

NURSE-LED INTERVENTIONS IN THE EARLY DETECTION AND MANAGEMENT OF POSTPARTUM HAEMORRHAGE: A NARRATIVE REVIEW

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Abstract

Postpartum haemorrhage (PPH) remains the leading direct cause of maternal death worldwide, and the speed and accuracy with which bleeding is detected and treated after birth are determined largely by frontline nursing and midwifery practice. This narrative review synthesises recent evidence (2019-2025) on nurse-led and nurse-driven strategies for PPH prevention, early detection, and first-response management, including calibrated blood-loss measurement, structured treatment bundles, simulation-based skills training, and quality-improvement (QI) collaboratives. The landmark multicountry E-MOTIVE trial, in which a calibrated blood-collection drape combined with a rapid first-response treatment bundle was delivered predominantly by midwives and nurses, demonstrated a substantial reduction in severe maternal outcomes from bleeding, with process evaluation confirming high fidelity of nurse- and midwife-led drape use and bundle delivery across diverse settings. Complementary evidence from United States labor and delivery units shows that transitioning nurses from visual estimation to quantified blood loss (QBL), supported by competency-based education, meaningfully improves recognition accuracy and timeliness of escalation. State-wide and hospital-level QI collaboratives built around standardised hemorrhage safety bundles, with nurse-physician mentor pairs guiding implementation, have been associated with reductions in severe maternal morbidity and blood product utilisation. Across the reviewed literature, the consistent finding is that no single tool or drug prevents PPH-related mortality in isolation; rather, objective early detection paired with rapid, protocol-driven nursing action, sustained through simulation drills, audit, and interprofessional accountability, is what converts evidence into outcomes. The review concludes with implications for nursing education, unit-based readiness, and future research priorities in low-resource and high-resource settings alike.

Keywords: postpartum haemorrhage; obstetric hemorrhage; nurse-led intervention; quantified blood loss; hemorrhage bundle; maternal safety; simulation training

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Introduction

A Postpartum haemorrhage (PPH), most commonly defined as blood loss of 500 mL or more within 24 hours of vaginal birth, is the leading direct cause of maternal death globally and a major contributor to severe maternal morbidity, including emergency hysterectomy, transfusion, and admission to critical care. Because nurses and midwives are physically present at the bedside during the third and fourth stages of labour, they are almost always the first clinicians positioned to recognise abnormal bleeding, initiate first-response measures, and trigger escalation to obstetric and anaesthesia teams. Consequently, PPH outcomes are strongly shaped by nursing surveillance practices, the objectivity of blood-loss assessment, and the speed with which structured protocols are activated at the bedside.

Traditional visual estimation of blood loss (EBL) has repeatedly been shown to be inaccurate, with health workers, including nurses and midwives, frequently underestimating blood loss, particularly at higher volumes, which delays recognition and treatment. In response, quantified or calibrated methods of measuring blood loss, combined with standardised first-response treatment bundles, have become a central focus of nurse-driven quality-improvement work over the last decade, culminating in large-scale trial evidence published between 2023 and 2025. This narrative review examines the recent evidence base for nurse-led strategies in PPH

prevention and management, drawing on randomised trial data, process evaluations, quality-improvement reports, and updated global guidance, with the aim of identifying which nursing-led practices produce the most consistent improvements in maternal outcomes.

2. Review Methodology

This is a narrative review rather than a systematic review or meta-analysis. Recent peer-reviewed literature, trial reports, process evaluations, and quality-improvement publications addressing nurse- and midwife-led PPH prevention and management were identified and synthesised thematically. Priority was given to sources published between 2019 and 2025, including the 2023 E-MOTIVE trial and its associated process evaluation and cost-effectiveness analyses, and the World Health Organization's 2025 consolidated guideline on the prevention, diagnosis, and treatment of PPH. As a narrative synthesis, this review does not follow a PRISMA protocol and does not report a formal risk-of-bias assessment; its purpose is to orient nursing practitioners, educators, and administrators to current intervention themes rather than to provide an exhaustive quantitative synthesis.

