

# Massive Hemorrhage in the Obstetrical Patient

Dr. Heather VanderMeulen, MD, MSc, FRCPC  
Hematologist & Transfusion Medicine Specialist  
Sunnybrook Health Sciences Centre

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# Faculty Disclosure

*In compliance with CPD policy,  
Temerty Faculty of Medicine  
requires the following disclosures  
to the session audience*

- This program has received no financial external support
- I have no relevant conflicts of interest to disclose
- I will use the term “woman” and “mother”. I acknowledge that these terms are exclusive, and the experiences may apply to all those with the anatomy for childbirth.



# Outline

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1. The epidemiology of massive obstetrical bleeding
2. The management of the massively bleeding peripartum patient: a focus on transfusion
3. The Ontario quality indicators: how do we score on managing obstetrical bleeding?



# Objectives

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My job is to convince you:

1. Obstetrical patient  $\neq$  trauma patient
2. TXA saves lives – give it ASAP
3. Detecting PPH early is higher yield than managing massive OB hemorrhage
4. Prioritize red cells + TXA + fibrinogen level
5. Plasma and platelets are RARELY required in OB MHP





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# **THE FACTS OF MASSIVE OBSTETRICAL BLEEDING**



# Every year...

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- 14 million women experience PPH
- 70 000 maternal deaths
- Surviving women experience morbidity, 'lifelong reproductive disability'
- 2.9% USA deliveries are complicated by PPH



WHO 2023; Batesman et al., Anesth Analg., 2010



# Etiology of PPH: 4T's

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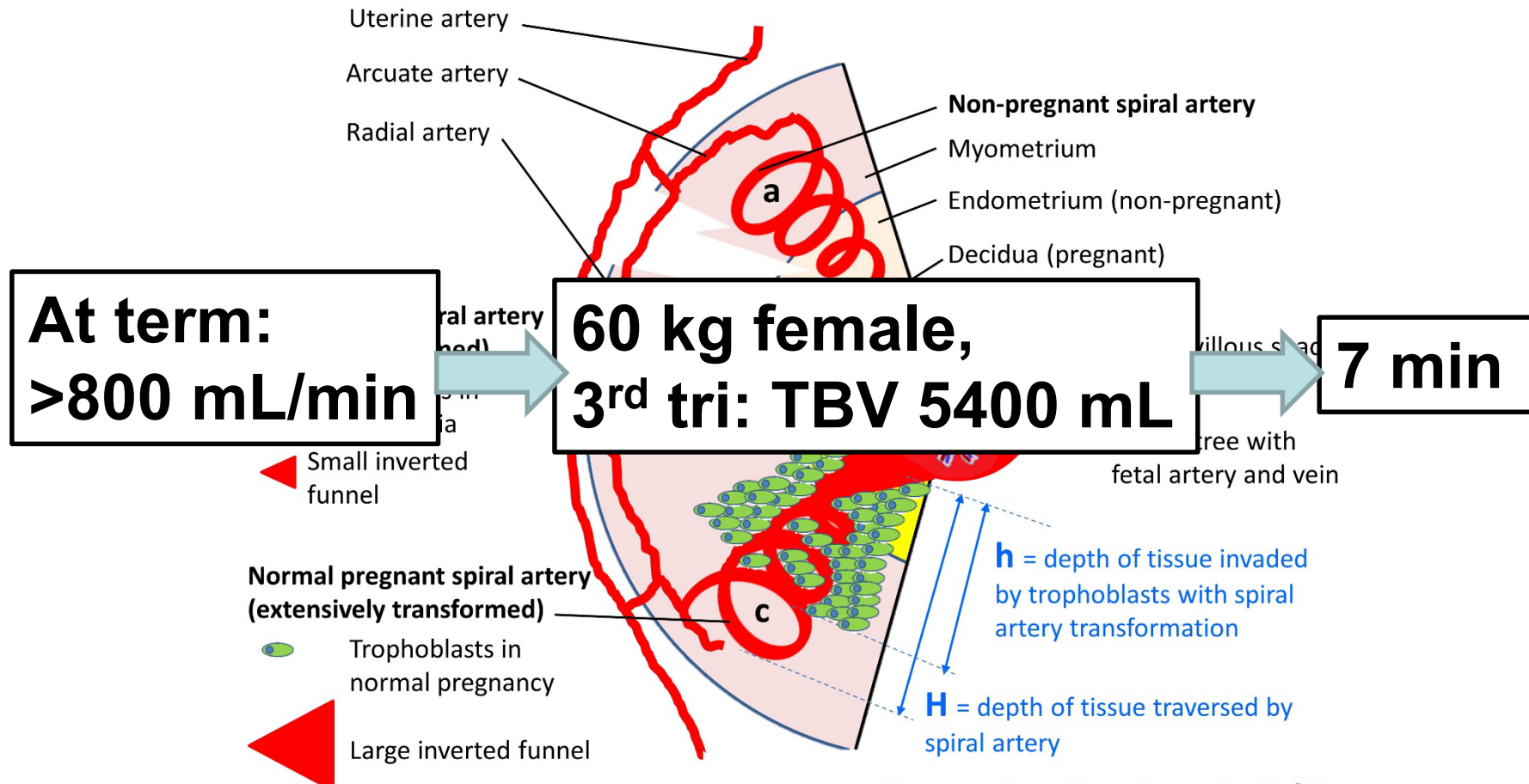
- **Tone (79%)**
- **Tissue (10%)**
- **Thrombin (coagulopathy) (5%)**
- **Trauma**

Bateman et al., Anesth Analg, 2010





# Uterine Blood Flow in Pregnancy



Zamir et al., Journal of Applied Physiology, 2021  
Moore et al., Am J Physiol, 2022



# Defining 1<sup>o</sup> Postpartum Hemorrhage

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- **THEN:**
  - Vaginal (>500 mL) vs c-section (>1000 mL) within 24 h
- **NOW (2017):**
  - >1000 mL within 24 h with signs/symptoms of hypovolemia (any method of delivery)



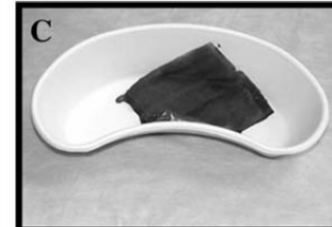
# Estimating Blood Loss is Hard...



