MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Blood Management for the Obstetric Patient

An overview with recommendations for managing patients experiencing obstetric hemorrhage

Publication Date: October 2024

For more information, please visit: MPOG Patient Blood Management Toolkit

Toolkit Overview

- This presentation is part of a Patient Blood Management Toolkit offering an overview of transfusion practices and considerations for cardiac and pediatric surgery as well as general recommendations for patient blood management.

- For other patient blood management recommendations please reference additional toolkit components:
  - Perioperative Transfusion - Overview of Incidence, Risks, and Costs Associated with Transfusion
  - Patient Blood Management - Transfusion Considerations for Adult Surgical Patient
  - Blood Management for the Cardiac Surgical Patient (Coming soon!)
  - Blood Management for the Pediatric Surgical Patient (Coming soon!)

Acknowledgements

Thomas Klumpner, MD – University of Michigan

Brandon Togioka, MD – Oregon Health and Sciences University

Nirav Shah, MD – MPOG

Nicole Barrios, MHA, BSN – MPOG

Kate Buehler, MS, RN - MPOG

Kimberly Finch, MS, RN – Henry Ford Health System

MPOG
MULTICENTER PERIOPERATIVE
OUTCOMES GROUP

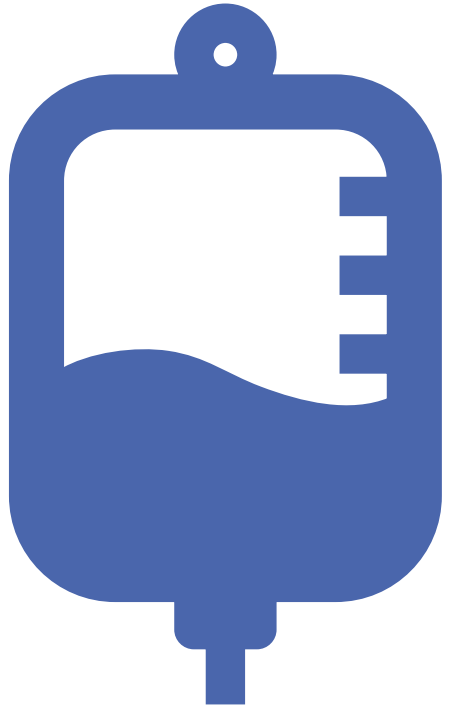
Objectives

- Provide an overview of obstetric (OB) hemorrhage
- Explain the primary causes and risk factors associated with obstetric hemorrhage
- Discuss risks and outcomes associated with transfusion in the obstetric population
- Share general recommendations when caring for the OB hemorrhage patient based on the American College of Obstetricians and Gynecologists (ACOG) guidelines
- Review massive transfusion / OB hemorrhage protocols
- Discuss methods for evaluating and monitoring practices within the healthcare setting to ensure continuous improvement
- Describe MPOG QI measures in this domain

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Sections

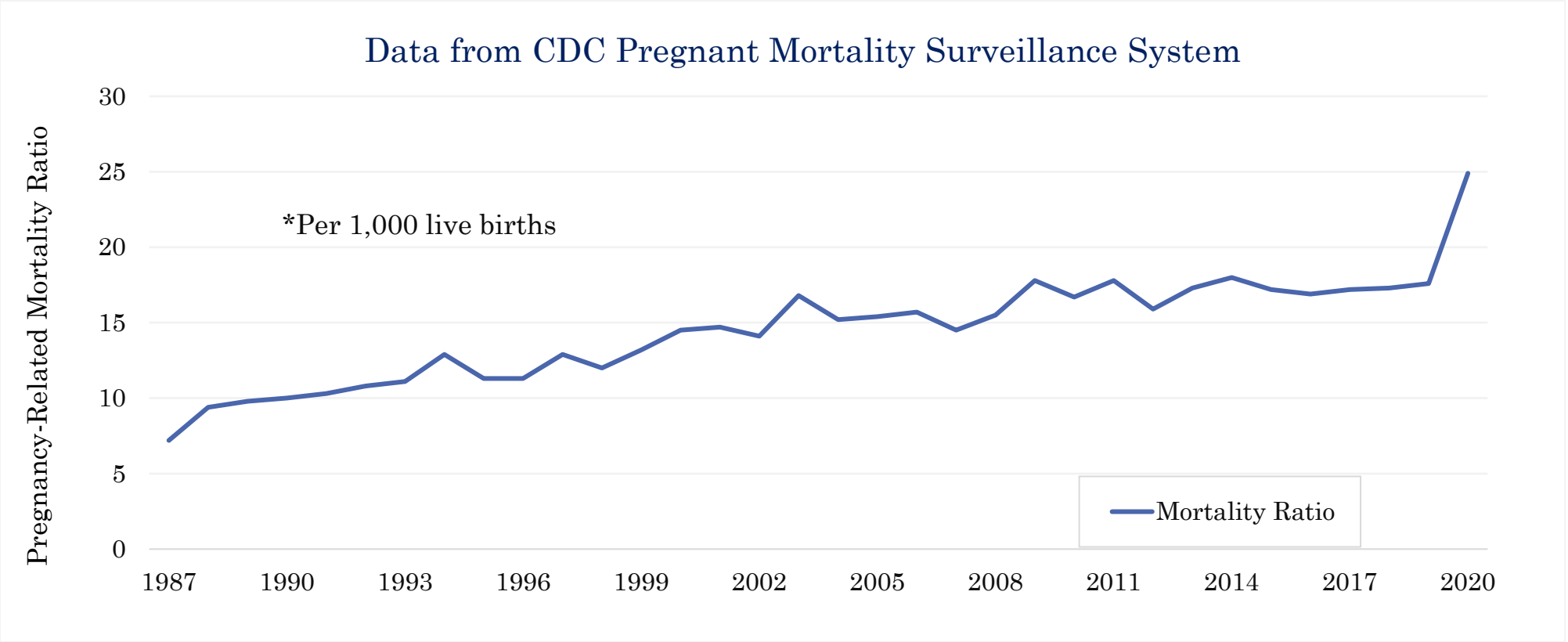
1. Obstetric Hemorrhage: Incidence and Impact
2. Definitions of OB Hemorrhage
3. Management of Obstetric Hemorrhage
4. Additional Recommendations
5. MPOG Transfusion QI Measures



MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Section I:
Obstetric Hemorrhage – Incidence & Impact

Pregnancy Related Mortality in the US

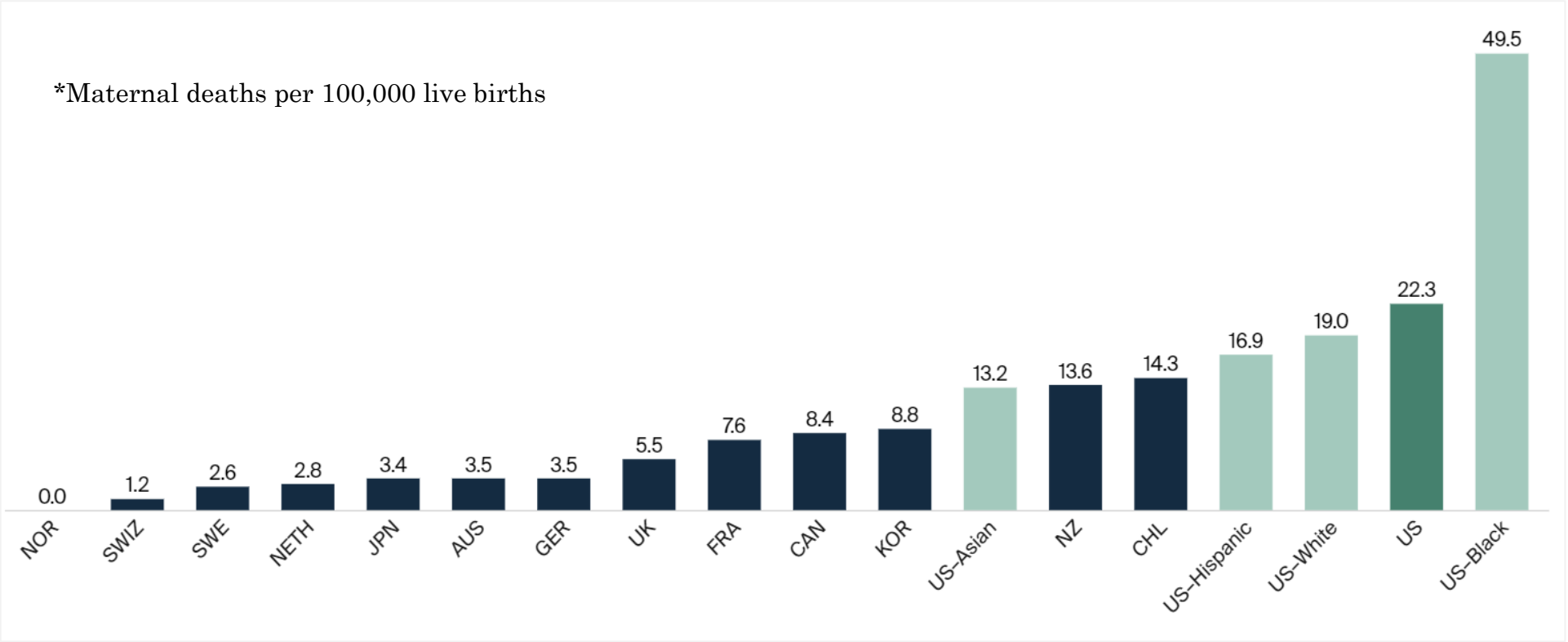


- Postpartum hemorrhage remains a leading cause of maternal mortality[1]
- Many deaths from PPH may be preventable.

