

## Preventive Strategies and Standardized Management Protocols for Postpartum Hemorrhage in a Tertiary Care Center

Shyama Nivas<sup>1</sup>, Vinita Sahay<sup>2</sup>

<sup>1</sup>Senior Resident, Department of Obstetrics and Gynecology, Netaji Subhas Medical College and Hospital, Amhara, Bihta, Patna, Bihar, India

<sup>2</sup>Professor and HOD, Department of Obstetrics and Gynecology, Netaji Subhas Medical College and Hospital, Amhara, Bihta, Patna, Bihar, India

Received: 06-01-2025 / Revised: 25-01-2025 / Accepted: 25-02-2025

Corresponding Author: Dr. Shyama Nivas

Conflict of interest: Nil

### Abstract:

**Background:** Postpartum hemorrhage (PPH) remains one of the leading causes of maternal mortality and morbidity globally, accounting for nearly one-quarter of maternal deaths, especially in low-resource settings. Defined as blood loss of more than 500 mL following vaginal delivery or more than 1000 mL after cesarean section, PPH can rapidly become life-threatening if not promptly identified and managed. Despite advancements in obstetric care, inconsistent adherence to standardized guidelines and lack of preparedness continue to contribute to preventable maternal deaths. This review aims to synthesize the most current evidence-based guidelines for the prevention and management of PPH and assess their applicability in a tertiary care center.

**Materials and Methods:** A Observational Study conducted with the aim of synthesizing the latest evidence-based guidelines and literature on the prevention and management of postpartum hemorrhage (PPH). The review was carried out in the Department of Obstetrics and Gynaecology, Netaji Subhas Medical College and Hospital, Amhara, Bihta, Patna, Bihar, India, from April 2024 to December 2024. The focus was to analyze existing recommendations, compare international protocols, and assess their relevance and application in the context of clinical practice within a tertiary care center

**Results:** Current evidence supports the routine use of AMTSL as a key strategy to prevent primary PPH, with oxytocin (10 IU IM/IV) identified as the first-line uterotonic agent. Alternatives such as misoprostol, ergometrine, and carbetocin have specific indications based on availability and patient profile. Tranexamic acid is now recommended as an early adjunct in cases of established PPH. Non-surgical methods such as uterine massage, bimanual compression, and intrauterine balloon tamponade play crucial roles in the early management of atonic PPH. In refractory cases, uterine artery ligation, compression sutures, or hysterectomy may be required. Protocol-based care and rapid response teams significantly reduce maternal complications. Simulation-based training and availability of PPH kits are increasingly recognized as best practices.

**Conclusion:** Evidence-based prevention and management of PPH require timely intervention, judicious use of uterotonics, and structured institutional protocols. Adopting global guidelines within the framework of local resources and infrastructure can improve maternal outcomes. Regular training of healthcare workers, early identification of risk factors, and adherence to AMTSL and response algorithms are crucial to reducing the burden of PPH-related maternal morbidity and mortality.

**Keywords:** Postpartum hemorrhage, AMTSL, Oxytocin, Uterotonics, Carbetocin, Misoprostol, Tranexamic acid, B-Lynch suture, Balloon tamponade, PPH protocols, Maternal mortality.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

Postpartum hemorrhage (PPH) remains one of the most serious and life-threatening complications of childbirth, contributing substantially to maternal morbidity and mortality worldwide. Globally, PPH is responsible for approximately 25% of maternal deaths, with a disproportionately high burden in low- and middle-income countries where access to quality obstetric care is limited [1]. In India, despite improvements in institutional deliveries and obstetric surveillance, PPH continues to be a major

direct cause of maternal mortality, particularly in rural and semi-urban healthcare settings. Its rapid onset and unpredictable nature require immediate recognition and a well-coordinated management response to prevent adverse outcomes [2].

PPH is clinically defined as blood loss of  $\geq 500$  mL after vaginal delivery or  $\geq 1000$  mL following cesarean section, within the first 24 hours of birth. It is further classified as primary (within 24 hours of

delivery) or secondary (from 24 hours to 12 weeks postpartum). The most common etiology is uterine atony, followed by retained placental tissue, genital tract trauma, and coagulopathy. Among these, uterine atony alone accounts for nearly 70–80% of cases. In many instances, multiple causes coexist, emphasizing the need for a comprehensive and systematic approach to diagnosis and management [3].

