed 10/1/2014

FIGURE 1

Annual postpartum hemorrhage rates (United States, 1994–2006)



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

Maternal Mortality and Obstetric Hemorrhage in New Mexico

- Obstetric hemorrhage is one of the leading causes of preventable maternal death.[1]
- IHS deliveries 2002-2004: 8.5% complicated by PPH[2]
- Wisconsin delivery discharges:[3]
  - Native American women : 1.93 odds ratio for PPH ($p<0.001$)
  - Hispanic women: 1.16 odds ratio ($p<0.001$)

- New Mexico: 10.4% American Indian, 47.3% Hispanic/Latino[4]

1. Main, et al, Obstet Gynecol 2015; 125:938-47
2. Bacak SJ, The HIS Primary Care Provider 2007 Feb; 32(2):33-37
3. Cabacungan, et al, Matern Child Health J 2012; 16:1455-1467
4. US Census Bureau 2015: http://quickfacts.census.gov

Obstetric Hemorrhage Protocols

- Uterine blood flow at term: **500-700 mL/min**
- Rapid evolution of coagulopathies.
- Uncertainty regarding blood product orders or appropriate laboratory assessment.
- Obstetric hemorrhage protocols recommended:
  - **ACOG**: Postpartum Hemorrhage. Practice Bulletin #76, 2006
  - **Joint Commission**: Preventing Maternal Death. Sentinel Event Alert 2010 44:1-4
  - **Royal College of Obstet & Gynecol:** Green-top Guidelines #52, revised 2011

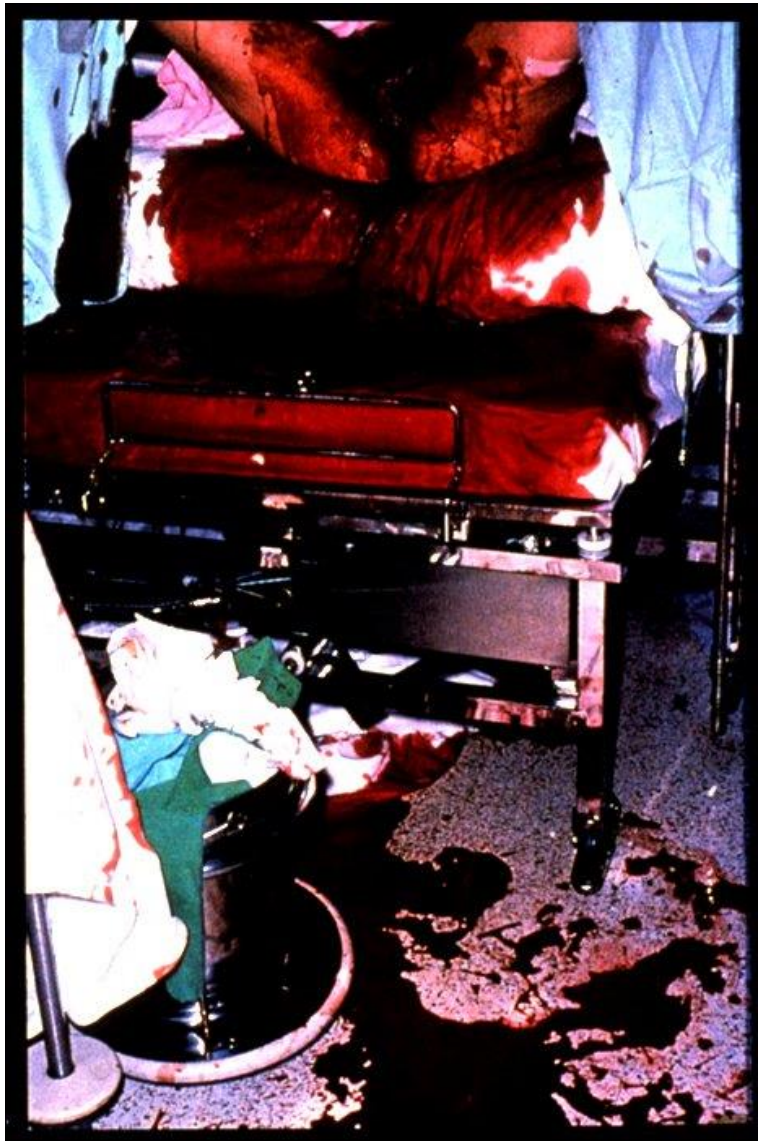


Image courtesy of Dr. Andra James, Duke University Medical Center

National Partnership for Maternal Safety

Consensus Bundle on Obstetric Hemorrhage

- Outline of critical clinical practices recommended in every maternity unit.
- "One size fits all" protocol does not account for variations and resources between centers.
- OB Hemorrhage Bundle is a selection of existing guidelines
- Low-resource centers may not be able to achieve all elements, but should consider transferring higher-risk patients.
- "**Every unit, every patient, every hemorrhage**"