References:
1. Pregnancy-related deaths data. (May 2024). Maternity Mortality Prevention. Centers for Disease Control and Prevention. https://www.cdc.gov/maternal-mortality/php/pregnancy-mortality-surveillance/?CDC_AAref_Val=https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Maternal Death Rate by Country



- Rates of maternal mortality in the United States are more than double compared to other developed countries[1].
- Black women have the highest maternal death rate[1].
- Studies suggest that positive patient experiences correlate with lower mortality rates[2].

References:
1. Munira Z. Gunja et al., *Insights into the U.S. Maternal Mortality Crisis: An International Comparison (Commonwealth Fund*, June 2024). https://doi.org/10.26099/cthn-st75
2. Guan, T., Chen, X., Li, J., & Zhang, Y. (2024). Factors influencing patient experience in hospital wards: a systematic review. BMC Nursing, 23(1), 527. https://doi.org/10.1186/s12912-024-02054-0

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Incidence & Impact of Postpartum Hemorrhage

The prevalence of PPH in the United States is currently at 11% and is on the rise.[1]

Uterine atony is the primary cause of PPH and accounts for 70-80% of all hemorrhages.[1]

Approximately 14 million women experience PPH annually, resulting in approximately 70,000 maternal deaths (globally).[1]

According to the World Health Organization (WHO), many survivors are often left with lifelong reproductive disability.[2]

References:
1. Wormer, K. C., Jamil, R. T., & Bryant, S. B. (2023). Acute Postpartum Hemorrhage. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK499988/
2. Postpartum haemorrhage. (May 29, 2023). Life Saving Solution dramatically reduces severe bleeding after childbirth. https://www.who.int/teams/sexual-and-reproductive-health-and-research-(srh)/areas-of-work/maternal-and-perinatal-health/postpartum-haemorrhage

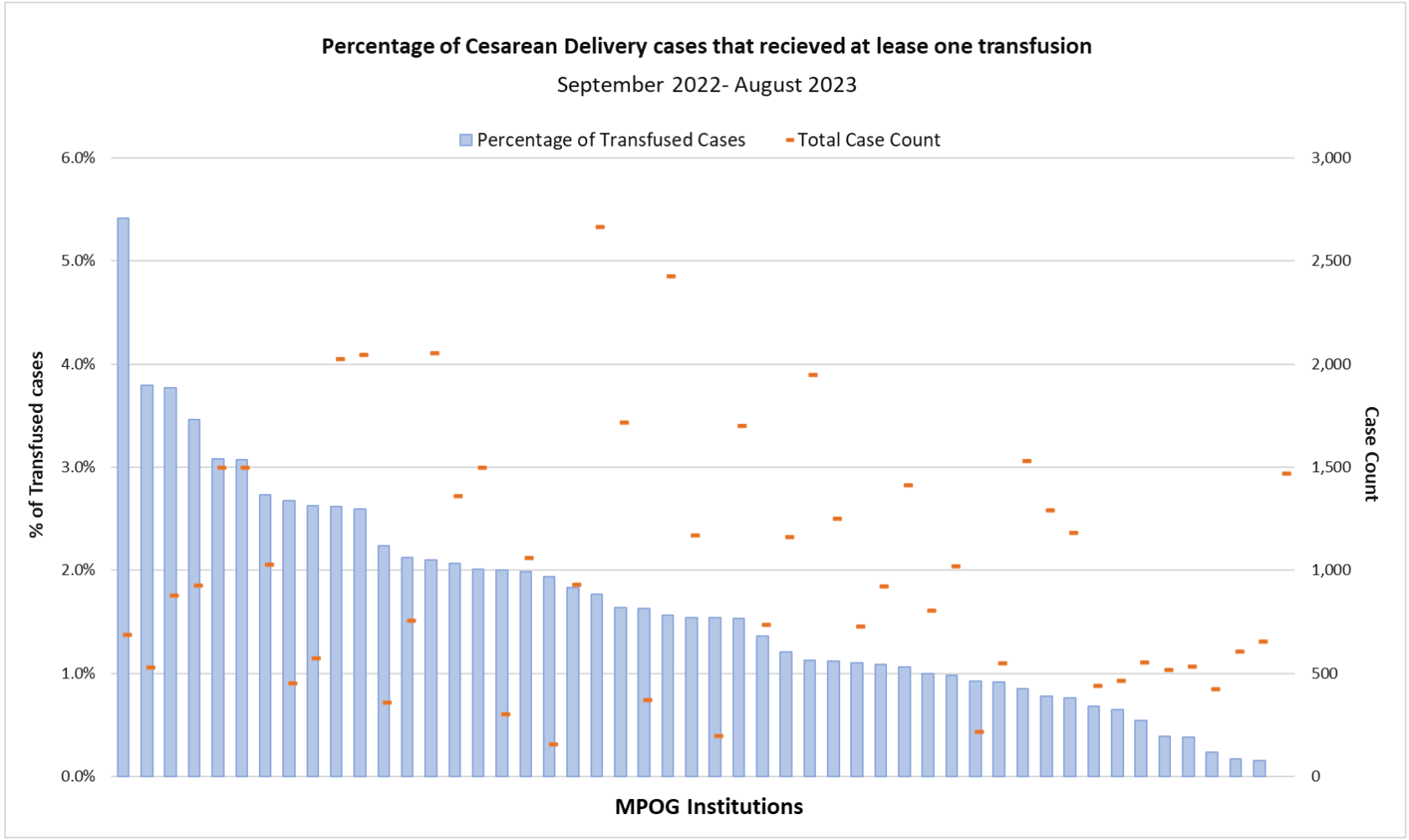
Postpartum Hemorrhage - figures and facts

- Primary PPH is 1L of blood loss within 24 hours of delivery or blood loss accompanied by signs or symptoms of hypovolemia.[1]
- Uterine atony, the primary cause of PPH, accounts for approximately 80% of PPH.[2]
- Postpartum hemorrhage can cause a reduction in blood pressure and perfusion to the brain and other vital organs.
- Many deaths from PPH are likely preventable.[2-3]

References:
1. Menard MK, Main EK, Currigan SM. Executive summary of the reVITALize initiative: standardizing obstetric data definitions. Obstet Gynecol 2014;124:150–3.
2. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
3. A Roadmap to combat postpartum haemorrhage between 2023 and 2030. Geneva: World Health Organization; 2023. Licence: CC BY-NC-SA 3.0 IGO.

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

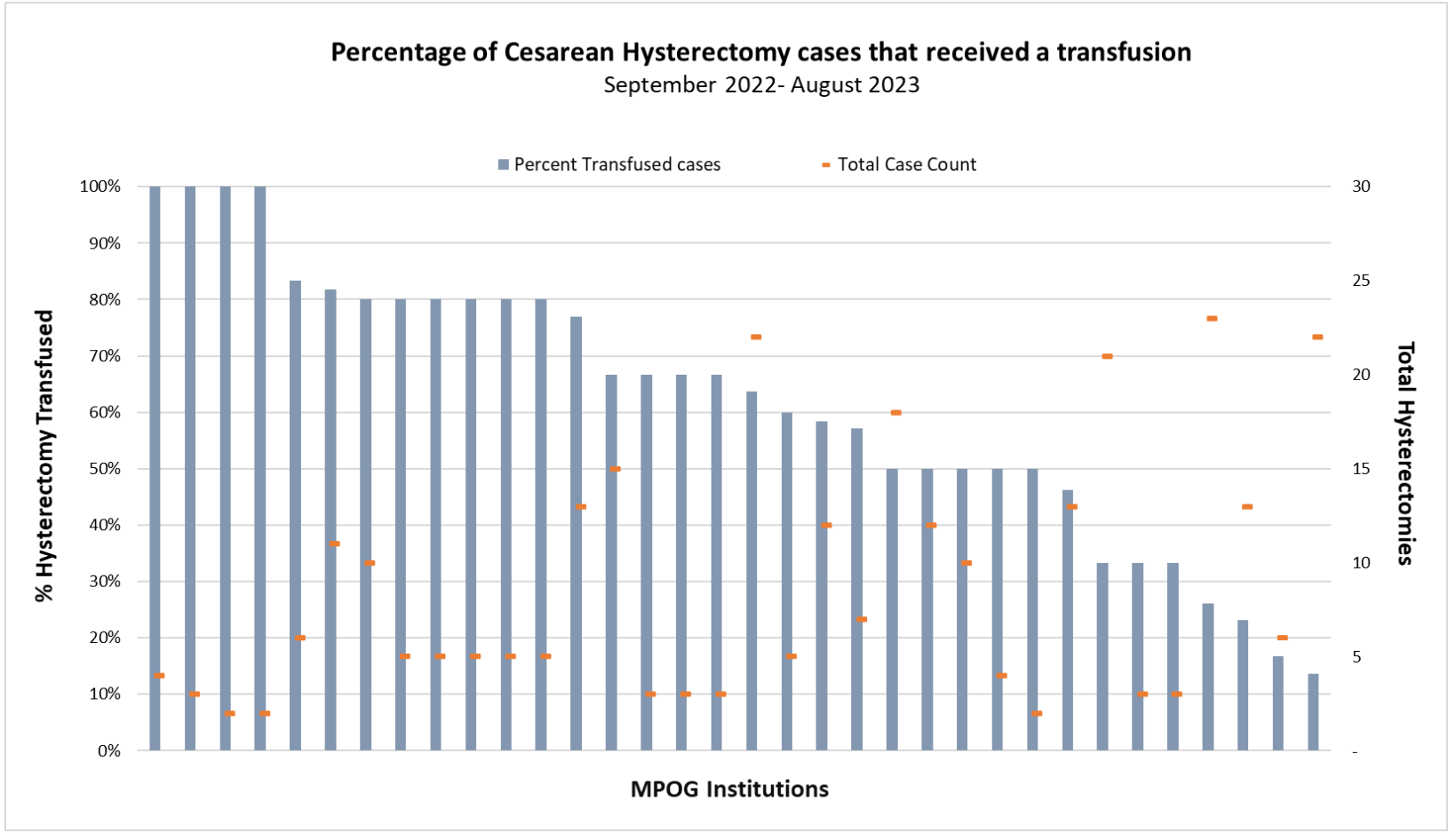
MPOG Data: Transfusion during cesarean delivery



For MPOG sites where cesarean deliveries are performed, 1-4% of cases received a blood transfusion in the perioperative time period.