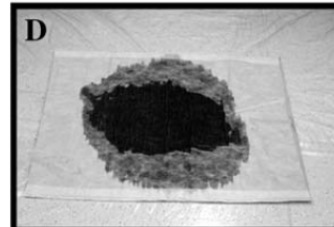
**A**  
Soiled sanitary towel  
(30 ml)



**B**  
Saturated sanitary towel  
(100 ml)



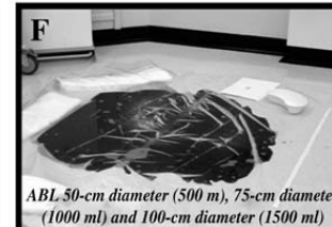
**C**  
Saturated small swab 10 x 10 cm  
(60 ml)



**D**  
Incontinence pad  
(250 ml)



**E**  
Saturated large swab 45 x 45 cm  
(350 ml)



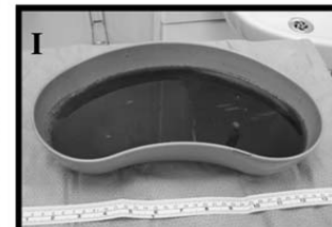
**F**  
*ABL 50-cm diameter (500 ml), 75-cm diameter (1000 ml) and 100-cm diameter (1500 ml)*  
100-cm diameter floor spill  
(1500 ml)



**G**  
PPH on bed only  
(1000 ml)



**H**  
PPH spilling to floor  
(2000 ml)



**I**  
Full kidney dish  
(500 ml)

Bose et al., BJOG, 2006



# Estimating Blood Loss is Hard...

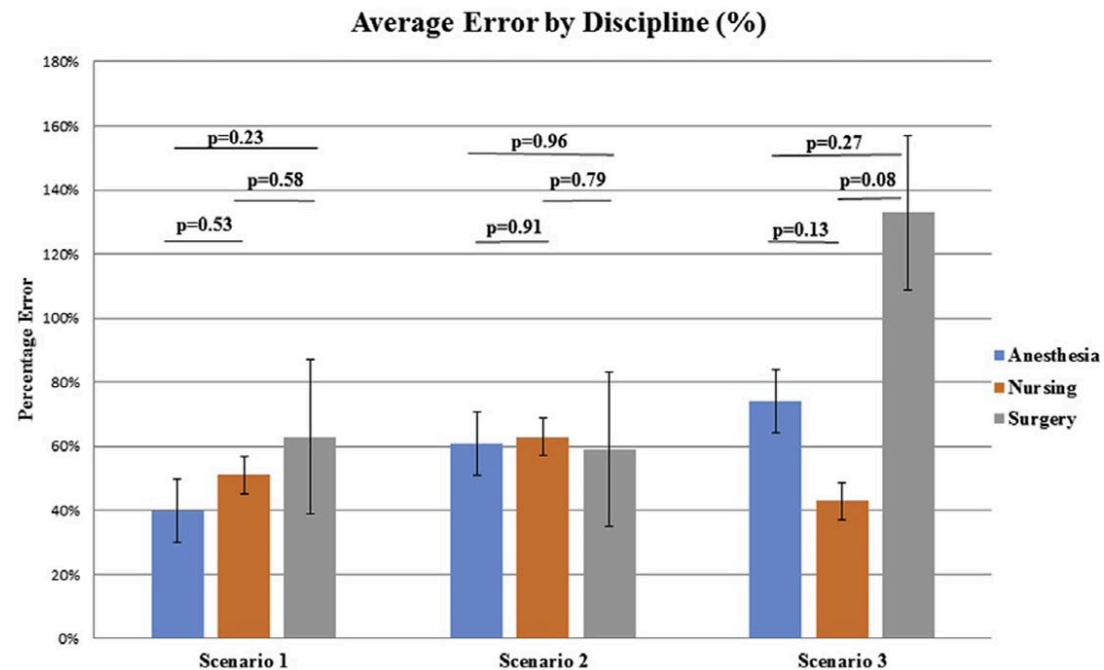


Rotherman & Lipman, Surgery, 2016



# The Thing Is...

We all **EQUALLY STINK** at estimating blood loss



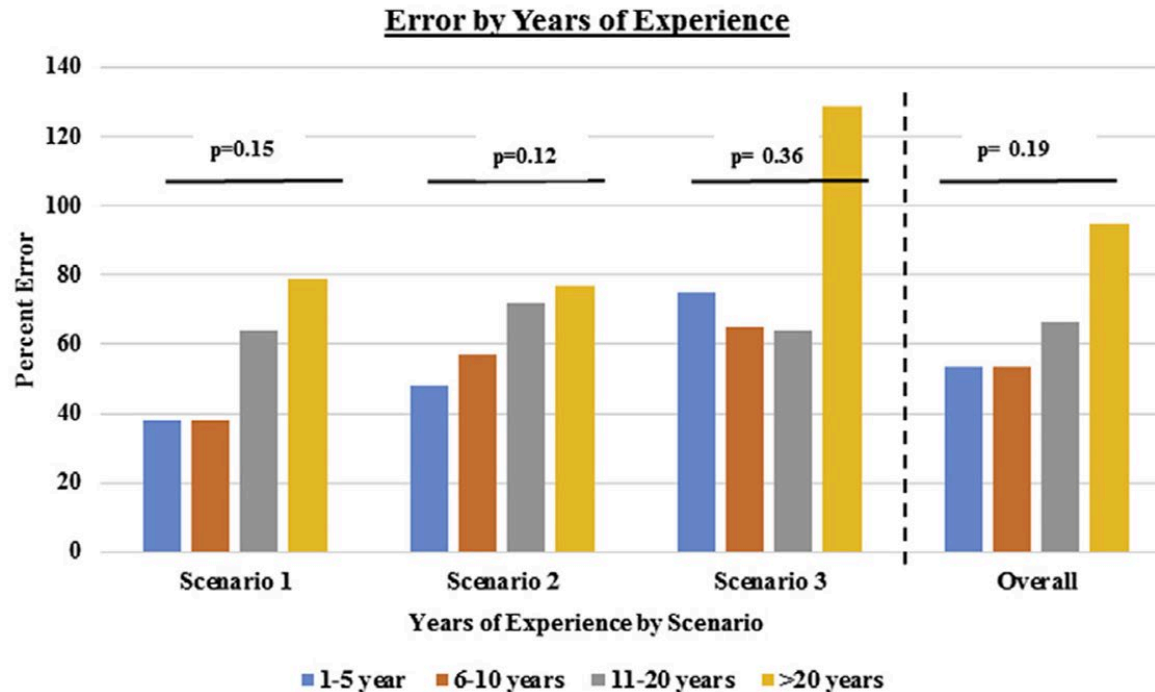
Regardless of your discipline....