3. Nurse-Led Intervention Strategies

3.1 Objective, Quantified Blood-Loss Measurement

Replacing visual estimation with quantified blood loss (QBL) is now recognised as a foundational nursing

practice for early PPH detection. Studies comparing visual estimation with direct measurement have found that clinicians, including experienced obstetric staff, substantially underestimate blood loss, correctly identifying a loss of 500 mL in only about one-fifth of cases and a loss of 1000 mL in fewer than one-quarter of cases in controlled simulation studies. A nurse-driven quality-improvement initiative on a high-volume labor and delivery unit used a plan-do-study-act cycle to transition staff from visual EBL to QBL, pairing the change with competency-based nurse education; post-training test scores rose sharply from a pre-test average of roughly 78%, and the initiative moved to full nurse-driven implementation with ongoing monthly audits of compliance. This pattern, that measurement accuracy is a trainable nursing competency rather than a fixed limitation, recurs throughout the QBL literature.

The calibrated blood-collection drape, most notably evaluated in the multicountry E-MOTIVE trial, extends this principle into a low-cost, scalable bedside tool. In that trial, calibrated drapes correctly identified postpartum haemorrhage in over 93% of affected patients, compared with roughly half of patients in the usual-care group using visual estimation, and process evaluation confirmed that staff midwives placed the drape in approximately three-quarters of observed births, reflecting midwifery and nursing ownership of the detection step. The 2025 WHO consolidated PPH guideline now incorporates calibrated blood-loss assessment as a recommended detection strategy, reinforcing quantified measurement as a nursing-led standard of care rather than a research tool.

3.2 Structured First-Response Treatment Bundles

Detection alone does not improve outcomes unless it is paired with an immediate, standardised treatment response. The E-MOTIVE intervention combined the calibrated drape with the MOTIVE bundle, uterine Massage, Oxytocic drugs, Tranexamic acid, IntraVenous fluids, and Examination with Escalation, delivered within 15 minutes of diagnosis. This cluster-randomised trial, conducted across 80 hospitals in Kenya, Nigeria, South Africa, and Tanzania, reported a substantial reduction in the composite outcome of severe postpartum haemorrhage, laparotomy for bleeding, or death from bleeding, and a subsequent cost-effectiveness analysis found the approach to be an efficient use of health-system resources. Because the bundle's individual components, most of which fall within nursing and midwifery scope of practice, are delivered in rapid succession by the bedside team, the trial's authors and subsequent commentary have emphasised that the intervention's effectiveness depends on nursing teams' ability to execute a coordinated, protocolised sequence rather than on any single drug or device.

In the United States, the California Maternal Quality Care Collaborative (CMQCC) obstetric hemorrhage safety bundle, structured around readiness, recognition, response, and reporting, has been implemented through statewide and multistate collaboratives using paired nurse and physician mentors supporting cohorts of hospitals. Analysis of a multistate rollout found that mandated implementation of an eight-component hemorrhage protocol incorporating quantitative blood-loss

measurement was associated with a significant reduction in blood-product utilisation within ten months of implementation, and California's statewide collaborative was associated with reductions in hemorrhage-related severe maternal morbidity, with nurses reported as the primary drivers of policy development, hemorrhage cart readiness, post-event debriefing, and simulation drills at the unit level.

3.3 Simulation-Based Training and Nurse Mentoring

Simulation and mentoring emerge repeatedly as the mechanism through which bundles and detection tools are translated into reliable bedside performance. The E-MOTIVE implementation strategy paired the calibrated drape and treatment bundle with on-site simulation training, hemorrhage trolleys stocked with all necessary supplies, designated PPH champions among midwives and doctors, and structured audit-and-feedback cycles; process evaluation found that access to supplies and sustained training were critical enablers of high-fidelity bundle delivery. In a lower-resource setting, a quality-improvement programme in Bihar, India used structured, repeated nurse-mentoring visits alongside simulation of normal and complicated deliveries to improve frontline diagnosis and management of PPH and intrapartum asphyxia at primary care facilities, illustrating that mentoring-based competency building can be adapted across both high-resource hospital systems and lower-resource primary care contexts.