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

MPOG Data: Transfusions during Cesarean Hysterectomy



- Across MPOG sites, more than half of cesarean hysterectomies received a blood transfusion.
- A common indication for unplanned cesarean hysterectomy is uterine atony, which can lead to PPH. Higher rates of transfusion for this patient population is expected due to the patient's acuity.

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Section II:
Obstetric Hemorrhage Defined

MPOG
MULTICENTER PERIOPERATIVE
OUTCOMES GROUP

Obstetric Hemorrhage Categories

Antepartum hemorrhage (APH) - before delivery[1]

Postpartum hemorrhage (PPH) - after delivery[2]

- Primary vs. Secondary
- Severe vs. Life-threatening

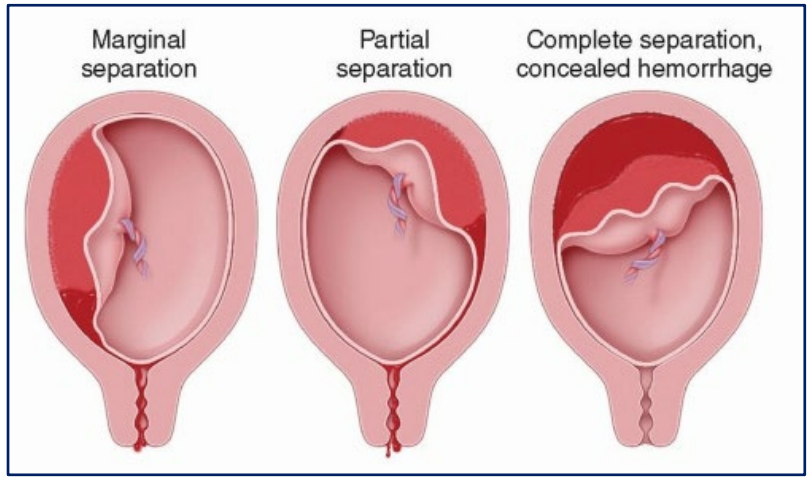
References:

1. Wormer, K. C., Jamil, R. T., & Bryant, S. B. (2023). *Acute Postpartum Hemorrhage*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK499988/
2. Munoz, M., Stensballe,. J., Ducloy-Bouthors, A., Bonnet, M., DeRobertis, E., Fornet, I., Goffinet, F., Hofer, S., Holzgreve, W., Manrique, S., Nizard, J., Christoru, F., Samama, C., Hardy, J. (2019) *Blood Transfusion Vol 17; 112-36.* "Patient Blood Management in Obstetrics: Prevention and Treatment of Postpartum Haemorrhage. A NATA Consensus Statement.
3. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
4. Bellamy, C. (2024, February). *Black women may prefer Black OBs due to fear of discrimination, dying during pregnancy*. NBC News. https://www.nbcnews.com/health/health-news/black-woman-may-prefer-black-obs-due-fear-discrimination-dying-pregnan-rcna138456

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

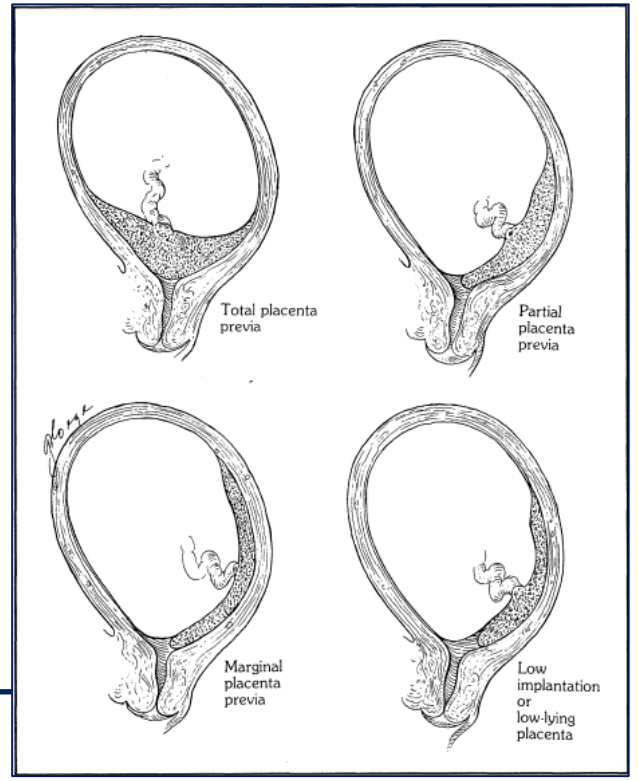
Antepartum Hemorrhage Considerations

- Common causes of APH include placenta previa, cervical bleeding and placental abruption[1].
- Treatment may include antenatal corticosteroid (once bleeding is controlled) between 24 and 32 weeks if preterm birth is anticipated[1]. Type and crosscheck should be completed at admission to avoid delays in receiving blood if needed.
- Immediate delivery of fetus if fetal or maternal health is compromised/suspected[1].
- The OB anesthesia team will plan for PPH and may notify the blood bank for potential Massive Transfusion Protocol[1].



Placental abruption [3]

Types of Placenta Previa [2]



References:
1. Linder, Grace E., and Tina S. Ipe. 2022. "Pregnancy and Postpartum Transfusion." *Annals of Blood* 7 (March): 12–12
2. Hacker NF, Moore JG, editors: *Essentials of obstetrics and gynecology,* 2nd ed. Philadelphia, WB Saunders, 1992, p 156.
3. Casanova R, Beckmann CRB, Ling FW, et al. *Beckmann and Ling's Obstetrics and Gynecology*. 8th ed. Philadelphia, PA: Wolters Kluwer; 2018.

PPH: Primary vs. Secondary

- **Primary (PPH)**: Blood loss > 1000 ml regardless of mode of delivery or bleeding associated with signs of hypovolemia within 24 hours of the birth process.[1]
- **Secondary PPH**: Blood loss of more than 500ml > 24 hours after delivery[1]

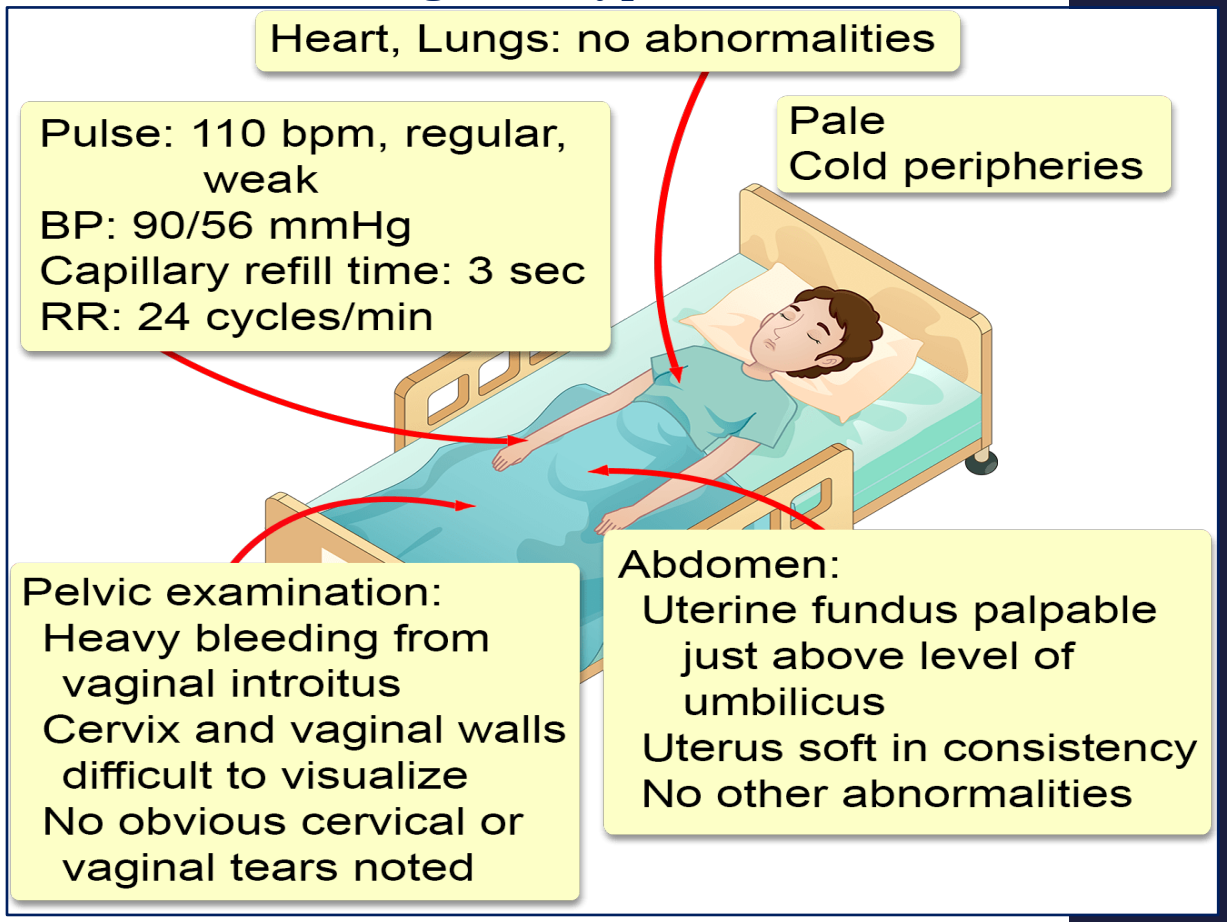
ACOG states that blood loss > 500 ml at time of delivery is abnormal and may warrant intervention.[1]