Rotherman & Lipman, Surgery, 2016



# The Thing Is...

We all **EQUALLY STINK** at estimating blood loss



Regardless of your experience....

Rotherman & Lipman, Surgery, 2016





# Calibrated Drapes



Image: Amornpetchakul et al., 2018



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Randomized Trial of Early Detection and Treatment  
of Postpartum Hemorrhage

I. Gallos, A. Devall, J. Martin, L. Middleton, L. Beeson, H. Galadanci, F. Alwy Al-beity, Z. Qureshi, G.J. Hofmeyr, N. Moran, S. Fawcus, L. Sheikh, G. Gwako, A. Osoti, A. Aswat, K.-M. Mammoliti, K.N. Sindhu, M. Podeseck, I. Horne, R. Timms, I. Yunas, J. Okore, M. Singata-Madliki, E. Arends, A.A. Wakili, A. Mwampashi, S. Nausheen, S. Muhammad, P. Latthe, C. Evans, S. Akter, G. Forbes, D. Lissauer, S. Meher, A. Weeks, A. Shennan, A. Ammerdorffer, E. Williams, T. Roberts, M. Widmer, O.T. Oladapo, F. Lorencatto, M.A. Bohren, S. Miller, F. Althabe, M. Gülmezoglu, J.M. Smith, K. Hemming, and A. Coomarasamy





# Early Detection and Treatment of PPH (NEJM 2023)

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- Population:
  - 80 hospitals across Africa
  - 210,132 vaginal deliveries
- Intervention:
  - Calibrated blood-collection drape
  - Bundle of 1<sup>st</sup> response treatments
  - Implementation support
- Composite outcome:
  - PPH >1000 mL, laparotomy for bleeding, maternal death from bleeding

Gallos et al., NEJM 2023



# The Bundle:

E

## Early Detection and Trigger Criteria

Calibrated drape for the collection of blood, with trigger lines at 300 ml and 500 ml for the first hr after birth  
 Observations (blood loss, blood flow, uterine tone) every 15 min documented on the blood-loss monitoring chart  
 Blood pressure and pulse monitored once in the first hr post partum and documented on the blood-loss monitoring chart

### Trigger Criteria

Clinical judgment  
 Blood loss  $\geq$ 500 ml  
 Blood loss  $\geq$ 300 ml plus one abnormal observation

M

## Massage of Uterus

Massage until uterus has contracted or for 1 min

O

## Oxytocic Drugs

10 IU IV oxytocin injected or diluted in 200–500 ml crystalloid administered over 10-min period, plus a maintenance dose of 20 IU IV oxytocin diluted in 1000 ml saline administered over 4-hr period (with misoprostol 800  $\mu$ g if used)

T

## Tranexamic Acid

1 g IV tranexamic acid injected or diluted in 200 ml crystalloid administered over 10-min period

IV

## IV Fluids

IV fluids in addition to the infusion should be given if clinically indicated for resuscitation and will require a second intravenous access

E

## Examination and Escalation

Ensure bladder is empty, evacuate clots, check for tears with an internal examination and placenta for completeness  
 Escalate if bleeding does not stop after first response or clinician is unable to identify or manage cause of bleeding

### Implementation Strategies

**Audit newsletters:** Sharing with all staff monthly rates of detection and bundle use, along with rates of PPH, severe PPH, blood transfusion, laparotomy, and death from PPH and giving feedback at monthly departmental meetings