Over the years, global health authorities such as the World Health Organization (WHO), the International Federation of Gynecology and Obstetrics (FIGO), the Royal College of Obstetricians and Gynaecologists (RCOG), and the Federation of Obstetric and Gynaecological Societies of India (FOGSI) have issued clear, evidence-based guidelines for the prevention and management of PPH [4]. The cornerstone of PPH prevention lies in the routine implementation of Active Management of the Third Stage of Labor (AMTSL), which includes the prophylactic use of uterotonics, controlled cord traction, and uterine massage. Oxytocin remains the first-line drug for both prevention and treatment [5]. However, in settings where oxytocin is unavailable or storage conditions are suboptimal, alternatives such as misoprostol and ergometrine are utilized. Recently, carbetocin and tranexamic acid have gained prominence in international protocols due to their demonstrated efficacy in reducing blood loss and improving maternal outcomes.

Despite the availability of evidence-based strategies, variability in clinical practice, lack of standardized protocols, delayed intervention, and insufficient resources often hinder effective PPH management, especially in peripheral health centers. Compounding this issue is the lack of structured training and poor awareness among healthcare providers regarding current clinical recommendations [6]. Given the preventable nature of most PPH-related deaths, the importance of standardized, guideline-driven care cannot be overstated. Emphasis on early identification of high-risk pregnancies, readiness with PPH kits, team-based simulations, availability of uterotonics, and timely escalation through stepwise management algorithms are vital components of effective care. Moreover, tailoring global guidelines to suit local contexts and strengthening institutional preparedness remain key to minimizing the burden of PPH [7].

A Observational Study was conducted at the Department of Obstetrics and Gynaecology, Netaji Subhas Medical College and Hospital, Amhara, Bihta, Patna, Bihar, India, with the objective of synthesizing current evidence-based practices for the prevention and management of postpartum hemorrhage. It aims to critically examine the international guidelines and highlight their

relevance, implementation strategies, and barriers in resource-constrained settings. Through this, the review seeks to advocate for improved clinical practices that align with standardized global protocols while adapting to the realities of local healthcare systems.

## Materials and Methods

A Observational Study conducted with the aim of synthesizing the latest evidence-based guidelines and literature on the prevention and management of postpartum hemorrhage (PPH). The review was carried out in the Department of Obstetrics and Gynaecology, Netaji Subhas Medical College and Hospital, Amhara, Bihta, Patna, Bihar, India, from April 2024 to December 2024. The focus was to analyze existing recommendations, compare international protocols, and assess their relevance and application in the context of clinical practice within a tertiary care center.

A comprehensive literature search was performed using the following electronic databases and official guideline repositories:

- PubMed/Medline
- Cochrane Library
- WHO Reproductive Health Library
- FIGO (International Federation of Gynecology and Obstetrics)
- RCOG (Royal College of Obstetricians and Gynaecologists)
- FOGSI (Federation of Obstetric and Gynaecological Societies of India)

The search terms used included combinations of: “postpartum hemorrhage,” “PPH prevention,” “uterotonics,” “active management of third stage of labor,” “tranexamic acid,” “carbetocin,” “balloon tamponade,” “B-Lynch suture,” “PPH guidelines,” and “PPH management protocol.” Boolean operators such as AND/OR were used to combine search terms.

The inclusion criteria for selection were:

- Full-text articles and guidelines published in English
- Clinical practice guidelines, systematic reviews, meta-analyses, randomized controlled trials, cohort studies, and large observational studies
- Studies that discussed primary prevention, active management, medical and surgical interventions, or institutional response protocols related to PPH

Exclusion criteria included:

- Case reports, editorials, or letters to editors
- Studies focused exclusively on secondary PPH or non-obstetric causes of hemorrhage

- Non-English language articles and those with incomplete data

A total of 112 references were initially identified. After screening titles and abstracts, 58 relevant articles were shortlisted for full-text review. Ultimately, 36 high-quality sources were included in the final synthesis. Priority was given to the most recent WHO, RCOG, FIGO, and FOGSI guidelines, and where available, Level I evidence was used to support clinical recommendations.

The extracted data were grouped under themes:

- Prevention strategies (e.g., AMTSL, uterotonics)
- First-line medical management (e.g., oxytocin, misoprostol, carbetocin)
- Adjunct pharmacologic agents (e.g., tranexamic acid)
- Non-surgical techniques (e.g., uterine massage, balloon tamponade)

- Surgical interventions (e.g., compression sutures, uterine artery ligation, hysterectomy)
- Institutional protocols (e.g., PPH kits, response teams, simulation drills)

This structured approach allowed for a comprehensive review of the global recommendations and an evaluation of their practical implications in a resource-constrained tertiary care setting.