References:
1. Wormer, K. C., Jamil, R. T., & Bryant, S. B. (2023). *Acute Postpartum Hemorrhage*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK499988/

PPH: Severe vs. Life-threatening

- **Severe**: Ongoing blood loss of > 1,000 mL within 24 hours or blood loss accompanied by signs/symptoms of hypovolemia.[1]
- **Life-threatening**: Ongoing blood loss of >2,500 mL, or hypovolemic shock, no matter the mode of delivery.[2]

Signs of hypovolemia[3]



References:

1. Wormer, K. C., Jamil, R. T., & Bryant, S. B. (2023). *Acute Postpartum Hemorrhage*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK499988/
2. Munoz, M., Stensballe,. J., Ducloy-Bouthors, A., Bonnet, M., DeRobertis, E., Fornet, I., Goffinet, F., Hofer, S., Holzgreve, W., Manrique, S., Nizard, J., Christoru, F., Samama, C., Hardy, J. (2019) *Blood Transfusion Vol 17; 112-36.* "Patient Blood Management in Obstetrics: Prevention and Treatment of Postpartum Haemorrhage. A NATA Consensus Statement." Accessed April 17, 2024.
3. *Clinical Odyssey: Interactive case study*. (November 29, 2020.). Retrieved October 7, 2024, from https://clinicalodyssey.com/lm/pd-after-birth-postpartum-hemorrhage

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Stages of Postpartum Hemorrhage (PPH)

1

Stage 1:

Blood Loss > 500 mL vaginal or > 1000 mL cesarean with normal labs and vitals [1,2]

2

Stage 2:

Continued bleeding (up to 1500 mL *or* > 2 uterotonics) with normal labs and vitals[1]

3

Stage 3:

Continued bleeding EBL >1500 mL *or* > 2 RBCs administered *or* risk for occult bleeding coagulopathy *or* abnormal vitals/labs/oliguria[1]

4

Stage 4:

Cardiovascular collapse (massive hemorrhage, profound hypovolemic shock)[1]

Obstetric hemorrhage care guidelines flowchart: CMQCC Toolkit

References:

1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
2. ACOG. Practice Bulletin #183. Obstet & Gynecol 2017;130(4):e168-186.

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Section III: Management of Obstetric Hemorrhage

Overview of Management of OB Hemorrhage

1. Assessment & management of risk factors in each phase of pregnancy
2. Care of Patients Refusing Blood Products
3. Preparation of hemorrhage cart and checklist
4. Readiness among team members to prepare for obstetric hemorrhage
   - Recognizing stages of hemorrhage
   - Familiarity with interventions associated with each stage.
5. Culture of learning.
   - Host team debrief sessions after hemorrhage event.
   - Conduct multidisciplinary review after severe and life-threatening hemorrhage events.
   - Monitor outcomes associated with obstetric hemorrhage.

Labor and Delivery teams have developed policies and processes to manage OB hemorrhage.

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

#1 Assessment of Risk Factors

MPOG
MULTICENTER PERIOPERATIVE
OUTCOMES GROUP

Clinical Assessment

Antepartum

+ Imaging reviewed to assess patient for placenta previa, accreta, increta, or precreta.[1]

+ Plan developed to admit patient to higher lever of care if placenta accreta spectrum disorders are identified.[1]

+ Anemia assessed and treated as appropriate.[2-5]

Upon Admission

+ Coagulation disorders and anemia assessed. Risk stratification performed. Blood bank notified as indicated for scheduled or unscheduled birth.[3]

+ Multidisciplinary consultation for patients with hematologic disorders for delivery and anesthetic planning.

Postpartum

+ Uterine atony assessed: will feel soft, boggy, non-contracted.[6-7]

+ Genital lacerations or retained placenta assessed which may be source of bleeding.[7]

+ Ongoing surveillance after hemostasis is achieved to identify worsening/delayed PPH.[1]

References:

1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
2. Smith, C, Teng, F., Branch, E., Chu, S., and K. S. Joseph. 2019. "Maternal and Perinatal Morbidity and Mortality Associated With Anemia in Pregnancy." *Obstetrics and Gynecology* 134 (6): 1234–44.
3. ASCLS. August 2022. Volume 36, Number 4. "Improving Obstetric Patient Safety with Better Massive Transfusion Protocols - ASCLS." Accessed December 22, 2023. https://ascls.org/improving-obstetric-patient-safety-with-better-massive-transfusion-protocols/.
4. *Iron*. (2023). Retrieved May 13, 2024, from https://ods.od.nih.gov/factsheets/Iron-HealthProfessional/
5. Qassim, A., Grivell, R. M., Henry, A., Kidson-Gerber, G., Shand, A., & Grzeskowiak, L. E. (2019). Intravenous or oral iron for treating iron deficiency anemia during pregnancy: systematic review and meta-analysis. *The Medical Journal of Australia*, *211*(8), 367–373. https://doi.org/10.5694/mja2.50308
6. Gill, P., Patel, A., & Van Hook, J. W. (2023). *Uterine Atony*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK493238/
7. Wormer, K. C., Jamil, R. T., & Bryant, S. B. (2023). *Acute Postpartum Hemorrhage*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK499988/

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Risk Assessment during pregnancy

Placenta Accreta Spectrum

- Assess patient for possible placenta previa/accreta/increta/precreta- these conditions increase patients' risk for PPH. Obtain necessary imaging studies for the conditions. Transfer to appropriate level of care if accreta is suspected.[1]

Anemia

- Early treatment of anemia can reduce morbidity and mortality.[2]
  - Anemia in pregnancy is a worldwide health concern. WHO estimates 40% of pregnant women are anemic.
  - During pregnancy women experience physiologic anemia, due to an increase in plasma volume that causes a dilutional effect.[3]
  - During pregnancy and lactation, the recommended daily allowance for Iron is 27 mg. This can be obtained by eating a whole foods diet and taking prenatal vitamins.[4]
- Qassim et al found no significant difference in first line therapy with IV iron vs oral administration for treating Iron Deficiency Anemia (IDA) in pregnancy.[5]

References:

1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
2. Smith, C, Teng, F., Branch, E., Chu, S., and K. S. Joseph. 2019. "Maternal and Perinatal Morbidity and Mortality Associated With Anemia in Pregnancy." *Obstetrics and Gynecology* 134 (6): 1234–44.
3. ASCLS. August 2022. Volume 36, Number 4. "Improving Obstetric Patient Safety with Better Massive Transfusion Protocols - ASCLS." Accessed December 22, 2023. https://ascls.org/improving-obstetric-patient-safety-with-better-massive-transfusion-protocols/.
4. *Iron*. (2023). Retrieved May 13, 2024, from https://ods.od.nih.gov/factsheets/Iron-HealthProfessional/
5. Qassim, A., Grivell, R. M., Henry, A., Kidson-Gerber, G., Shand, A., & Grzeskowiak, L. E. (2019). Intravenous or oral iron for treating iron deficiency anemia during pregnancy: systematic review and meta-analysis. *The Medical Journal of Australia*, *211*(8), 367–373. https://doi.org/10.5694/mja2.50308

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Risk Factors for OB Hemorrhage

Before Pregnancy	Antepartum	Intra/Post-Partum
• Grand Multiparity (≥ 5 births) • Maternal Age <19 • Maternal Age >35 • Prior Cesarean Delivery	• Placenta accreta spectrum • Diabetes • Fibroids • Hypertensive Disease of Pregnancy • Infection • Macrosomia (>4,000g) • Multiple Gestation • Placenta Previa/Abruption • Polyhydramnios	• Cesarean Delivery • Instrumental Vaginal Delivery • Medical Induction of Labor

References:
1. Linder, Grace E., and Tina S. Ipe. 2022. "Pregnancy and Postpartum Transfusion." *Annals of Blood* 7 (March): 12–12.
2. Munoz, M., Stensballe,. J., Ducloy-Bouthors, A., Bonnet, M., DeRobertis, E., Fornet, I., Goffinet, F., Hofer, S., Holzgreve, W., Manrique, S., Nizard, J., Christoru, F., Samama, C., Hardy, J. (2019) *Blood Transfusion Vol 17; 112-36.* "Patient Blood Management in Obstetrics: Prevention and Treatment of Postpartum Haemorrhage. A NATA Consensus Statement." Accessed April 17, 2024.