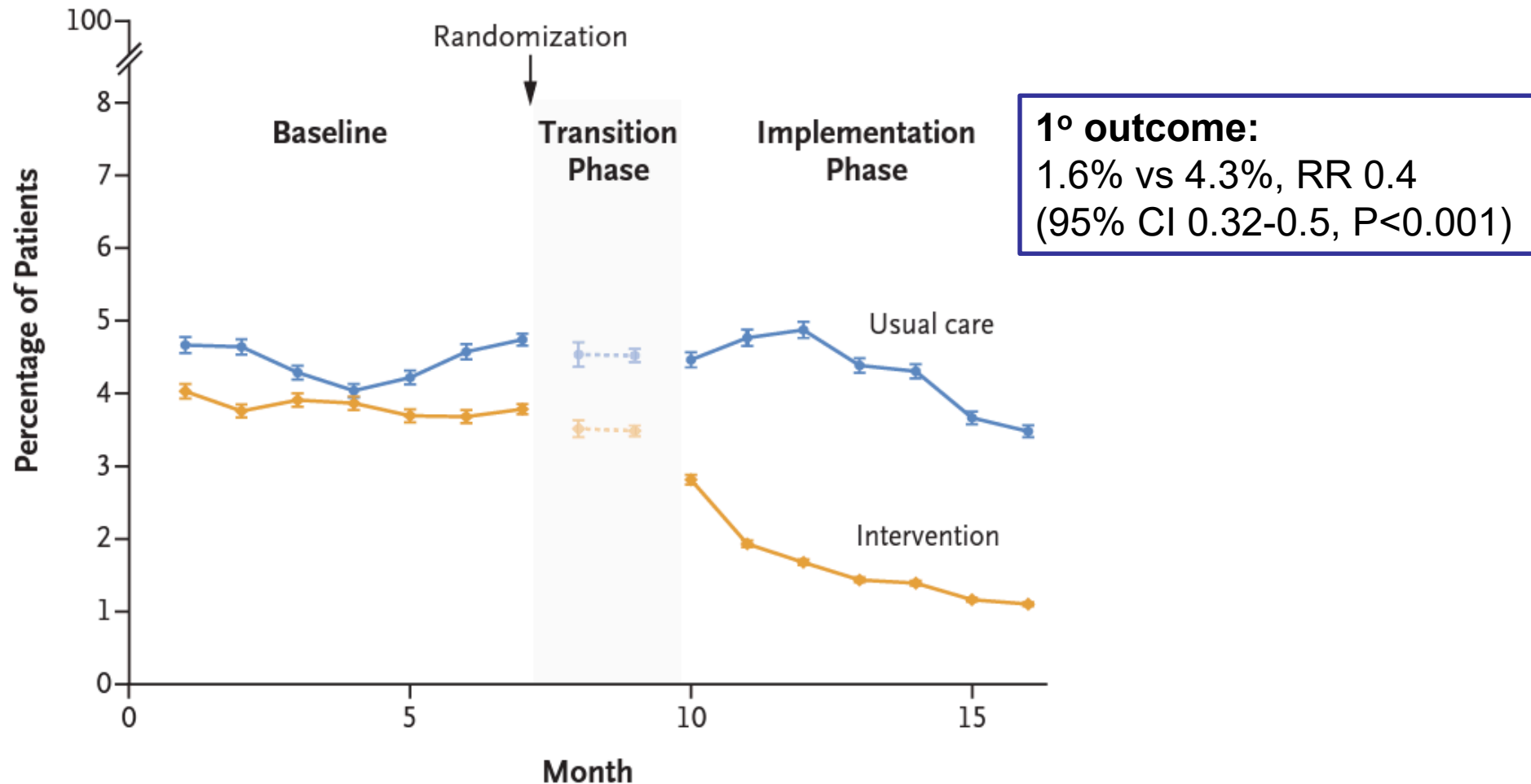
**Champions:** Midwife and doctor to oversee change, troubleshoot, give feedback on audit newsletters, connect with other champions by means of chats, meetings, and websites for sharing knowledge and lessons learned

**Trolley or carry case:** Restocking of all medicines and devices used for treatment of PPH after every use and completion of a stocking checklist at the start of every shift

**Training:** Onsite, simulation-based, and peer-assisted training, lasting from 90 min to an entire workday, facilitated by the use of provider guides, flipcharts, and job aids displayed in labor wards