Main, et al., *Obstet Gynecol* 2015; 126:155-62

National Partnership for Maternal Safety

Consensus Bundle on Obstetric Hemorrhage

READINESS:

1. Hemorrhage cart with supplies, checklist, and instruction cards for intrauterine balloons and compression stitches
2. Immediate access to hemorrhage medications (kit or equivalent)
3. Establish a response team-who to call when help is needed (blood bank, advanced gynecologic surgery, other support and tertiary services)
4. Establish massive and emergency-release transfusion protocols (type-O negative or uncrossmatched)
5. Unit education on protocols, unit-based drills (with postdrill debriefs)

Main, et al., *Obstet Gynecol* 2015; 126:155-62

National Partnership for Maternal Safety

Consensus Bundle on Obstetric Hemorrhage

RECOGNITION AND PREVENTION:

1. Assessment of hemorrhage risk (prenatal, on admission, and at other appropriate times)
2. Measurement of cumulative blood loss (formal, as quantitative as possible)
3. Active management of the 3rd stage of labor (department-wide protocol)

Main, et al., *Obstet Gynecol* 2015; 126:155-62

Risk Factor identification

Table 1: Pregnancy/Admission risk factors

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, percreta, increta
≤ 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 post partum hemorrhage	History of previous post partum hemorrhage	Active bleeding (greater than show) on admit
	Large uterine fibroids	Known coagulopathy

Lyndon, et al. CMQCC OB Hemorrhage toolkit. From URL: cmqcc.org/ob_hemorrhage ; last accessed 11/17/2015

Additional risk factors

<u>During labor:</u>

- Prolonged 2nd stage
- Prolonged oxytocin use
- Active bleeding
- Chorioamnionitis
- Mag Sulfate treatment

<u>3rd stage/postpartum:</u>

- Vacuum/forcep assisted birth
- Atony
- Cesarean delivery
- Retained placenta/abnormal placentation

CMQCC recommendations for assessment timing:

1. On admission
2. Once per shift pre-delivery and for 24 hours post delivery

Quantitation of blood loss

- Weigh items after establishing dry weights (swabs, pads, etc.)
- Visual chart of saturated items with estimated blood content
- Measure collected blood in graduated cylinders
- Under-buttock graduated cylinder drapes