OB Hemorrhage Risk Assessment Tools

California Maternal Quality Care Collaborative[1]

Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN)[2]

American College of Obstetricians and Gynecologists Safe Motherhood Initiative[3]

Appendix K: Obstetric Hemorrhage Risk Factor Assessment Screen

(Risk factors added since Obstetric Hemorrhage Toolkit V2.0, 2015, are shaded)
Blood bank recommendations should be highly localized. *Many institutions no longer hold a specimen in the blood bank, others utilize automated technology to type and screen all obstetric patients. An example of a risk-based approach is included in the table below.*

ADMISSION AND LABOR RISK FACTORS		
Low	**Medium**	**High**
MONITOR FOR HEMORRHAGE *Routine obstetric care*	**NOTIFY CARE TEAM** *Personnel that could be involved in response are made aware of patient status and risk factors*	**NOTIFY CARE TEAM MOBILIZE RESOURCES** *Consider anesthesia attendance at delivery*
Specimen on hold in blood bank	*Type and screen*	*Type and cross, 2 units on hold*
No previous uterine incision	Prior cesarean(s) or uterine surgery	Placenta previa, low lying placenta
Singleton pregnancy	Multiple gestation	Suspected/known placenta accreta spectrum
≤ 4 vaginal births	> 4 vaginal births	Abruption or active bleeding (> than show)
No known bleeding disorder	Chorioamnionitis	Known coagulopathy
No history of PPH	History of previous postpartum hemorrhage	History of > 1 postpartum hemorrhage
	Large uterine fibroids	HELLP Syndrome
	Platelets 50,000 - 100,000	Platelets < 50,000
	Hematocrit < 30% (Hgb < 10)	Hematocrit < 24% (Hgb < 8)
	Polyhydramnios	Fetal demise
	Gestational age < 37 weeks or > 41 weeks	2 or more medium risk factors
	Preeclampsia	
	Prolonged labor/Induction (> 24 hrs)	

AWHONN hemorrhage risk assessment[29].

Low risk	Medium risk*	High risk
No previous uterine incision ≤ 4 Previous vaginal births No known bleeding disorder No history of PPH Singleton pregnancy	Induction of labor > 4 Prior vaginal births Prior cesarean birth or prior uterine incision Large uterine fibroids History of one previous PPH Chorioamnionitis Fetal demise Morbid obesity (BMI > 35) Estimated fetal weight > 4 kg Family history in first degree relative who experienced PPH Polyhydraminos	Active bleeding more than bloody show Suspected accreta or percreta Placenta previa, low lying placenta Known coagulopathy History of more than one previous PPH Hematocrit < 30 and other risk factors Platelets < 100 k

AWHONN Association of Women's Health, Obstetric and Neonatal Nurses, *PPH* Postpartum hemorrhage, *BMI* body mass index.

*If two or more medium risk items are found then that classifies as 'high risk'.

OBSTETRIC HEMORRHAGE

Risk Assessment Tables

LABOR & DELIVERY ADMISSION

	MEDIUM RISK	HIGH RISK
RISK FACTORS	☐ Prior cesarean, uterine surgery, or multiple laparotomies	☐ Placenta previa/low lying
	☐ Multiple gestation	☐ Suspected accreta/percreta
	☐ › 4 prior births	☐ Platelet count ‹ 70,000
	☐ Prior PPH	☐ Active bleeding
	☐ Large myomas	☐ Known coagulopathy
	☐ EFW › 4000 g	☐ 2 or more medium risk factors
	☐ Obesity (BMI › 40)	/
	☐ Hematocrit ‹ 30% & other risk	/
INTERVENTION	☐ Type & SCREEN, review protocol	☐ Type & CROSS, review protocol

References:
1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
2. Colalillo EL, Sparks AD, Phillips JM, Onyilofor CL, Ahmadzia HK. Obstetric hemorrhage risk assessment tool predicts composite maternal morbidity. Sci Rep. 2021 Jul 19;11(1):14709. doi: 10.1038/s41598-021-93413-3. PMID: 34282160; PMCID: PMC8289851.
3. ACOG. January 2019. Obstetric Hemorrhage. Risk Assessment Tables. https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-ob-hemorrhage-bundle-risk-assessment-ld-admin-intrapartum.pdf

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

California Maternal Quality Care Collaborative[1]

Appendix K: Obstetric Hemorrhage Risk Factor Assessment Screen

(Risk factors added since Obstetric Hemorrhage Toolkit V2.0, 2015, are shaded)
Blood bank recommendations should be highly localized. *Many institutions no longer hold a specimen in the blood bank, others utilize automated technology to type and screen all obstetric patients. An example of a risk-based approach is included in the table below.*

ADMISSION AND LABOR RISK FACTORS		
Low	**Medium**	**High**
MONITOR FOR HEMORRHAGE *Routine obstetric care*	**NOTIFY CARE TEAM** *Personnel that could be involved in response are made aware of patient status and risk factors*	**NOTIFY CARE TEAM** **MOBILIZE RESOURCES** *Consider anesthesia attendance at delivery*
Specimen on hold in blood bank	*Type and screen*	*Type and cross, 2 units on hold*
No previous uterine incision	Prior cesarean(s) or uterine surgery	Placenta previa, low lying placenta
Singleton pregnancy	Multiple gestation	Suspected/known placenta accreta spectrum
≤ 4 vaginal births	> 4 vaginal births	Abruption or active bleeding (> than show)
No known bleeding disorder	Chorioamnionitis	Known coagulopathy
No history of PPH	History of previous postpartum hemorrhage	History of > 1 postpartum hemorrhage
	Large uterine fibroids	HELLP Syndrome
	Platelets 50,000 - 100,000	Platelets < 50,000
	Hematocrit < 30% (Hgb < 10)	Hematocrit < 24% (Hgb < 8)
	Polyhydramnios	Fetal demise
	Gestational age < 37 weeks or > 41 weeks	2 or more medium risk factors
	Preeclampsia	
	Prolonged labor/Induction (> 24 hrs)	

Reference
1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.

Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN)[1]

AWHONN hemorrhage risk assessment[29].

Low risk	Medium risk*	High risk
No previous uterine incision ≤ 4 Previous vaginal births No known bleeding disorder No history of PPH Singleton pregnancy	Induction of labor > 4 Prior vaginal births Prior cesarean birth or prior uterine incision Large uterine fibroids History of one previous PPH Chorioamnionitis Fetal demise Morbid obesity (BMI > 35) Estimated fetal weight > 4 kg Family history in first degree relative who experienced PPH Polyhydraminos	Active bleeding more than bloody show Suspected accreta or percreta Placenta previa, low lying placenta Known coagulopathy History of more than one previous PPH Hematocrit < 30 and other risk factors Platelets < 100 k

AWHONN Association of Women's Health, Obstetric and Neonatal Nurses, *PPH* Postpartum hemorrhage, *BMI* body mass index.

*If two or more medium risk items are found then that classifies as 'high risk'.

Reference:
1. Colalillo EL, Sparks AD, Phillips JM, Onyilofor CL, Ahmadzia HK. Obstetric hemorrhage risk assessment tool predicts composite maternal morbidity. Sci Rep. 2021 Jul 19;11(1):14709. doi: 10.1038/s41598-021-93413-3. PMID: 34282160; PMCID: PMC8289851.

American College of Obstetricians and Gynecologists Safe Motherhood Initiative[1]

Reference:
1. ACOG. January 2019. Obstetric Hemorrhage. Risk Assessment Tables. https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-ob-hemorrhage-bundle-risk-assessment-ld-admin-intrapartum.pdf

Obstetric Hemorrhage

Risk Assessment Tables

Labor & Delivery Admission		
	Medium Risk	**High Risk**
RISK FACTORS	☐ Prior cesarean, uterine surgery, or multiple laparotomies	☐ Placenta previa/low lying
	☐ Multiple gestation	☐ Suspected accreta/percreta
	☐ › 4 prior births	☐ Platelet count ‹ 70,000
	☐ Prior PPH	☐ Active bleeding
	☐ Large myomas	☐ Known coagulopathy
	☐ EFW › 4000 g	☐ 2 or more medium risk factors
	☐ Obesity (BMI › 40)	/
	☐ Hematocrit ‹ 30% & other risk	/
INTERVENTION	☐ **Type & SCREEN, review protocol**	☐ **Type & CROSS, review protocol**

#2: Care of Patients Refusing Blood Products

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Standard Protocols and Processes

- Detailed discussion and documentation of each blood product as accepted or refused
- Plan for blood conservation techniques and hemorrhage discussed early among OB, anesthesia, and nursing teams
- Early intervention to prevent bleeding, hypothermia, and fluid deficits
- May need to move to surgical management quicker in this population.[1]

Supplemental Digital Content Table 1.
Blood conservation techniques used throughout the perioperative period.

Bloodless Medicine Techniques	
Preoperative	• Diagnosis and treatment of preoperative anemia • Management of iron deficiency anemia • Discontinuing anticoagulants appropriately
Intraoperative	• Maintaining perioperative normothermia • Intraoperative autologous cell salvage • Intraoperative acute normovolemic hemodilution • Controlled hypotension • Topical hemostatic agents • Antifibrinolytic drugs when indicated (tranexamic acid, aminocaproic acid) • Minimally invasive surgical techniques • Point-of-care coagulation testing (viscoelastic testing)
Postoperative	• Decreasing the frequency of blood draws • Utilizing pediatric-sized phlebotomy tubes • Tolerating lower hemoglobin levels • Inline blood return devices for arterial and central venous catheters

References:
1. Maternal Safety Bundle for OB Hemorrhage. *American College of Obstetrician and Gynecologists.* (2020). https://www.acog.org/community/districts-and-sections/district-ii/programs-and-resources/safe-motherhood-initiative/obstetric-hemorrhage

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

#3: Preparation of Hemorrhage Cart & Checklist

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Standard Medications and Supplies

- **Oxytocin:** administered via infusion (10-40 units in 500 mL or 20-60 in 1000 mL solution) or
  - IV Bolus -1-3 units to initiate tone, followed by an infusion of 30 units in 500 mL at 125 mL/hr.
  - If no IV access: Oxytocin 10 units IM [1,2]

  Note: Oxytocin dosing strategies are varied and will differ based on patient needs/presentation.