# Patients with Primary-Outcome Event during the Baseline, Transition and Implementation Phases

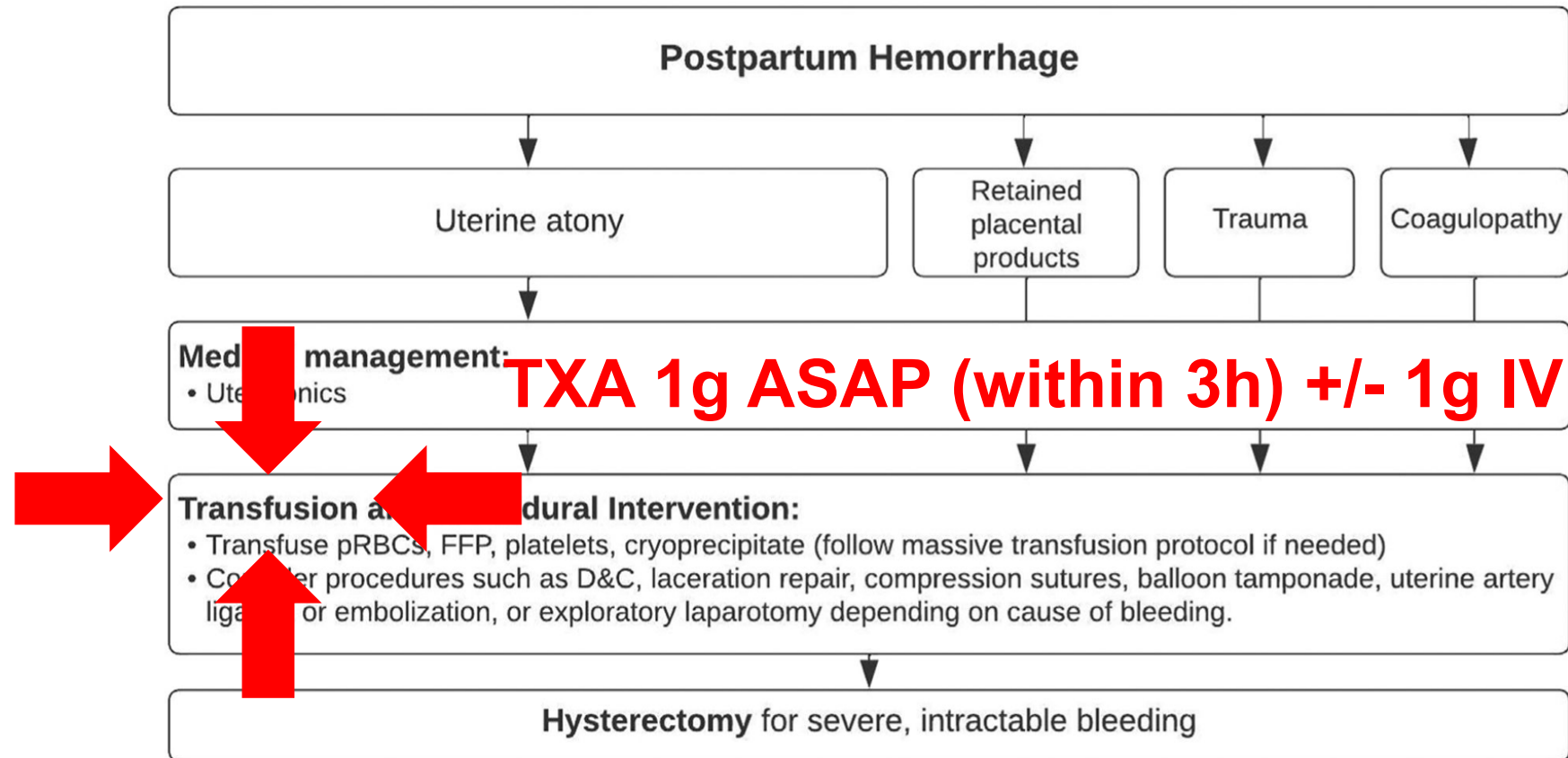


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# **MANAGING PPH: A FOCUS ON TRANSFUSION**



# Managing PPH



ACOG Practice Bulletin No 183, 2017  
Guan et al., AJOG 2023



# WOMAN TRIAL:

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- An international, randomized, double blind, placebo-controlled trial
- **N=20,060** women with PPH after vaginal birth or c-section (>500 mL or any blood loss within 24h associated with hemodynamic instability)
- **TXA** (1g +/- 1g for ongoing bleeding at 30 min or re-bleed within 24h) **vs placebo**
- Composite outcome: **mortality or hysterectomy**

WOMAN Trial Collaborators, Lancet 2017



# WOMAN TRIAL

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- 21 countries, mostly in Africa (12,343) and Asia (6,030)
- Primary outcome: RR 0.97 (95% CI 0.97-1.09), p=0.65
  - TXA (n=10,051): 5.3%
  - Placebo (n=9,985): 5.5%
- Death due to hemorrhage: RR 0.81 (95% CI 0.65-1.00), p=0.045
  - TXA: 1.5%
  - Placebo: 1.9%

**Death due to hemorrhage with EARLY TREATMENT (<3h)**  
**RR 0.69 (95% CI 0.52-0.91)**



# Bottom line from WOMAN:

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**TXA reduces death due to bleeding when you give it early (ASAP, always <3h)**

Tranexamic acid should be administered as soon as intravenous or intraosseous access is achieved but within 3 hours from time of injury or **within 3 hours from MHP activation** in all other patients.



WOMAN Trial Collaborators, Lancet 2017  
Callum et al., CMAJ, 2019





# The stories of women who died in WOMAN

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- WOMAN recruited 20,060 women with PPH
- 483 mothers died
  - 375 in Africa
  - 105 in Asia
- Interviews of clinicians involved in the care of these women

Picetti et al., BMC Pregnancy and Childbirth, 2020



# TXA is not always enough: access to blood products is critical

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“There was **no more blood available**  
in my blood bank”

She could only get one pint of blood and **efforts to get more blood for further transfusion was on-going** when she died”

“Relatives were **unable to pay or donate for further blood transfusion**”

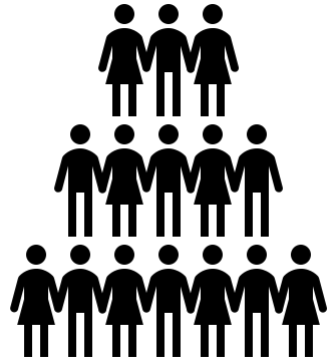
“When she became [unwell after] a blood transfusion reaction (from **a transfusion which was discontinued, then found to be type-incompatible**). That is the more probable cause of death.”

Picetti et al., BMC Pregnancy and Childbirth, 2020



# Trauma patient $\neq$ OB patient

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$\neq$



Fibrinogen in general population: 1.5-4 g/L

Fibrinogen at term: 4-6 g/L

↑ VWF, ↑ clotting factors  
↓ protein S

Collins, Blood, 2014



# PTT and INR are RARELY abnormal in PPH

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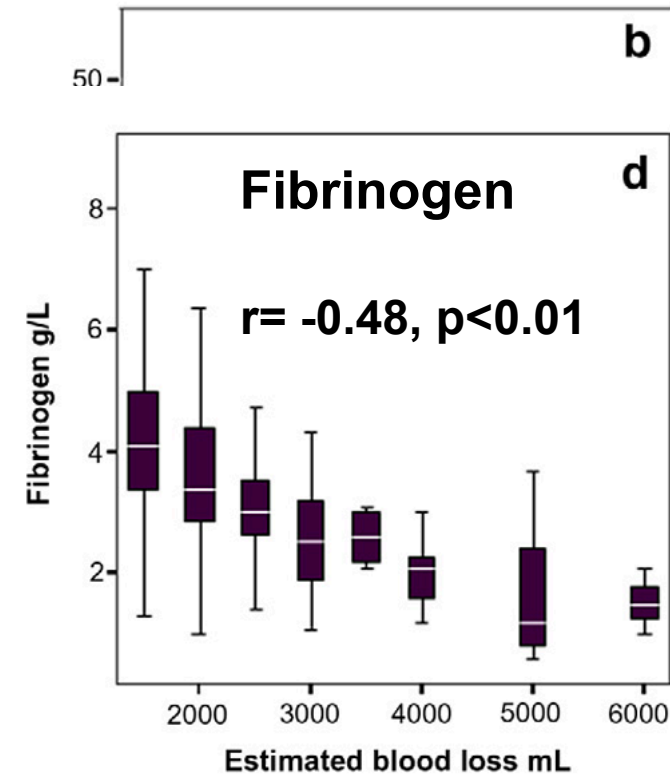
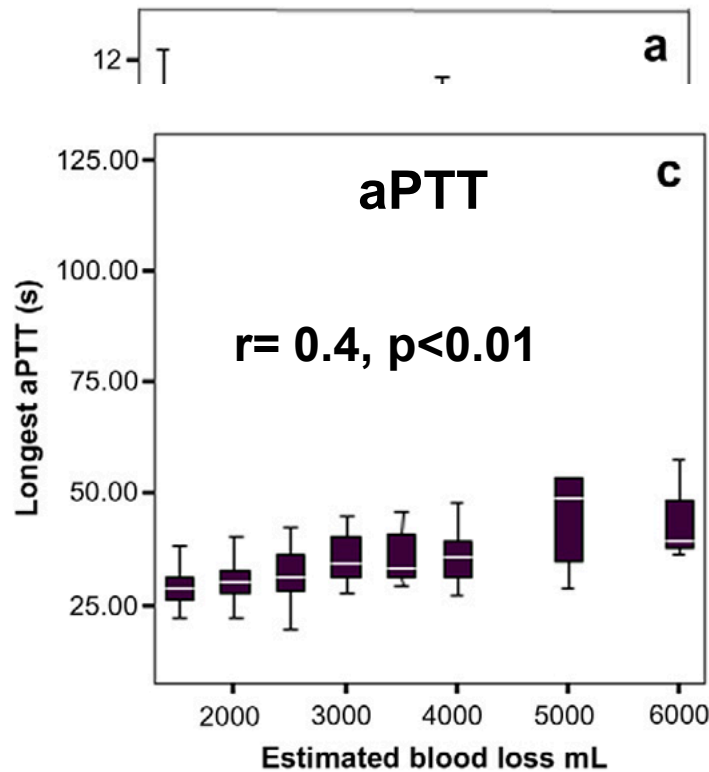
	<b>&lt;=2500 mL EBL (n=297)</b>
PTT normal	296 (99.7%)
PTT abnormal	1 (0.3%)
INR normal	296 (99.7%)
INR abnormal	1 (0.3%)