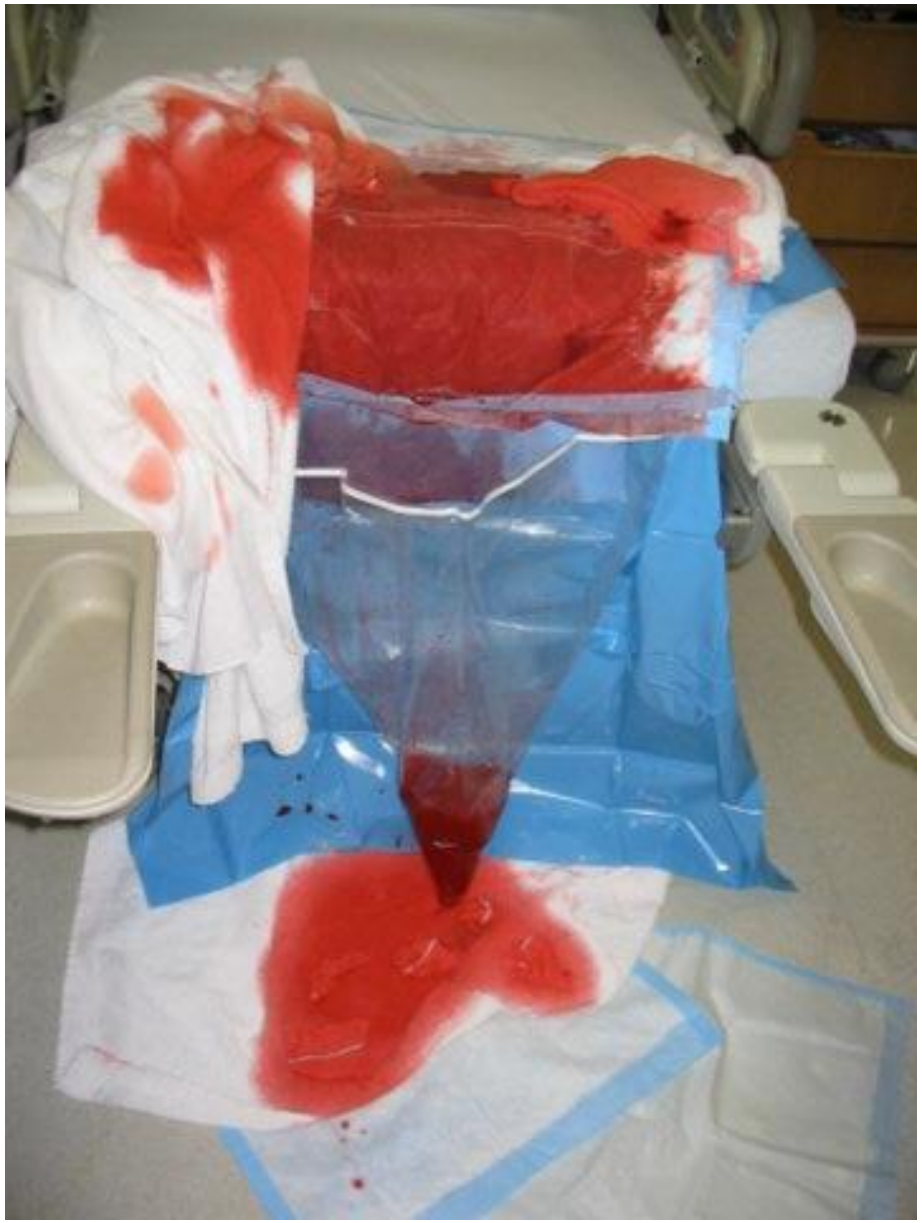
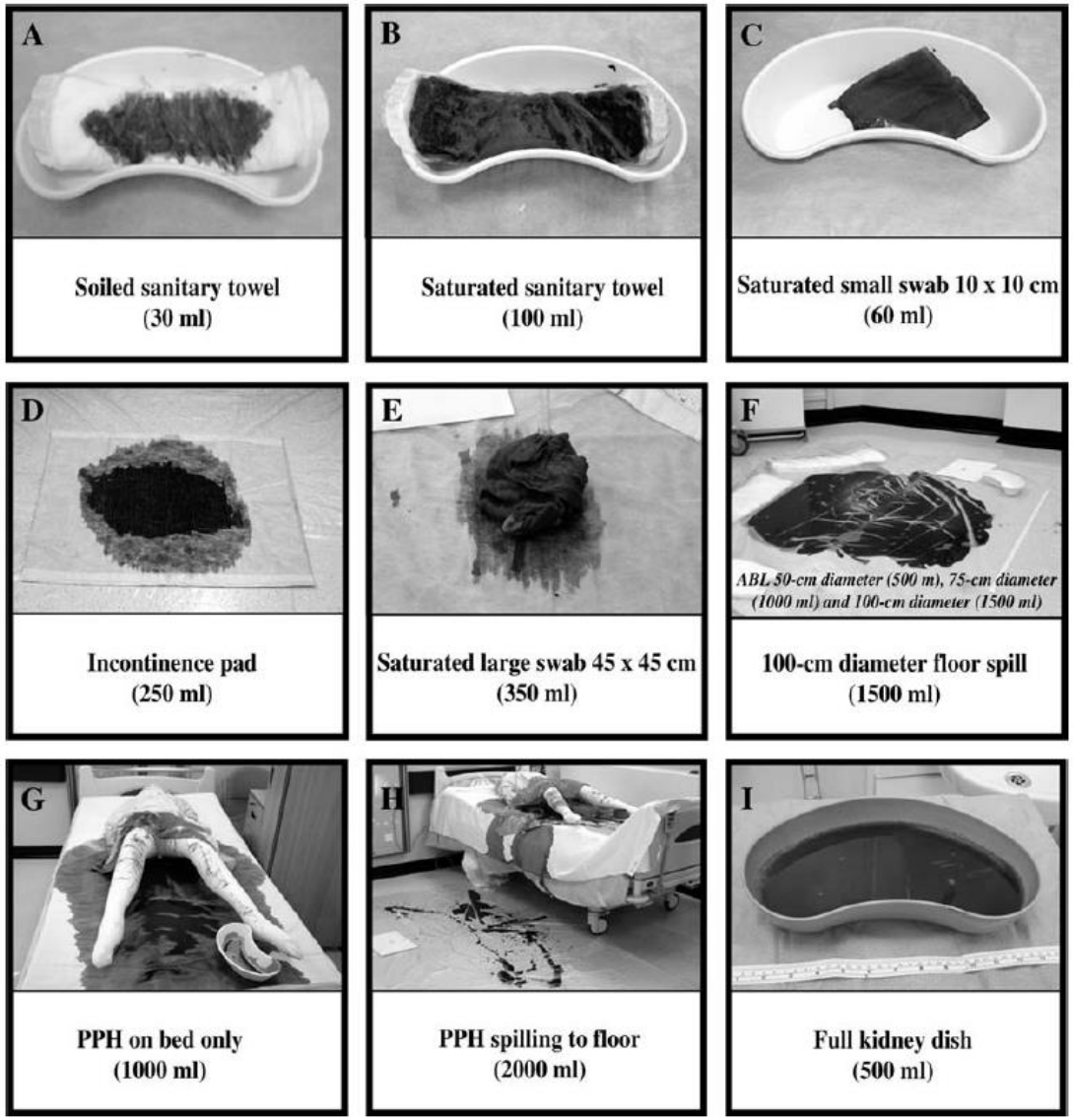