- **15-methyl PGF2a** (Carboprost / Hemabate): 250 mcg/ml IM. Avoid in patients with severe asthma.[1,2]

- **Misoprostol** (Cytotec): 200 mcg tablets administered in 600 mcg or 800 mcg doses sublingually. (Rectal administration is no longer recommended due to late onset of action).[1]

- **Methylergonovine** (Methergine): 0.2 mg/mL IM. Avoid in patients with poorly controlled hypertension[1]

- **Calcium**: consider 1 gram IV infused over 10 minutes after cord clamping[3]

- **Tranexamic acid** (TXA): 1 gram IV, can repeat in 30 minutes, max dose: 2 grams in 24 hours[4,5]

- Hysterectomy Tray and Intrauterine Balloon[6]

References:

1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
2. Jones AJ, Federspiel JJ, Eke AC. Preventing postpartum hemorrhage with combined therapy rather than oxytocin alone. Am J Obstet Gynecol MFM. 2023 Feb;5(2S):100731. doi: 10.1016/j.ajogmf.2022.100731. Epub 2022 Aug 24. PMID: 36028160; PMCID: PMC9941051.
3. Ansari, Jessica R., Alla Yarmosh, Guillermina Michel, Deirdre Lyell, Haley Hedlin, David N. Cornfield, Brendan Carvalho, and Brian T. Bateman. 2024. "Intravenous Calcium to Decrease Blood Loss During Intrapartum Cesarean Delivery: A Randomized Controlled Trial." *Obstetrics and Gynecology* 143 (1): 104–12.
4. Shakur, H., Roberts, I., Fawole, B., Chaudhri, R., El-Sheikh, M., Akintan, A., Qureshi, Z., Kidanto, H., Vwalika, B., Abdulkadir, A., Etuk, S., Noor, S., Asonganyi, E., Alfirevic, Z., Beaumont, D., Ronsmans, C., Arulkumaran, S., Grant, A., Afsana, K., … Faye, G. E. (2017). Effect of early tranexamic acid administration on mortality, hysterectomy, and other morbidities in women with post-partum haemorrhage (WOMAN): an international, randomised, double-blind, placebo-controlled trial. *The Lancet*, *389*(10084), 2105–2116. https://doi.org/10.1016/S0140-6736(17)30638-4
5. Chauncey, J. M., & Wieters, J. S. (2023). *Tranexamic Acid*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK532909/
6. Maternal Safety Bundle for OB Hemorrhage. *American College of Obstetrician and Gynecologists.* (2020). https://www.acog.org/community/districts-and-sections/district-ii/programs-and-resources/safe-motherhood-initiative/obstetric-hemorrhage

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Hemorrhage Cart

A well stocked Hemorrhage Cart should contain:

- **Emergency hemorrhage supplies:**
  - IV start supplies
  - hemorrhage balloons and supplies
  - urinary catheters
  - sutures
  - pressure infuser bags
  - policy and procedure binder and laminated handouts that are easy to read easily accessible
- **Associated equipment**
  - stepstool
  - bright task light on wheels
  - ultrasound machine
  - crash cart- stocked and routinely checked by staff responsible [2]

References:
1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
2. Designating an Effective Emergency Coordinator Environment of Care. (2021). The Joint Commission. Emergency Management, 24(7). https://store.jcrinc.com/assets/1/7/ECN_24_2021_07.pdf

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Treating Uterine Atony

The rule of threes was developed due to variation in initial doses of oxytocin, lack of an existing protocol for step-wise increase in uterotonic agents, and normalization of deviance from standard dosages of oxytocin.[1]

Oxytocin protocol for cesarean delivery: Rule of threes
3 IU oxytocin intravenous loading dose administered no faster than 15 seconds
3 min assessment intervals. If inadequate uterine time, give 3- IU oxytocin intravenous rescue dose.
3 total doses of oxytocin (initial load + 2 rescue doses)
3 IU oxytocin intravenous maintenance dose (3 IU/L at 100 mL/hr)
3 Pharmacologic options (e.g. ergonovine, carboprost and misoprostol) if inadequate uterine tone persists
**An initial dose of 3 IU oxytocin is sufficient for effective uterine contractions for both non-laboring and laboring women. Preferably this dose should be administered in the form of a rapid infusion, rather than a bolus. Maintenance oxytocin infusion can be administered for up to 8 hr following delivery.

References:

1. Tsen, L. C., & Balki, M. (2010). Oxytocin protocols during cesarean delivery: time to acknowledge the risk/benefit ratio? *International Journal of Obstetric Anesthesia*, *19*(3), 243–245. https://doi.org/10.1016/j.ijoa.2010.05.001

#4: Ensure Readiness of Team Members

MPOG
MULTICENTER PERIOPERATIVE
OUTCOMES GROUP

Team Readiness

#1: Understanding stages of hemorrhage

#2: Familiarity with interventions associated with each stage

3: Evaluation and monitoring practices available within team's healthcare setting

#4: Regular review of hospital's policy on massive transfusion protocol and PPH treatment

Stage 1: blood loss > 500 mL vaginal or > 1000 mL cesarean with normal labs and vitals

Initial steps:

1. Ensure 16- or 18-gauge IV access.
2. Increase IV fluid (crystalloid without oxytocin)
3. Insert urinary catheter.
4. Begin fundal massage [1]

Medications:

1. Increase oxytocin if indicated
2. Consider Methylergonovine, 15-methyl PGF or Misoprostol

Contact Blood Bank:

1. Contact Blood Bank- (early) [2]
2. Type and Crossmatch 2 units RBCs [1]

Action:

1. Determine cause and treatment. Continually assess tone, trauma, tissue and thrombin, or coagulation dysfunction.
2. Prepare for OR if clinically indicated [1]

References:

1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
2. ASCLS. August, 2022. Volume 36, Number 4. "Improving Obstetric Patient Safety with Better Massive Transfusion Protocols - ASCLS." Accessed December 22, 2023. https://ascls.org/improving-obstetric-patient-safety-with-better-massive-transfusion-protocols/.

Stage 2: continued bleeding up to 1500 mL or > 2 uterotonics with normal labs and vitals

Initial steps

1. Request additional help/resources (RRT, Anesthesiologist, OB, RN, Hemorrhage cart, record scribe, assign one person to communicate with blood bank and one person to communicate with family)[1]
2. Place second IV
3. Draw stat labs (CBC, coags, fibrinogen), use point of care viscoelastic testing if available.
4. Prepare OR

Medications (See slide 32)

1. Continue stage 1 medications: consider TXA
2. TXA dose: 1 gram over 10 minutes. Add 1 gram vial to 10 mL NS or 100 ml NS and give over 10 minutes, may be repeated once after 30 min

Blood Bank

1. Patient currently bleeding and at risk for uncontrollable bleeding
    i. Review steps of MTP and call Blood bank and initiate massive transfusion protocol
    ii. Nursing/anesthesia draw stat labs
        a. Immediate need for transfusion (type and crossmatch not yet available)

Action

1. Uterine Atony: consider uterine balloon or packing, possible surgical intervention.
2. Consider moving patient to OR
3. Escalate therapy with goal of hemostasis [1]

All obstetric units need a massive transfusion protocol for the initial management of life threatening PPH and consider early therapy of RBCs and FFP. [1]

References:
1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
2. ASCLS. August 2022. Volume 36, Number 4. "Improving Obstetric Patient Safety with Better Massive Transfusion Protocols - ASCLS." Accessed December 22, 2023. https://ascls.org/improving-obstetric-patient-safety-with-better-massive-transfusion-protocols/.

Stage 3: bleeding > 1500 mL or > 2 RBCs or at risk for occult bleeding/coagulopathy or abnormal vitals/labs/oliguria

Initial steps

1. Request additional help and resources/staff
    i. continue communication with family.
    ii. Reidentify team leadership
2. Move patient to OR
3. Announce clinical status (vitals, cumulative blood loss, etiology)
4. Outline and communicate plan

Medications (See slide 32)

1. Continue stage 1 medications; consider TXA

Contact Blood Bank

1. Clinical signs of blood loss > 1500
    1. Hypotension, narrowed pulse pressure, marked tachycardia, tachypnea, pale, cool extremities, restlessness, decreased urine output
2. Initiate Massive Transfusion protocol
3. If clinical coagulopathy, add cryoprecipitate, consult for additional agents [1]

Action

1. Achieve hemostasis, intervention at this stage will be based on the cause of bleeding.
2. Escalate interventions and prevent hypothermia [2]

Possible interventions:

1. Bakri balloon
2. Compression suture/B-Lunch suture
3. Uterine artery ligation
4. Hysterectomy

References:
1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
2. ASCLS. August 2022. Volume 36, Number 4. “Improving Obstetric Patient Safety with Better Massive Transfusion Protocols - ASCLS.” Accessed December 22, 2023. https://ascls.org/improving-obstetric-patient-safety-with-better-massive-transfusion-protocols/

Stage 4: cardiovascular collapse (massive hemorrhage, profound hypovolemic shock)