**Overall: 98.8% had normal PTT and 98.2% had normal PT/INR**

Collins et al., Blood, 2014



# Fibrinogen is the best predictor of EBL in PPH



de Lloyd et al., Int Journal of Obs Anesth, 2011



# Low Fibrinogen & Fibtem A5: Harbingers of Severe PPH

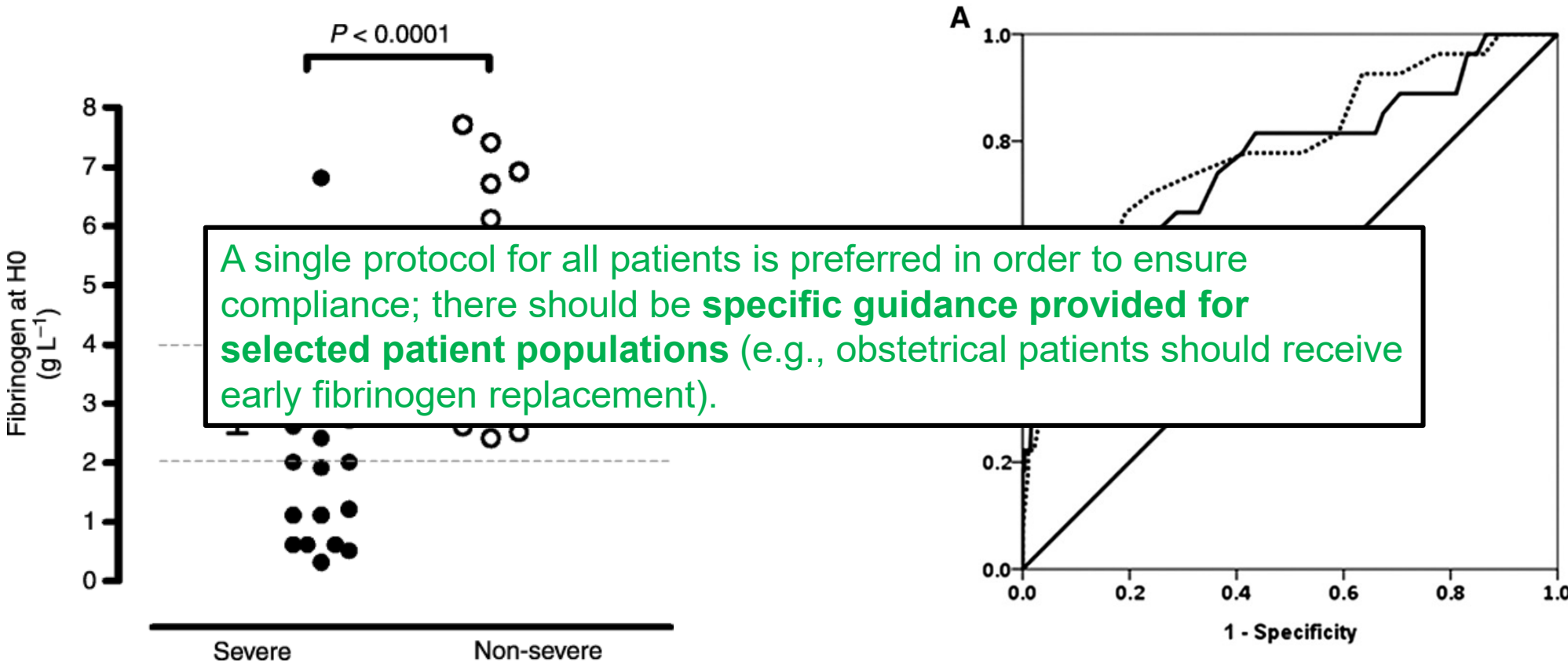


Figure 2. ROC curves for fibrinogen and Fibtem A5. (A) ROC curves for fibrinogen Progression to  $\geq 8$  U allogeneic blood products (RBCs + FFP + platelets).