Image courtesy of Dr. Sharon Phelan,
University of New Mexico Health Science Center

Visual scale for blood loss estimation



Bose, et al. *BJOG* 2006; 113:919–924.

National Partnership for Maternal Safety

Consensus Bundle on Obstetric Hemorrhage

RESPONSE:

1. Unit-standard, stage-based obstetric hemorrhage emergency management plan with checklists
2. Support program for patients, families, and staff for all significant hemorrhages

Main, et al., *Obstet Gynecol* 2015; 126:155-62

Hemorrhagic shock stages

Blood loss	Volume lost	Respiration	Heart rate	Blood Pressure	Urine output
CLASS I	< 15% TBV	normal	<100	Normal or increased	>30 mL/hr
CLASS II	15-30% TBV	Mild increase	>100	normal	20-30 mL/hour
CLASS III	30-40% TBV	Mod-marked tachypnea	>120	Decreased (MAP <60)	5-15 mL/hr
CLASS IV	> 40% TBV	Marked tachypnea, respiratory collapse	>140	Systolic < 70, no peripheral blood pressure discernible. Peripheral pulses absent.	Anuric

Class III and IV hemorrhagic shock = loss of compensatory mechanisms.
Prompt fluid and transfusion therapy needed to avoid ischemic injury.

OB Hemorrhage: Stage-based interventions

	Assessment	Blood Bank Intervention
Stage 0	Typical labor	Med risk: Type and Screen High risk: Type and Crossmatch 2 pRBC units
Stage 1	Excessive blood loss, HR>110, BP <85/45, O2 sat < 95%	Type and crossmatch 2 U pRBC (if not already done)
Stage 2	Continued bleeding with EBL < 1500 mL	Transfuse 2 U PRBC Consider plasma, platelets, cryoprecipitate
Stage 3	• EBL > 1500 ml or • 2 U PRBC given or • Unstable vitals or • Suspicion of DIC	<u>Massive Transfusion:</u> • Transfuse around 1:1 RBC:plasma • 1 platelet per 6 RBC • Cryoprecipitate

National Partnership for Maternal Safety

Consensus Bundle on Obstetric Hemorrhage

REPORTING AND SYSTEMS LEARNING:

11. Establish a culture of huddles for high-risk patients and postevent debriefs to identify successes and opportunities.
12. Multidisciplinary review of serious hemorrhages for systems issues
13. Monitor outcomes and process metrics in perinatal quality improvement committee

Main, et al., *Obstet Gynecol* 2015; 126:155-62

Joint Commission: Sentinel Event Policy

<u>As of January 2015:</u>

- Any intrapartum maternal death or severe maternal morbidity (*not due to the patient's underlying condition*) is considered a sentinel event.
- Severe maternal morbidity: within 24 hours postpartum, either:
  - **Transfusion of 4+ blood products (pRBC, plasma, whole blood, platelets)**
  - **ICU admission**

- All sentinel events must be reviewed by the hospital and are subject to review by TJC.

1. Joint Commission, Comprehensive Accreditation Manual for Hospitals, Update 2, January 2015.
2. Callaghan, et al., *Obstet Gynecol* 2014; 123:978-81

URL: http://www.safehealthcareforeverywoman.org/national-partnership.php last accessed 2/16/2016

Patient Blood Management standards for massive hemorrhage protocols (MHP)

10.3: Responsibility for management of coagulopathy is defined

10.5: MHP includes guidelines for management of acidosis, hypocalcemia, and hypothermia

10.6: MHP includes guidelines for blood component transfusion and factor concentrates.

10.7: Laboratory testing is used to monitor for acidosis, hypocalcemia, and coagulation.