Initial Step

1. Request additional help and resources (Additional provider, charge RN, RRT Staff) [1]

Medications

1. ACLS Medications [2]

Blood Bank

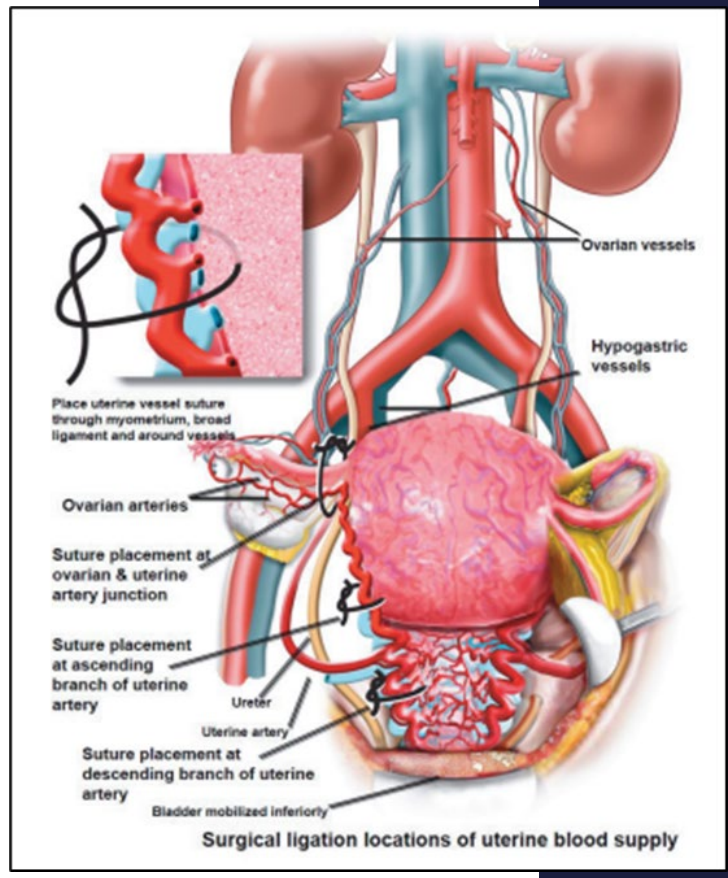
1. Clinical signs/symptoms: profound hypotension, worsening tachycardia and tachypnea, negligible urine output or anuria, altered level of consciousness [1]
2. Simultaneous aggressive massive transfusion

Action

1. Immediate surgical intervention to ensure hemostasis- possible hysterectomy [1]

Post-hemorrhage management

1. Determine disposition of patient
2. Debrief with entire team
3. Debrief with patient and family (continuous through event)
4. Document events [1]



Surgical ligation locations of uterine blood supply

References:

1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
2. ASCLS. August 2022. Volume 36, Number 4. "Improving Obstetric Patient Safety with Better Massive Transfusion Protocols - ASCLS." Accessed December 22, 2023. https://ascls.org/improving-obstetric-patient-safety-with-better-massive-transfusion-protocols/

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

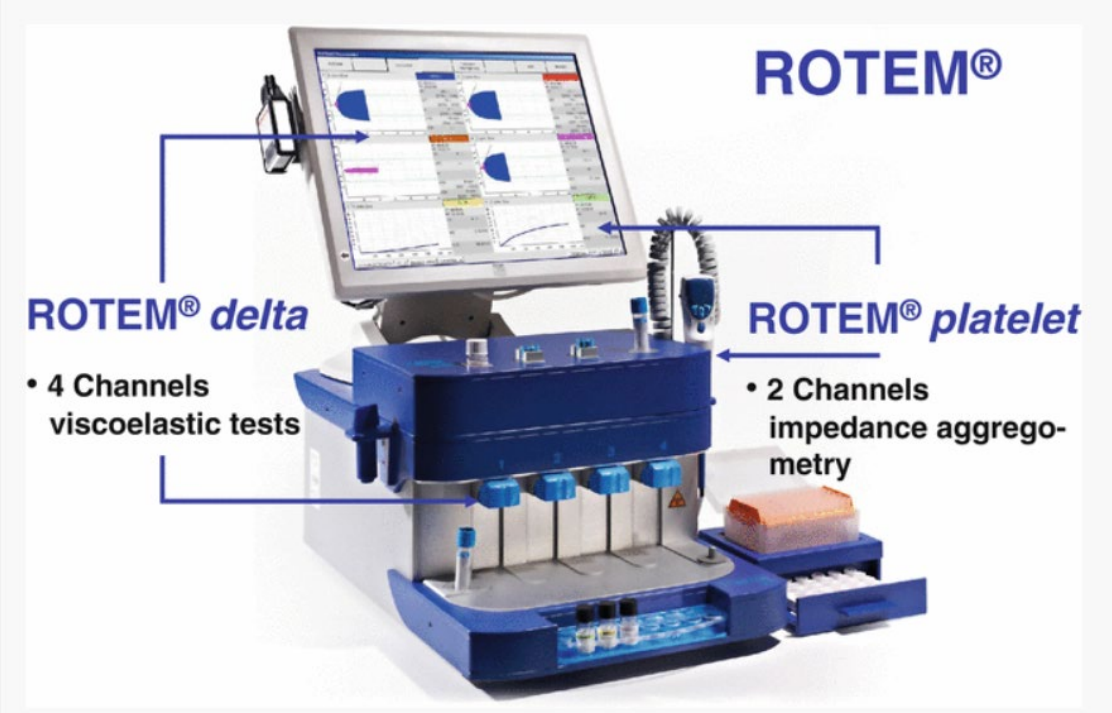
Viscoelastometric Testing

Rotational Thromboelastometry (ROTEM)

- Point of care testing device
- Provides a global assessment of hemostasis by using a whole blood sample to demonstrate how platelets, coagulation factors, RBCs, and other elements work together to:
  - initiate a clot
  - determine clot strength; and
  - investigate if there is any fibrinolysis[1].
- Used in the management of bleeding because it can quickly assess the state of hemostasis and can direct care.

References:
1. Drotarova M, Zolkova J, Belakova KM, Brunclikova M, Skornova I, Stasko J, Simurda T. Basic Principles of Rotational Thromboelastometry (ROTEM®) and the Role of ROTEM-Guided Fibrinogen Replacement Therapy in the Management of Coagulopathies. Diagnostics (Basel). 2023 Oct 16;13(20):3219. doi: 10.3390/diagnostics13203219. PMID: 37892040; PMCID: PMC10606358.

Viscoelastometric Testing



Used to analyze various aspects of clotting cascade.

- INTEM
  - Intrinsic system screening test
- EXTEM
  - Extrinsic system screening test
- FIBTEM
  - Isolated fibrinogen contribution to clot firmness

Point-of-care viscoelastic testing (ROTEM) helps reduce unnecessary transfusions[1]

MPOG TEG & ROTEM Concepts

References:
1. Gonzalez E, Moore EE, Moore HB. Management of Trauma-Induced Coagulopathy with Thrombelastography. Crit Care Clin. 2017 Jan;33(1):119-134. doi: 10.1016/j.ccc.2016.09.002. PMID: 27894492; PMCID: PMC5142763
Department of Anesthesiology

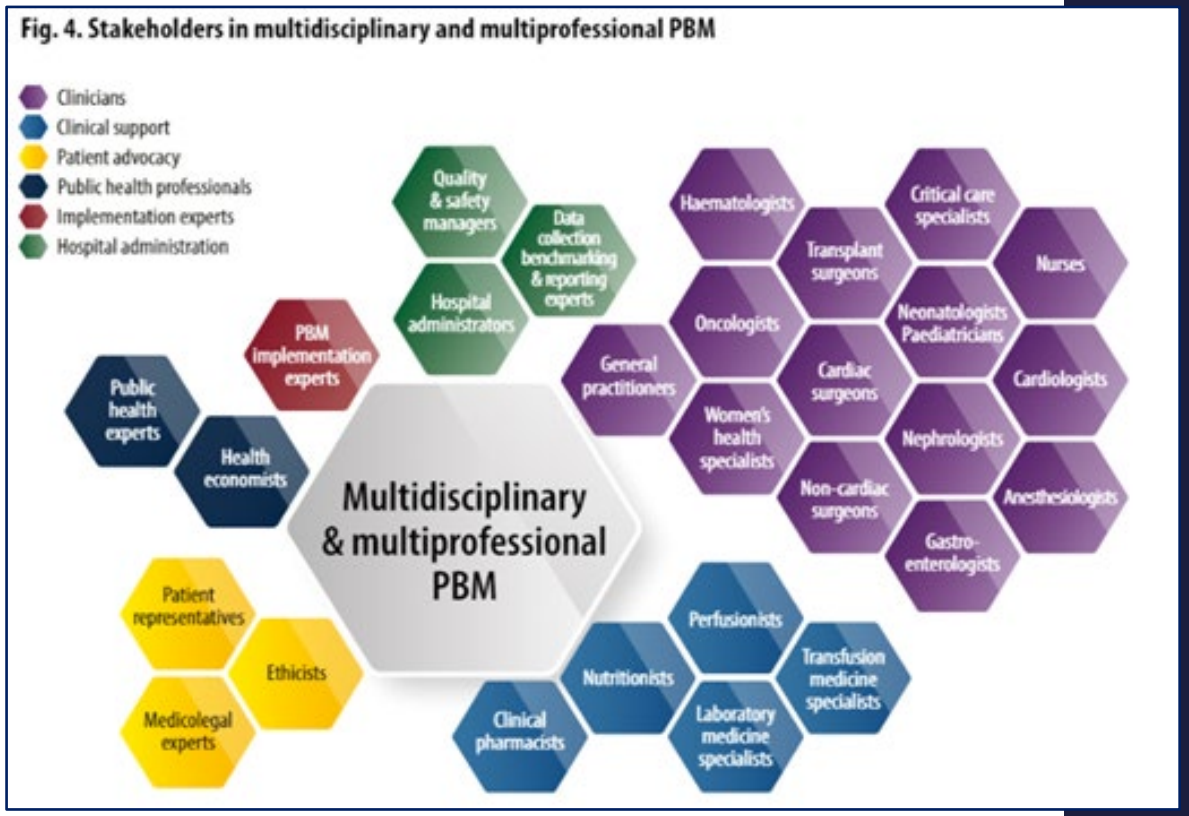
MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