3.4 Quality-Improvement Infrastructure and Escalation Culture

Beyond individual tools, the durability of nurse-led PPH gains depends on organisational infrastructure. CMQCC's model of pairing nurse and physician mentors with small hospital cohorts, alongside standardised coding, hands-on drills, and structured post-event debriefing, has been used across successive statewide and multistate hemorrhage collaboratives, with rate of nursing-led bundle-element adoption tracked as an explicit marker of hospital engagement. The American Hospital Association's 2025 guidance on improving PPH outcomes similarly highlights predictive analytics and structured electronic documentation as tools that support, rather than replace, nursing recognition and escalation, suggesting that technology adoption should be framed as augmenting nursing judgement rather than substituting for it.

3.5 Application in Low-Resource and High-Risk Settings

The evidence base for nurse- and midwife-led PPH detection and first response is unusual in maternal health in that its strongest trial evidence originates from low- and middle-income country settings. The E-MOTIVE trial's primary results and process evaluation, conducted across four African countries, found that the intervention was deliverable with high fidelity by midwives and nurses even in busy, resource-constrained labor wards, provided that supplies and simulation-based training were consistently available. This is a notable contrast to some hemorrhage-bundle literature from high-resource settings, where early outcome data from regional hospital networks did not immediately show reductions in hemorrhage-related severe maternal morbidity, with authors noting that additional time was needed before all

bundle elements were fully embedded in practice. Together, these findings suggest that implementation fidelity and sustained nursing engagement, not merely the availability of a tool or protocol, determine whether nurse-led PPH strategies translate into measurable outcome improvements.

4. Discussion

Taken together, the reviewed literature points to a consistent conclusion: PPH-related mortality is reduced not by any single device or drug but by the combination of objective, nurse-performed detection and a rapid, protocol-driven, nursing-delivered treatment sequence. Quantified blood-loss measurement, whether through calibrated drapes or structured QBL training, corrects a well-documented tendency toward underestimation of bleeding, but its value depends on nurses being trained and empowered to act immediately on the numbers it produces. Treatment bundles such as MOTIVE and the CMQCC hemorrhage bundle translate detection into standardised bedside action, but the trial and QI evidence reviewed here shows that fidelity, not merely bundle design, drives outcomes, and fidelity is sustained through simulation, mentoring, adequate supply readiness, and audit-and-feedback cycles rather than through one-time protocol rollout.

This synthesis also highlights that some of the strongest randomised evidence for nurse- and midwife-led PPH intervention now comes from resource-constrained settings, which has implications for how findings are generalised. Hospitals in high-resource systems should not assume that bundle adoption alone will replicate trial-level reductions in morbidity without matching the implementation intensity, simulation training, and mentoring support that accompanied the original trials. Finally, framing technologies such as predictive analytics and electronic hemorrhage-risk flagging as supports to nursing judgement, rather than replacements for it, appears essential to maintaining the vigilance and escalation culture on which PPH outcomes depend.

5. Implications for Nursing Practice and Education

- Replace visual estimation of blood loss with quantified or calibrated measurement as the default nursing standard for all vaginal births, not only those already identified as high risk.
- Embed a structured first-response treatment sequence (uterine massage, uterotonics, tranexamic acid, IV fluids, examination and escalation) as a nurse-initiated protocol activated immediately upon objective detection of excess bleeding.
- Sustain competency through recurring simulation drills and hemorrhage-cart readiness checks rather than one-time orientation training.
- Designate unit-based PPH champions among nursing staff to drive local audit, feedback, and post-event debriefing cycles.
- Pair technology adoption, such as electronic risk-flagging or predictive analytics, with nursing education so that these tools augment rather than replace bedside clinical judgement.
- Adapt implementation intensity, including mentoring and supply-chain readiness, to local

resource settings rather than assuming bundle adoption alone will reproduce trial-level outcome reductions.

6. Conclusion

Postpartum haemorrhage remains the leading direct cause of maternal death worldwide, yet recent trial and quality-improvement evidence confirms that nursing and midwifery practice sits at the centre of effective prevention and first response. Current evidence indicates that nurse-led, quantified blood-loss detection paired with a standardised, rapidly delivered treatment bundle, sustained through simulation training, mentoring, and structured quality-improvement infrastructure, achieves substantially greater reductions in severe maternal morbidity and mortality than reliance on visual estimation and ad hoc response. As nursing education and health-system leadership continue to prioritise maternal safety, future research should focus on scaling calibrated detection tools across diverse resource settings, refining escalation protocols, and strengthening the audit and mentoring infrastructure that sustains nurse-led gains over time

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