10.8: Laboratory results are available quickly enough to allow for goal-directed transfusion.

Society for the Advancement of Blood Management, “Standards for Patient Blood Management Programs”, 3nd Ed. (2014). URL: http://www.sabm.org/publications (last accessed 2/16/2016)

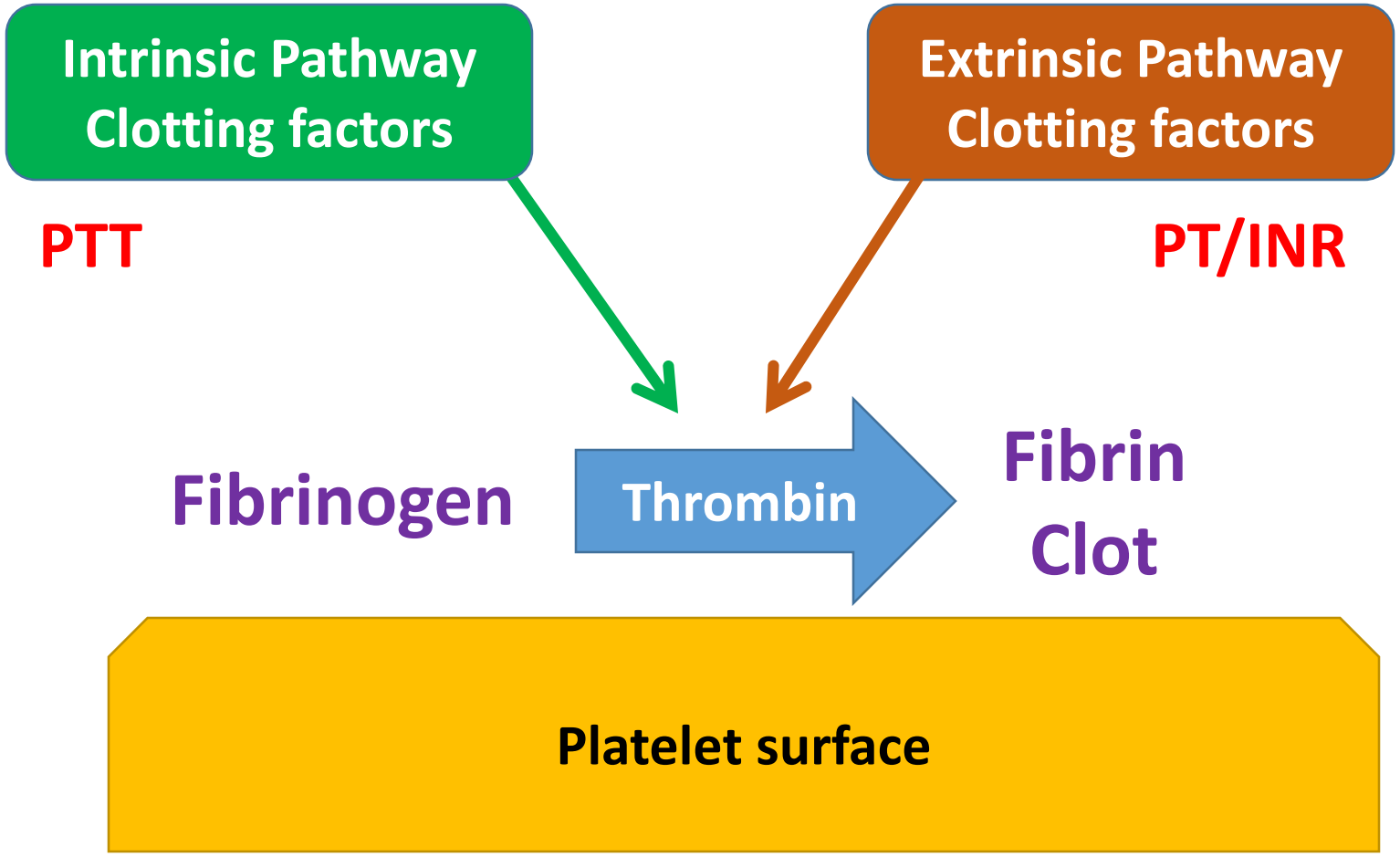
International consensus panel: PPH evaluation and management

<u>Coagulation testing:</u>

1. Perform coagulation testing ***as soon as PPH is recognized***.
2. Repeat testing every 45-60 minutes
   N.B.: Some organizations (i.e. CMQCC) recommend testing q 30 min.
3. Tests should include: platelet count, PT/PTT, fibrinogen levels
4. Thromboelastography/-ometry can be performed in addition to standard testing.