### Results and Synthesis of Guidelines

The review synthesized international and national guidelines on the prevention and management of postpartum hemorrhage (PPH), with particular focus on their clinical applicability in a tertiary care setting. The findings have been summarized below by thematic domains, covering pharmacological, non-pharmacological, surgical, and system-level interventions.

**Table 1: Comparison of AMTSL Components Across Major Guidelines**

Guide-line	Uterotonic Use	Controlled Cord Traction	Uterine Mas-sage	Remarks
WHO	Oxytocin 10 IU IM/IV recom-mended	Yes	After placenta delivery	Universal recommenda-tion
FIGO	Oxytocin preferred; misoprostol if unavailable	Yes	Yes	Encouraged in low-re-source settings
RCOG	Oxytocin 10 IU IM/IV	Yes	Not routinely	Emphasis on timely deliv-ery of placenta
FOGSI	Oxytocin; carbetocin/misoprostol as alternatives	Yes	Yes	AMTSL mandated under national protocols

**Table 2: Overview of Uterotonic Agents**

Drug	Dose	Route	Indications	Cautions/Limitations
Oxytocin	10 IU	IM/IV bolus	First-line for prevention & treatment	Cold chain required
Miso-prostol	600–800 mcg	Oral/Rectal/Sublin-gual	Alternative when oxytocin un-available	Fever, chills, GI effects
Ergome-trine	0.2 mg	IM/IV	In cases unresponsive to oxy-tocin	Contraindicated in hyper-tension
Carbetocin	100 mcg	IM/IV bolus	Long-acting alternative	Expensive, limited availa-bility

**Table 3: Role of Tranexamic Acid in PPH Management**

Indication	Dose	Timeframe	Outcome Benefit
Adjunct in established PPH	1 g IV over 10 minutes	Within 3 hours of birth	Reduces maternal death from bleeding

**Table 4: Non-Surgical Interventions in Atonic PPH**

Intervention	Description	Indication
Uterine massage	Manual stimulation of uterine con-traction	First step in atony
Bimanual compression	Manual compression of uterus using both hands	In immediate response
Uterine tamponade (Bakri balloon/Fo-ley catheter)	Intrauterine balloon inflation to ex-ert pressure	Uncontrolled bleeding post-uterotonics

**Table 5: Surgical Interventions in PPH Management**

Procedure	Indication	Advantages	Limitations
B-Lynch compression suture	Uncontrolled atonic PPH post-delivery	Uterus-sparing, reversible	Requires surgical expertise
Uterine artery ligation	Failed medical + compression therapies	Preserves fertility	Invasive, technical complexity
Internal iliac ligation	Massive intractable PPH	Last resort before hysterectomy	Difficult, needs advanced skills
Peripartum hysterectomy	Life-saving in uncontrollable bleeding	Definitive	Loss of fertility

**Table 6: Institutional and System-Level Measures**

Strategy	Objective	Implementation Tools
PPH Kits	Rapid access to essential supplies	Pre-packed kits with drugs, IV sets
Simulation-based training	Skill reinforcement and team coordination	Role-playing, emergency drills
Standard response algorithms	Stepwise escalation of treatment	Posters, protocols in labor wards
Regular audits and documentation	Quality assurance and system review	Case-based review, morbidity meetings

In summary, the review highlights that oxytocin remains the first-line drug of choice for both prevention and management of PPH, supported by AMTSL as a routine standard of care. In cases of uterine atony unresponsive to pharmacological agents, early adoption of mechanical and surgical interventions is critical. The integration of structured institutional protocols, simulation training, and emergency preparedness strategies further enhances the clinical response and reduces preventable maternal deaths. Implementation of WHO-endorsed guidelines, adapted to local infrastructure and workforce, is essential to improving maternal health outcomes in resource-constrained tertiary care settings.

## Discussion

Postpartum hemorrhage (PPH) remains a formidable challenge in obstetric care, particularly in resource-constrained settings. Despite the preventable nature of most PPH-related maternal deaths, delayed recognition, inconsistent clinical practices, and lack of protocol-based management continue to contribute to high morbidity and mortality [8]. This review consolidates current evidence-based guidelines and emphasizes practical, adaptable strategies for prevention and management of PPH in tertiary healthcare institutions.