#5: Foster a Culture of Learning

MPOG
MULTICENTER PERIOPERATIVE
OUTCOMES GROUP

Organizational Preparedness

- Establish a culture of debriefs/huddles and multidisciplinary reviews.[1]
- Monitor outcomes and trends for your department and patient population.
- Conduct drills at least once a year to ensure staff are prepared for an OB emergency.[2]



References:
1. Lagrew D, McNulty J, Sakowski C, Cape V, McCormick E, Morton CH. Improving Health Care Response to Obstetric Hemorrhage, a California Maternal Quality Care Collaborative Toolkit, 2022.
2. ASCLS. August 2022. Volume 36, Number 4. "Improving Obstetric Patient Safety with Better Massive Transfusion Protocols - ASCLS." Accessed December 22, 2023. https://ascls.org/improving-obstetric-patient-safety-with-better-massive-transfusion-protocols/
3. World Health Organization "WHO Policy Brief." 2021 https://iris.who.int/bitstream/handle/10665/346655/9789240035744-eng.pdf?sequence

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Educational Resources for Clinicians and Patients

- Center for Disease Control and Prevention – Hear Her Campaign[1]
  - Resources available for people who are pregnant or post-partum, their care takers or healthcare workers.
  - Aim: Raise awareness regarding maternal warning signs during and after pregnancy and improve communication between health care providers and patients.
  - 18 languages available
- Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) – Post-Birth discharge education program for clinicians[2]
  - Online course with resources to educate nurses and clinicians about postpartum maternal morbidity and mortality in the US.
- Alliance for Innovation on Maternal Health (right) [3]
  - Quality Improvement initiative identifying best practices to make birth safer & improve maternal health outcomes.
  - 80 languages available.

References:
1. CDC. (2024, May 20). Hear Her Campaign: An Overview. HEAR HER Campaign. https://www.cdc.gov/hearher/about/index.html
2. Doolin, S. (2020, January 5). POST-BIRTH Warning Signs Education Program. AWHONN. https://www.awhonn.org/education/hospital-products/post-birth-warning-signs-education-program/
3. Urgent Maternal Warning Signs. (2024, August 6). AIM. https://saferbirth.org/aim-resources/aim-cornerstones/urgent-maternal-warning-signs-2/

Section IV:
Additional Recommendations

ACOG Maternal Safety Recommendations

KEY ELEMENTS: OBSTETRIC HEMORRHAGE BUNDLE

- RECOGNITION & PREVENTION (every patient)
  - Risk assessment
  - Universal active management of 3rd stage of labor
- READINESS (every unit)
  - Blood bank (massive transfusion protocol)
  - Cart & medication kit
  - Hemorrhage team with education & drills for all stakeholders
- RESPONSE (every hemorrhage)
  - Checklist
  - Support for patients/families/staff for all significant hemorrhages
- REPORTING / SYSTEMS LEARNING (every unit)
  - Culture of huddles & debrief
  - Multidisciplinary review of serious hemorrhages
  - Monitor outcomes & processes metrics

ACOG

References:

1. Maternal Safety Bundle for OB Hemorrhage. *American College of Obstetrician and Gynecologists.* (2020). https://www.acog.org/-/media/project/acog/acogorg/files/forms/districts/smi-ob-hemorrhage-bundle-slides.pdf

MPOG MULTICENTER PERIOPERATIVE OUTCOMES GROUP

Society for Obstetric Anesthesia and Perinatology (SOAP) Guidelines

Obstetric Anesthesiology

SPECIAL ARTICLE

Society for Obstetric Anesthesia and Perinatology: Consensus Statement and Recommendations for Enhanced Recovery After Cesarean

Laurent Bollag, MD,* Grace Lim, MD, MS,† Pervez Sultan, MBChB, FRCA,‡
Ashraf S. Habib, MBBCh, MSc, MHSc, FRCA,§ Ruth Landau, MD,‖ Mark Zakowski, MD,¶
Mohamed Tiouririne, MD,# Sumita Bhambhani, MD,** and Brendan Carvalho, MBBCh, FRCA‡

In 2019, SOAP published a summary of their Enhanced Recovery After Cesarean Delivery (ERAC) protocol, developed by six providers and approved by the SOAP Board of Directors. The goal of the consensus statement was to provide practical and evidence-based recommendations regarding ERAC. The recommendations are as follows[1]:

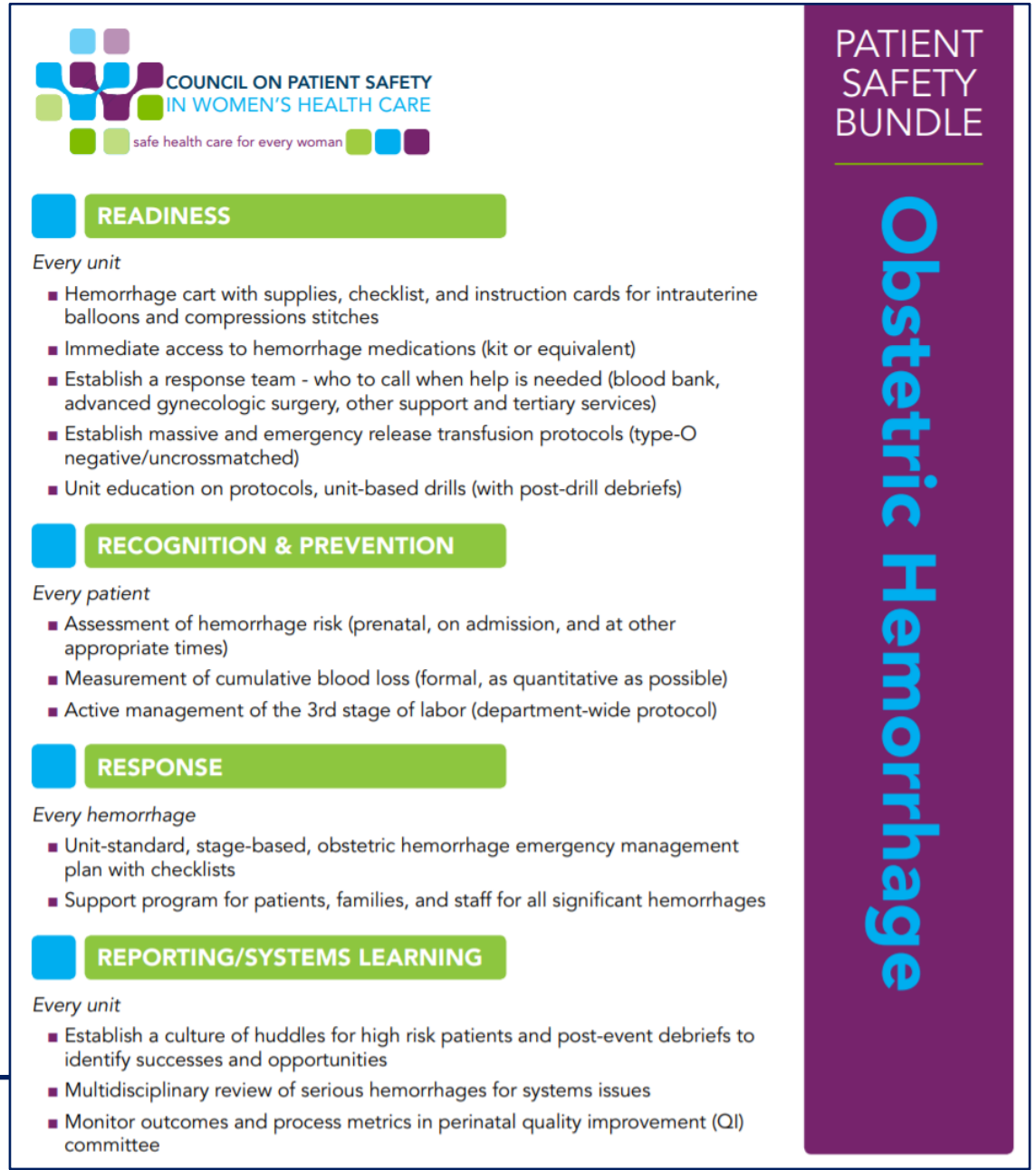
1. Use the lowest effective dose of oxytocin for cesarean delivery:
   a. Scheduled Cesarean Delivery: 1 unit bolus + 2.5-7.5 U/hr
   b. Intrapartum Cesarean Delivery: 3 U bolus + 7.5-15 U/hr
2. Limit IV fluids to < 3 L for routine cases.

References:
1. Bollag L, Lim G, Sultan P, Habib AS, Landau R, Zakowski M, Tiouririne M, Bhambhani S, Carvalho B. Society for Obstetric Anesthesia and Perinatology: Consensus Statement and Recommendations for Enhanced Recovery After Cesarean. Anesth Analg. 2021 May 1;132(5):1362-1377. doi: 10.1213/ANE.0000000000005257. PMID: 33177330

Council on Patient Safety in Women's Health Care

Recommendations from the Alliance for Innovation on Maternal Health

- Prepare hemorrhage cart
- Ensure emergency release blood available
- Perform regular risk assessments for hemorrhage



Reference

1. Obstetric Emergency Readiness Resource Kit. (2023). https://saferbirth.org/wp-content/uploads/FINAL_AIM_OERRK.pdf

Summary

- Maternal mortality rates in the US continue to rise while it is decreasing in other developed countries.
- Early identification of PPH is important in reducing maternal mortality because many deaths are preventable.
- Point-of-care viscoelastic testing (ROTEM) helps reduce unnecessary transfusions.
- Review your hospitals Blood Bank and Emergency Release policies to ensure staff are prepared to treat PPH
- Establish a process to review your site's MPOG specific outcome and process measures
- For more information, please visit the Patient Blood Management Transfusion Toolkit page on the MPOG website

MPOG
MULTICENTER PERIOPERATIVE OUTCOMES GROUP