Abdul-Kadir, et al., *Transfusion* 2014; 54: 1756-1768

Hemostasis simplified



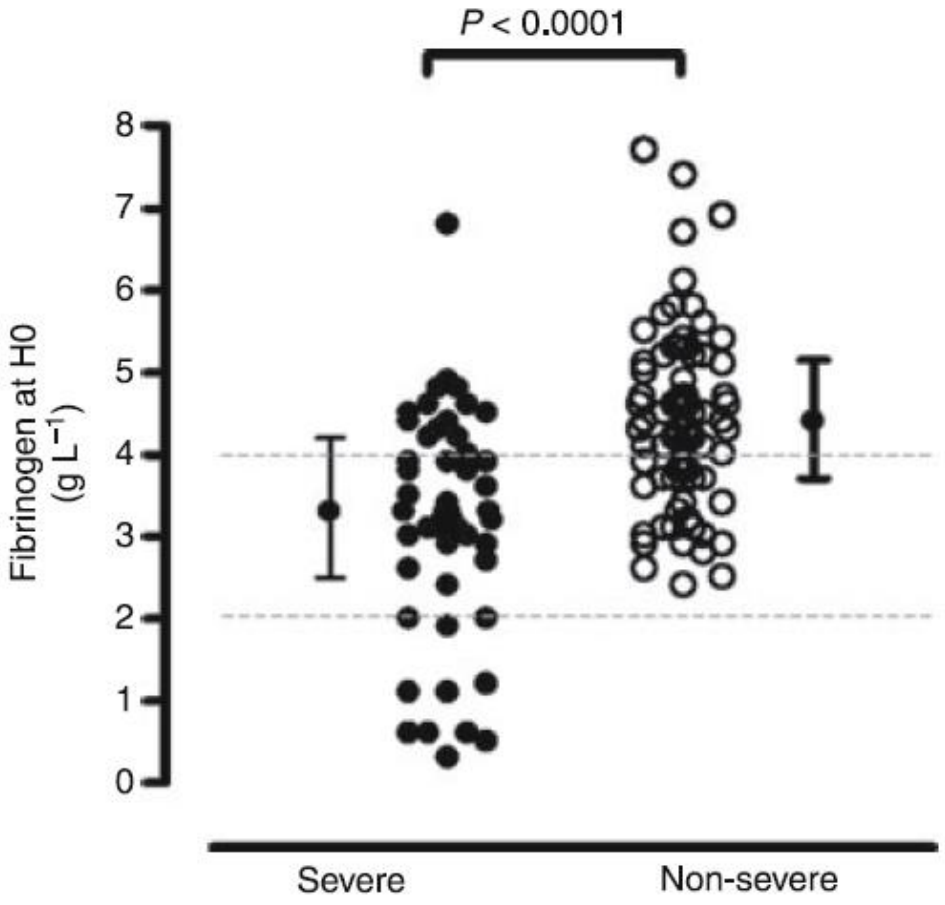
Coagulation in Pregnancy

<u>Hypercoagulable state:</u>

- Lowered Protein S
- Reduced fibrinolysis, increased PAI-1
- Increased procoagulant factors (Fgn, FVII, FVIII, FIX)
  - **Fibrinogen (non-pregnant): 197-400 mg/dL**
  - **Fibrinogen (term pregnancy): 350-650 mg/dL**

Szecsi, et al., *Thromb Haemost* 2010; 103: 718-727

Low Fibrinogen Predictive of Severe PPH



Fibrinogen <200 mg/dL predictive of severe PPH

Charbit, *J. Thromb Haemost.* 2007; 5:266-273

Emergency Hemostasis Panel (EHP)

- Test panel: Hgb, platelet count, PT/INR, fibrinogen level
- Goal: <20 min turnaround time after arrival in lab
- Pre-EHP: turnaround time = 35-70 minutes
- Adjustments to shorten time:
  - Check for sample clotting at end, not beginning
  - Eliminate hemolysis check
  - Altered fibrinogen calibration curve
- Post-EHP: turnaround time = 14 (+/- 3) minutes