Charbit et al., JTH 2007; Collins, Blood, 2014

# Preemptive Fibrinogen Replacement in PPH?

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- Randomized, placebo-controlled trial:  
249 women with early PPH
- 2g FC vs placebo
- RBC transfusion 20% vs 22%,  $p=0.88$ 
  - Only 2.2% had fibrinogen level  $< 2.0$  g/L

Wikkelso et al. Br J Anaesth 2015



# Plasma in PPH

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- Ratio-based resuscitation leads to over-transfusion of plasma
  - 1495 French patients with severe PPH transfused without coag. guidance
    - 69% of transfused patients received FFP

Deleu et al., Int J Obstet Anesth 2019





# Plasma in PPH

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- **Population:** 605 women with moderate/severe PPH (>1000 mL EBL)
- **Intervention:** Viscoelastometric POC testing-guided FP
  - Fibtem A5  $\leq$  15 mm + ongoing bleeding  $\rightarrow$  FP
  - **98% did not need plasma**

Collins et al., Br J Anaesth, 2017



# Platelets in PPH

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- Platelets rarely required for PPH
- 12/347 (3%) moderate to severe PPH required platelets
- All those transfused plt had 1 of:
  - Antenatal thrombocytopenia
  - Consumptive coagulopathy (abruption, amniotic fluid embolism)
  - >5000 mL hemorrhage



# r7a in PPH

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- ?↓ risk of invasive procedures in those non-responsive to uterotonics
- ↑ thrombotic risk
- no change in blood products, hysterectomy, EBL

## ISTH Guidance:

*“Consider for ongoing PPH unresponsive to standard treatment or to prevent hysterectomy”*

Lavigne-Lissalde et al., JTH, 2015

Collins et al., JTH 2016



# TEG/ROTEM

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- Less blood component transfusion
- Timely care
- The future...?

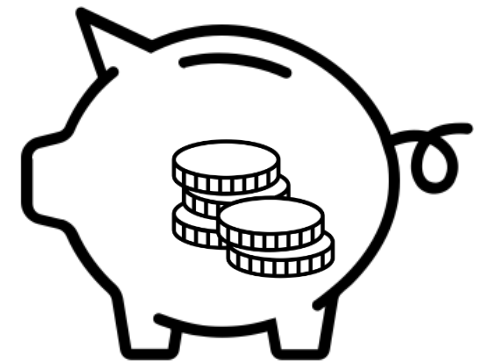
Frigo et al., Transfusion Medicine, 2020  
Butwick et al., Transfusion, 2020



# Bottom Line

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- Where the money is:
  - Timely recognition and care
  - TXA (ideally within 1 h, always within 3h)
  - Red cells with early labs to guide fibrinogen
    - Fibrinogen if  $<2.0$  g/L



# Don't forget the G&S...

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Women of child-bearing potential should be informed of the **risk of red blood cell alloimmunization**, which may result in hemolytic disease of the fetus and newborn, and should be counselled to undergo red blood cell **antibody screening 6 weeks and/or 6 months after transfusion** (many antibodies are evanescent, and there is a brief window for detection)