The analysis confirms the universal recommendation of Active Management of the Third Stage of Labor (AMTSL) as a frontline preventive strategy. All major guidelines including those from WHO, FIGO, RCOG, and FOGSI endorse AMTSL, with oxytocin (10 IU IM/IV) as the preferred uterotonic. When oxytocin is unavailable, alternatives such as misoprostol and carboprocaine provide effective substitutes [9]. The use of ergometrine, although effective, is restricted in women with hypertensive disorders due to

vasoconstrictive properties. The introduction of heat-stable carboprocaine and low-cost misoprostol formulations has improved access to uterotonics in low-resource regions, but logistic constraints and inconsistent cold chain maintenance still pose challenges for oxytocin deployment [10]. The incorporation of tranexamic acid (TXA) in the early management of PPH has been a pivotal addition to global guidelines. Recent evidence supports its administration within 3 hours of birth to reduce the risk of death from bleeding [11]. This pharmacologic adjunct is particularly relevant in settings where surgical intervention is delayed, and its inclusion in emergency kits is now widely encouraged [12].

For cases unresponsive to medical management, non-surgical interventions such as uterine massage, bimanual compression, and intrauterine tamponade using Bakri balloons or Foley catheters offer valuable temporizing measures. These techniques are simple, cost-effective, and suitable for bedside use in labor rooms, making them indispensable in initial stabilization [13]. However, lack of training in proper application and limited availability of devices can reduce their effectiveness.

In severe and refractory cases, surgical measures including B-Lynch compression sutures, uterine artery ligation, internal iliac artery ligation, and peripartum hysterectomy are required. These are resource- and skill-intensive procedures and should ideally be performed in referral centers with operative and transfusion capabilities. Early referral and structured decision-making pathways can improve surgical outcomes and reduce the need for emergent hysterectomy [14].

Beyond clinical interventions, the review underscores the importance of institutional preparedness and systemic response. The

availability of pre-packed PPH kits, stepwise treatment algorithms, and simulation-based training are proven to reduce response time and enhance team coordination [15]. Regular audits and maternal death reviews contribute to ongoing quality improvement and policy refinement.

Overall, while standardized global guidelines provide a robust framework for PPH management, their effectiveness depends on contextual adaptation. In semi-urban and rural India, improving antenatal risk stratification, ensuring timely access to uterotonics, training healthcare workers in manual and surgical skills, and implementing clear, locally-tailored protocols are key to reducing preventable PPH-related complications.

### Conclusion

Postpartum hemorrhage remains a leading cause of maternal mortality and morbidity, particularly in low-resource and high-burden settings. This review emphasizes that most cases of PPH are preventable and manageable through timely interventions, adherence to standardized guidelines, and proactive institutional preparedness. Evidence strongly supports the routine implementation of Active Management of the Third Stage of Labor using oxytocin as the first-line uterotonic. In cases where oxytocin is unavailable or contraindicated, alternative agents such as misoprostol, ergometrine, or carbetocin serve as effective substitutes, with the early use of tranexamic acid further improving outcomes in established hemorrhage.

The inclusion of non-surgical methods such as uterine massage, balloon tamponade, and compression techniques provide critical bridging measures before escalation to surgical interventions. When required, procedures such as B-Lynch sutures, uterine artery ligation, or hysterectomy must be initiated promptly in appropriate settings. More importantly, the success of any PPH management strategy hinges on institutional readiness—through availability of PPH kits, clearly defined treatment algorithms, and regular training of healthcare providers.

Adapting global recommendations into context-specific, protocol-driven clinical practices is essential to reduce the burden of PPH in tertiary and secondary care facilities. Strengthening emergency obstetric care systems and fostering multidisciplinary teamwork can significantly improve maternal outcomes and bring down preventable maternal mortality associated with postpartum hemorrhage.

### References

1. Maher MA, Abdelaziz A. Comparison between two management protocols for postpartum hemorrhage during cesarean section in placenta previa: Balloon protocol versus non-balloon