Chandler, et al., *Transfusion* 2010; 50:2547

Sources of fibrinogen repletion

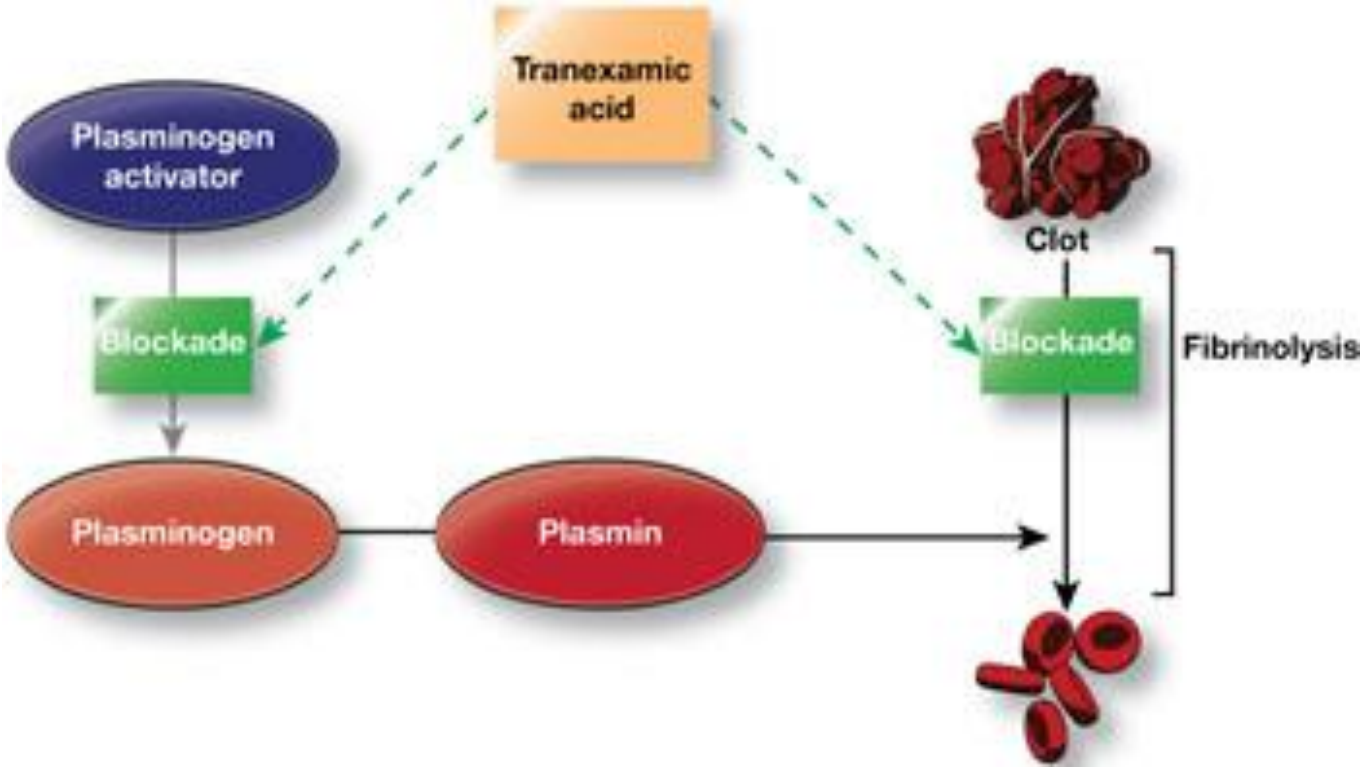
- Plasma: 2-4 g/L
- Cryoprecipitate: 15-17 g/L **preferred

Fibrinogen in PPH: Guideline recommendations

Organization/Group	Recommendation
European Society of Anaesthesia (2013)[1]	• Fgn less than 2g/L may indicate increased risk for PPH (Grade 2C) • Fgn <1.5–2.0 g/L deficit should be triggers for Fgn substitution (Grade 1C)
Abdul-Kadir, et al. (2014)[2]	Maintain fibrinogen above 2.0 g/L using either cryoprecipitate or Fgn concentrates
Royal College of Obstetricians and Gynaecologists (2011)[3]	Cryoprecipitate if Fgn < 1g/L
California Maternal Quality Care Collaborative (2015)[4]	• Initial order for cryoprecipitate when Fgn < 100 mg/dL or if patient has severe abruption or amniotic fluid embolism • Maintain Fgn > 100-125 mg/dL

1. Kozek-Langnecker, et al., *Eur J Anaesthesiol* 2013; 30:270–382
2. Abdul-Kadir, et al., *Transfusion* 2014; 54: 1756-1768
3. RCOG, Green Top Guideline No. 52, last revised 2011
4. Lyndon, et al. CMQCC OB Hemorrhage toolkit. From URL: cmqcc.org/ob_hemorrhage, last accessed 5/21/2015

Tranexamic acid



- Lysine analogue inhibitor of plasmin: reduces fibrinolysis

Image from Kaunitz, *OBGyn Management* 2010; Vol 6

Tranexamic acid (TXA) in PPH

Cochrane review on TXA for prevention of PPH.[1]

- 12 trials, 3285 subjects
- Blood loss > 400-500 mL and blood transfusion less common in women receiving TXA (moderate quality evidence)
- Effect on maternal mortality and severe morbidity uncertain

CRASH-2 [2]: RCT of TXA in trauma

- >20,000 adult subjects
- 1 g IV TXA + 1 g IV TXA infusion vs saline placebo
- Significant reduction in all-cause mortality and bleeding deaths
- No increase in thromboembolic complications.