Callum et al., CMAJ, 2019

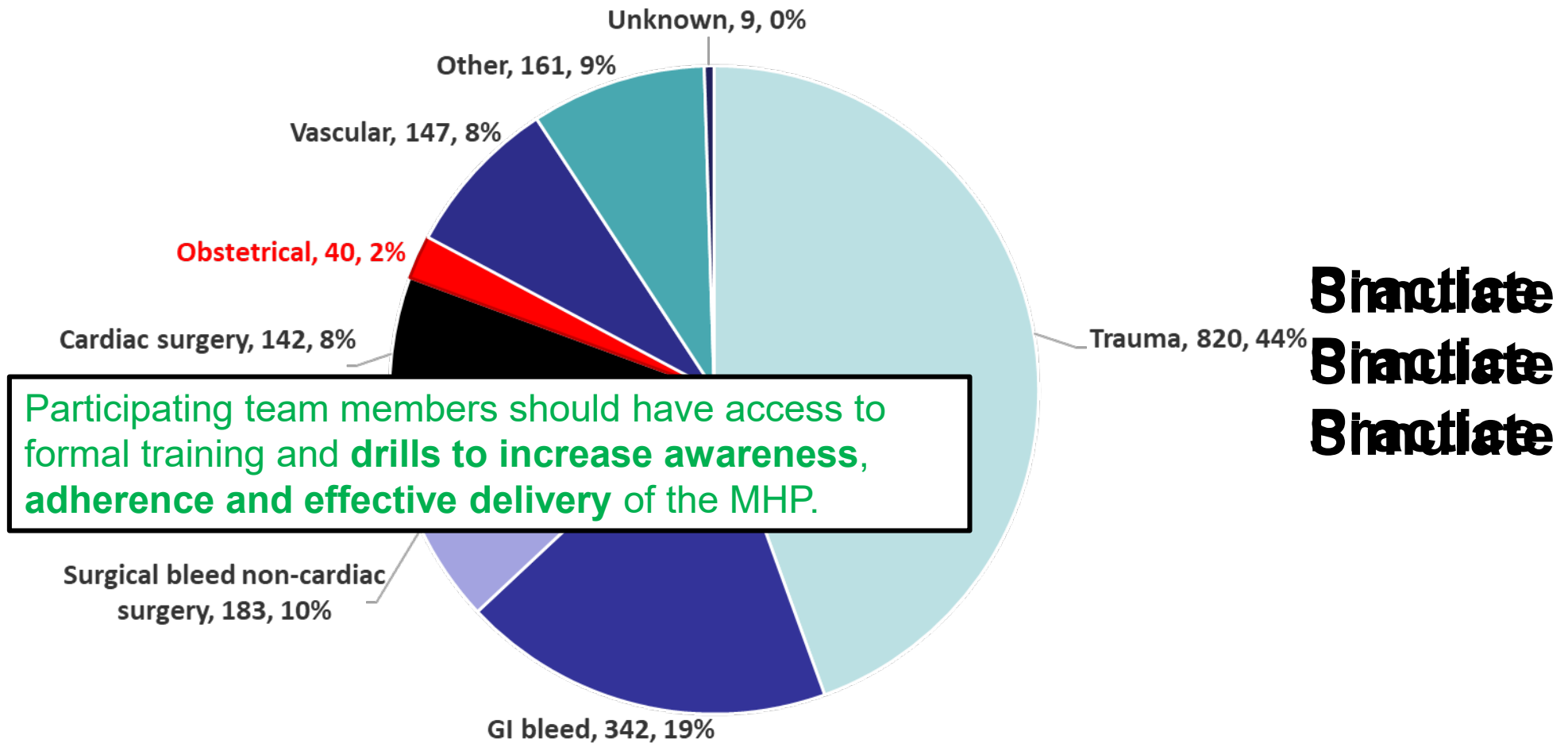


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**ONTARIO DATA:  
QUALITY INDICATORS IN  
OBSTETRICAL HEMORRHAGE**



# Type of MHPs Reported in Ontario: 2019-2022





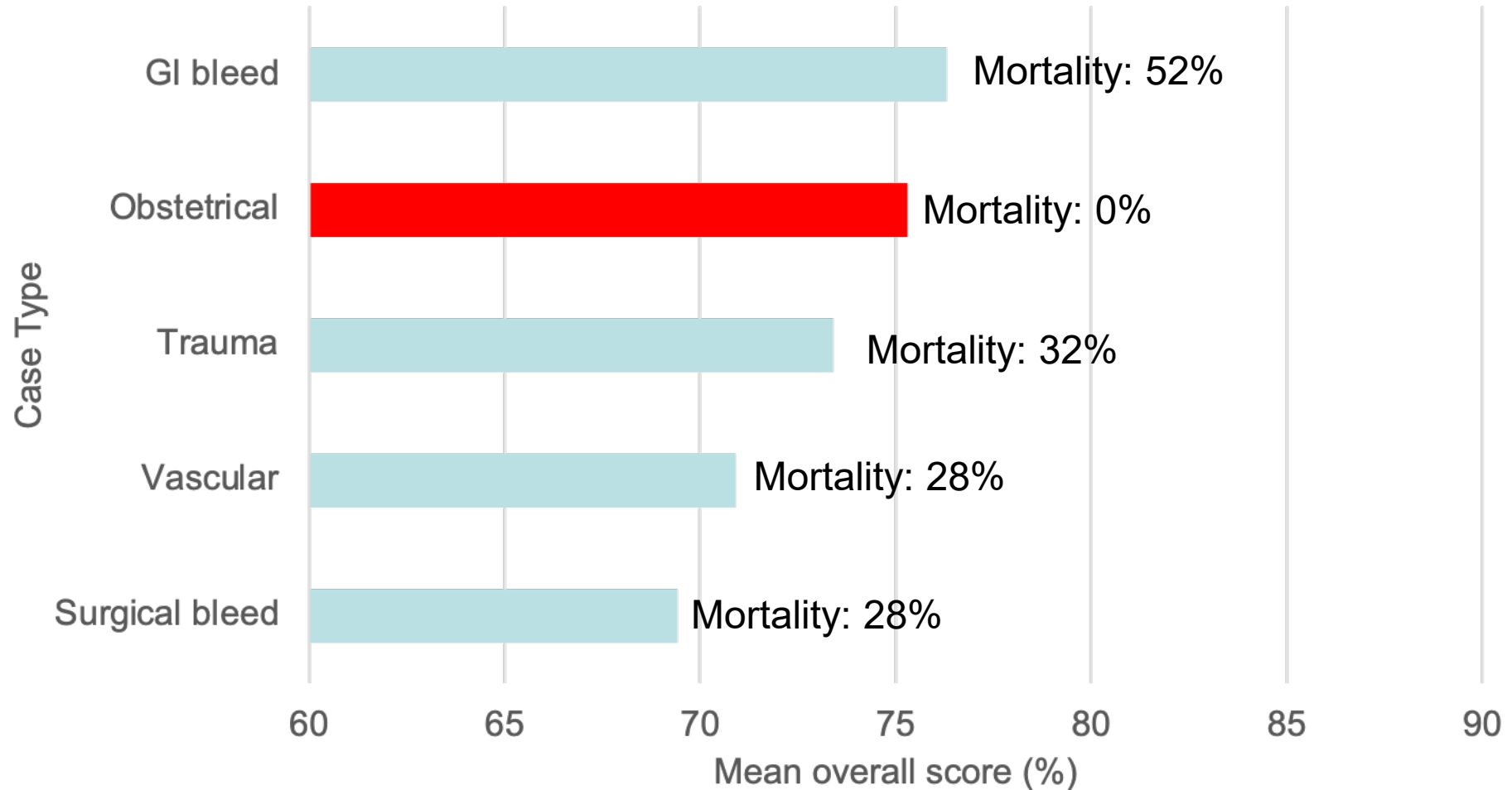
# MHP Case Score

Quality Metrics
Did the patient receive <b>tranexamic acid</b> within 1 hour of activation?
Was RBC transfusion initiated within <b>15 minutes</b> of activation?
Was the initiation for patient <b>transfer</b> within 1 hour of activation?
Was the patient's temperature $\geq 35^{\circ}\text{C}$ at termination?
Was the hemoglobin maintained <b>over 60 g/L</b> for the first 24 hours?
Was the hemoglobin <b>below 110 g/L</b> at 24 hours?
Was the patient transitioned to group specific RBC within <b>90 minutes</b> of activation?
Was the MHP activation <b>appropriate</b> for this patient?
Were any blood products <b>wasted</b> during this activation?

**SCORE: /9**



# MHP Case Score



Adapted from Ali et al., ISBT 2023



# ONTARIO MHP DATA IN OBSTETRICS

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- This included just 18 pregnant patients
- Where do OB teams excel?
- Where do they need training?



# Bottom Line

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- Pregnancy hemorrhage  $\neq$  trauma hemorrhage
  - These patients need unique mgmt. and dedicated training
- These are rare events that require simulation to maintain clinical currency
  - Simulation



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# THANK YOU FOR YOUR ATTENTION

Heather VanderMeulen

heather.vandermeulen@sunnybrook.ca