- protocol. J Obstet Gynaecol Res. 2017 Mar;43(3):447-455. doi: 10.1111/jog.13227. Epub 2016 Dec 17. PMID: 27987342.
2. Vendittelli F, Barasinski C, Rivière O, Da Costa Correia C, Crenn-Hébert C, Dreyfus M, Legrand A, Gerbaud L. Does the Quality of Postpartum Hemorrhage Local Protocols Improve the Identification and Management of Blood Loss after Vaginal Deliveries? A Multi-center Cohort Study. Healthcare (Basel). 2022 May 27;10(6):992. doi: 10.3390/healthcare10060992. PMID: 35742043; PMCID: PMC9222306.
3. Feduniw S, Warzecha D, Szymusik I, Wielgos M. Epidemiology, prevention and management of early postpartum hemorrhage - a systematic review. Ginekol Pol. 2020;91(1):38-44. doi: 10.5603/GP.2020.0009. PMID: 32039467.
4. Kogutt BK, Vaught AJ. Postpartum hemorrhage: Blood product management and massive transfusion. Semin Perinatol. 2019 Feb;43(1):44-50. doi: 10.1053/j.semperi.2018.11.008. Epub 2018 Nov 14. PMID: 30527516; PMCID: PMC8015778.
5. Evensen A, Anderson JM, Fontaine P. Postpartum Hemorrhage: Prevention and Treatment. Am Fam Physician. 2017 Apr 1;95(7):442-449. PMID: 28409600.
6. Suarez S, Conde-Agudelo A, Borovac-Pinheiro A, Suarez-Rebling D, Eckardt M, Theron G, Burke TF. Uterine balloon tamponade for the treatment of postpartum hemorrhage: a systematic review and meta-analysis. Am J Obstet Gynecol. 2020 Apr;222(4):293.e1-293.e52. doi: 10.1016/j.ajog.2019.11.1287. Epub 2020 Jan 6. PMID: 31917139.
7. Ring L, Landau R. Postpartum hemorrhage: Anesthesia management. Semin Perinatol. 2019 Feb;43(1):35-43. doi: 10.1053/j.semperi.2018.11.007. Epub 2018 Nov 14. PMID: 30578145.
8. Guasch E, Gilsanz F. Massive obstetric hemorrhage: Current approach to management. Med Intensiva. 2016 Jun-Jul;40(5):298-310. English, Spanish. doi: 10.1016/j.medint.2016.02.010. Epub 2016 May 13. PMID: 27184441.
9. Nguyen TN, Boyd ME. Bloodless Management of Postpartum Hemorrhage and Jehovah's Witnesses. J Obstet Gynaecol Can. 2019 Jun;41(6):743-744. doi: 10.1016/j.jogc.2019.03.020. PMID: 31126430.
10. Jackson DL, DeLoughery TG. Postpartum Hemorrhage: Management of Massive Transfusion. Obstet Gynecol Surv. 2018 Jul;73(7):418-422. doi: 10.1097/OGX.0000000000000582. PMID: 30062383.
11. James AH, Grotegut C, Ahmadzia H, Peterson-Layne C, Lockhart E. Management of Coagulopathy in Postpartum Hemorrhage. Semin

- Thromb Hemost. 2016 Oct;42(7):724-731. doi: 10.1055/s-0036-1593417. Epub 2016 Oct 3. PMID: 27699730.
12. Seto S, Itakura A, Okagaki R, Suzuki M, Ishihara O. An algorithm for the management of coagulopathy from postpartum hemorrhage, using fibrinogen concentrate as first-line therapy. *Int J Obstet Anesth.* 2017 Nov;32:11-16. doi: 10.1016/j.ijoa.2017.03.005. Epub 2017 Apr 1. PMID: 28501265.
  13. Vendittelli F, Barasinski C, Legrand A, Costa-Correia CD, Crenn-Hébert C, Rivière O, Dreyfus M, Lémery D. A French audit of maternity unit protocols for immediate postpartum hemorrhage: A cross-sectional study (HERA). *J Gynecol Obstet Hum Reprod.* 2021 Jan;50(1):101934. doi: 10.1016/j.jogoh.2020.101934. Epub 2020 Oct 7. PMID: 33035719.
  14. Dahlke JD, Mendez-Figueroa H, Maggio L, Hauspurg AK, Sperling JD, Chauhan SP, Rouse DJ. Prevention and management of postpartum hemorrhage: a comparison of 4 national guidelines. *Am J Obstet Gynecol.* 2015 Jul;213(1):76.e1-76.e10. doi: 10.1016/j.ajog.2015.02.023. Epub 2015 Feb 28. PMID: 25731692.
  15. Vendittelli F, Barasinski C, Pereira B, Dreyfus M, Lémery D, Bouvier-Colle MH; HERA Group. Policies for management of postpartum haemorrhage: the HERA cross-sectional study in France. *Eur J Obstet Gynecol Reprod Biol.* 2016 Oct;205:21-6. doi: 10.1016/j.ejogrb.2016.08.008. Epub 2016 Aug 10. PMID: 27566217.