1. Novikova and Hofmeyer, Cochrane Database Syst Rev 2015; (6):CD007872
2. CRASH-2 trial collaborators, *Lancet* 2010; 376: 23-32

Tranexamic acid (TXA) and PPH

EXADELI: randomized, open label trial of TXA in PPH

- Subjects: vaginal deliveries with EBL >800 mL (n=144)
- Intervention: 4 g TXA, followed by 1 g/hour for 6 hours.
- Primary outcome: reduction of blood loss statistically significant, but questionable clinical signficiance (173 mL vs 221 mL, p=0.041)

Ducloy-Bouthors, et al., *Crit Care* 2011; 15:R117

- Ongoing randomized trial enrolling 20,000 women
- Subjects: PPH after vaginal or C-section delivery
- Intervention: 1 g I.V. TXA vs. placebo
- Primary outcome: maternal death
- End point: death, discharge, or 42 days post-intervention.
- Secondary endpoints include thromboembolic events in both mother and infant.
- Results expected in summer 2016

Shakur, et al., *Trials* 2010; 11:40
URL: http://womantrial.lshtm.ac.uk last accessed 2/16/2016

TXA in PPH: Guideline recommendations

Organization/Group	Recommendation
European Society of Anaesthesia (2013)[1]	Administer TXA to reduce blood loss, bleeding duration, and transfusion requirements (Grade 1B)
Abdul-Kadir, et al. (2014)	• Early TXA in severe PPH (prior to Fgn repletion) • 1g IV TXA, followed by 2nd dose after 30 min; follow with 1g/hr infusion
Royal College of Obstetricians and Gynaecologists (2011)[3]	TXA seldom, if ever, has a place in management of obstetric hemorrhage
WHO 2012	For refractory atonic and trauma-related bleeding (weak recommendation, moderate evidence)

1. Kozek-Langnecker, et al., *Eur J Anaesthesiol* 2013; 30:270–382
2. Abdul-Kadir, et al., *Transfusion* 2014; 54: 1756-1768
3. RCOG, Green Top Guideline No. 52, last revised 2011
4. WHO recommendations for the prevention and treatment of postpartum hemorrhage, 2012

Goals: New Mexico Perinatal Collaborative obstetric hemorrhage and maternal mortality workgroup

1. Dissemination, education, and training on obstetric hemorrhage patient safety bundles available from the National Partnership for Maternal Safety.

2. Promote case reviews of all severe maternal morbidities and mortalities from obstetric hemorrhage using standardized case abstraction forms.

NMPC
NEW MEXICO PERINATAL COLLABORATIVE

Goals:
NMPC obstetric hemorrhage and maternal mortality workgroup

3. Survey NM centers regarding OH protocols and SMM review.

4. Prepare educational material for site champions for dissemination at participating institutions, and work with champions to implement hospital-specific bundles.

First training: Gallup, NM.

- Half-day seminar with lectures and hands-on simulation
- 30 providers from IHS and private practice

NMPC
NEW MEXICO PERINATAL COLLABORATIVE

Goals:
NMPC obstetric hemorrhage and maternal mortality workgroup

Site visits started at the following centers:

- Christus St. Vincent (Santa Fe)
- UNMH (Albuquerque)
- Lovelace (Albuquerque)
- Presbyterian (Albuquerque)
- Presbyterian (Espanola)
- Gallup IHS
- Alta Vista (Las Vegas)
- Taos Holy Cross
- Memorial (Las Cruces)

NMPC
NEW MEXICO PERINATAL COLLABORATIVE

Obstetric hemorrhage/maternal mortality team

Jean Howe, MD (OB, IHS-Shiprock)

Amy Levi CNM (midwifery, UNM)

Abe Lichtmacher, MD (OB, Lovelace)

Evelyn Lockhart, MD (Pathology, UNM)

Amy Moore, MD (OB, IHS-Shiprock)

Lang Ha Pham, MD (Anesthesia, Presbyterian)

Sharon Phelan, MD (OB, UNM)

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Questions?

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