Improving Anesthesia Management of Postpartum Hemorrhage Through Simulation Education

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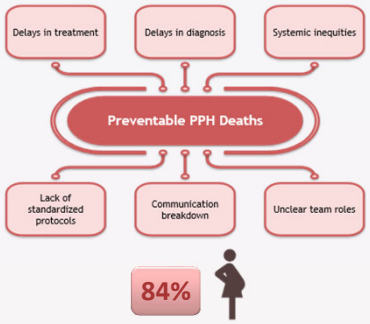
OBJECTIVES

At the end of this presentation, participants will be able to:

- describe the clinical significance of postpartum hemorrhage (PPH),
- explain the role of simulation training in obstetric emergencies,
- analyze evidence regarding uterotonic administration timing,
- examine maternal outcomes associated with simulation training, and
- apply evidence-based recommendations to anesthesia practice.

BACKGROUND

- Postpartum hemorrhage remains the leading cause of maternal morbidity and mortality worldwide.
- PPH is defined as ≥ 1000mL of blood loss within the initial 24 hours of delivery, irrespective of delivery mode.



Percentage of preventable pregnancy-related deaths in U.S.

- The World Health Organization (WHO) recommends the **immediate administration of a uterotonic drug within 1 minute of birth** for all deliveries.
- Timely administration of uterotonics is crucial to reduce blood loss, transfusion requirements, and maternal morbidity.

Why Simulation?

- Improves teamwork, communication & protocol adherence
- Allows for repetition and debriefing
- Safe environment for high-risk scenarios

RESEARCH QUESTION

P: Among members of the obstetric anesthesia team,

I: how does implementation of multidisciplinary postpartum hemorrhage (PPH) simulation training,

C: compared with no formalized simulation training,

O: affect the timeliness **and accuracy** of uterotonic administration, **adherence to hemorrhage management protocols,** and maternal outcomes?

LITERATURE REVIEW

Texas Medical Center Library

Databases: PubMed, Medline (Ovid), and The Cochrane Library

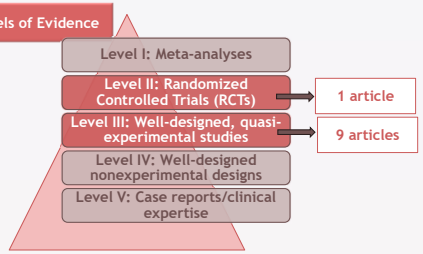
Key Terms	MeSH Terms	Filters	Search Techniques
• Postpartum hemorrhage • Obstetric • Simulation training • Uterotonic	• Postpartum Hemorrhage • Simulation Training • Uterotonic Agents • Obstetrics	• Published within 10 years • Full-text • Peer-reviewed • Available in English	• Boolean operators "AND" and "OR" • Truncation • Snowballing

Result: 10 studies included

Exclusions: No anesthesia involvement, Simulation not primary intervention, Meta-analyses, No patient or time-based outcomes, Exclusively neonatal outcomes

GRADING THE EVIDENCE

Levels of Evidence



Strength of Evidence

GRADE	RELEVANCE & USEFULNESS	ARTICLES
Grade A	Strongly recommend; good evidence	1 article
Grade B	Recommend; at least fair evidence	8 articles
Grade C	No recommendation	1 article
Grade D	Recommend against	None
Grade I	Insufficient evidence	None

STUDY DESIGNS

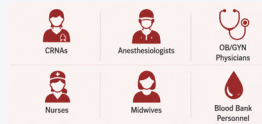
INCLUSION CRITERIA	EXCLUSION CRITERIA
• Multidisciplinary teams[1-10] • Women ≥ 23-28 weeks gestation[1,3-10] • Hospital-based[1,3-4,6,9-10] • Complete medical records with documented blood loss[1,3,6,8,10]	• Multiparous pregnancies[7] • Non-hospital or obstetric settings[3,8] • No documented hemorrhage or unclear diagnosis[4,8,10] • Incomplete records with missing outcome data[6,8,10]

STUDY DESIGNS

Settings included:



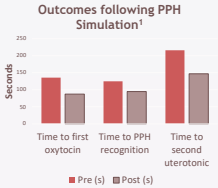
Multidisciplinary participants:



PRIMARY OUTCOMES

Timeliness of Intervention[1]

Outcome	Pre	Post
Time to oxytocin	135.4 sec	87.3 sec
Time to PPH recognition	124.8 sec	94.5 sec
Time to 2nd uterotonic	216.0 sec	147.0 sec



Blood Loss and Transfusion[1]

- Median EBL decreased 1500 → 1250 mL, $p = .032$[1]
- Time to transfusion shortened 102 → 51 min, $p = 0.005$[1]
- Massive transfusion events decreased, no change in PPH incidence[2,3]

SECONDARY OUTCOMES

Improved Uterotonic Use

Overall oxytocin administration increased in 3 studies

Oxytocin within one minute increased in 2 studies

Inappropriate methergine administration decreased in 2 studies

- ↓ from 59% → 25%[1]

Maternal Outcomes

Length of hospital stay
↓ in 2 studies

Massive transfusion rates/Severe PPH
↓ in 3 studies, no change in overall PPH occurrence

Composite maternal morbidity (i.e., hysterectomy, ICU admission, transfusion)
↓ in 5 studies

Hysterectomy rates and mortality
↔ no consistent change across studies

TEAM PERFORMANCE IMPROVED

Protocol & checklist adherence
↑ in 6 studies

Provider confidence
↑ in 5 studies

Team communication(i.e., hysterectomy, ICU admission)
↑ in 5 studies

Self-efficacy and Collective efficacy
↑ in 3 studies

RECOMMENDATIONS FOR PRACTICE

Implement regular multidisciplinary PPH simulation including anesthesia providers. (Grade: **moderate** recommendation)

In-situ training with role-specific checklists and structured debriefing.

Measure process metrics: time to recognition, time to first uterotonic, EBL, transfusion rate, protocol adherence.

Conduct **regular** simulation training at consistent intervals

LIMITATIONS

- **Variable definitions of PPH** ≥1,000 mL vs ≥1,500 mL vs transfusion thresholds
- **Heterogeneity among study designs**
- **Several outcomes are multifactorial events**
- **Few studies directly measuring uterotonic administration times**
- **Geographical location- not all studies in U.S.**
- **Many quasi-experimental designs limit causal inference**

FUTURE RESEARCH

- Standardize outcome measures across studies
- Directly measure time to first uterotonic administration
- Determine optimal simulation frequency
- Evaluate long-term retention of skills
- Assess cost-effectiveness of simulation programs

REFERENCES

1: Marshall et al., 2015; 2: Egenberg et al., 2017; 3: Nelissen et al., 2017; 4: Lutgendorf et al., 2024; 5: Greer et al., 2023; 6: Dillon et al., 2021; 7: Fransen et al., 2017; 8: Kumar et al., 2018; 9: de Melo et al., 2021; 10: Gerard et al., 2024