

Rethinking Postpartum Haemorrhage Care in Lower and Lower-Middle-Income Countries: A Comparative Review of E-MOTIVE Bundle and Single-Intervention Protocols

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ABSTRACT

Postpartum haemorrhage is defined as a blood loss of more than 500 mL in a vaginal delivery. The E-MOTIVE bundle has been created to improve treatment in low- and middle-income countries (LMICs). This paper aims to explore the vulnerabilities of LMICs, particularly in terms of understaffing, supply chain fragility, and financial constraints, which raise questions about the bundle's long-term sustainability.

Methods: The paper was developed as a narrative review informed by realist principles, with PRISMA guidelines used to transparently report the literature search and the study-selection process. Papers from the last 8 years addressing PPH and/or E-MOTIVE protocol in LMIC settings were included. The search was conducted through PubMed, Google Scholar, Cochrane Library and Consensus, retrieving 101 records. The screening through Covidence platform firstly eliminated duplicates, then assessed eligibility through a title and abstract screening, finally a full-text screening was conducted, reducing the number to 31 studies, which underwent data extraction.

Conclusions: Findings indicated that the E-MOTIVE bundle appears to offer greater effectiveness in comparison with single-intervention protocols due to the objective diagnosis and prompt treatment administration. Policies should prioritise comprehensive and evidence-informed staff training, preparedness and increasing reliability on the uterotronics and medical equipment supply chain. Overall, the E-MOTIVE bundle has the potential to be a cost-effective and sustainable tool to treat PPH in LMICs, although further evidence, particularly on long-term implementation and cost-effectiveness across different settings, is needed to establish its broader applicability.

Keywords: Lower and lower-middle-income countries, Postpartum haemorrhage, Staffing, Supply chain

INTRODUCTION

Postpartum haemorrhage (PPH) is defined as a blood loss of more than 500 mL in a vaginal delivery or more than 1000 mL during Caesarean delivery (Wormer et al., 2025). The primary causes of PPH are summarised by the 4 “T’s”: tone (uterine atony), trauma (lacerations or uterine rupture), tissue (retained placenta or clots), and thrombin (coagulation deficiency) (Wormer et al., 2025). Recent estimates indicate approximately 14 million PPH cases, resulting in 70,000 related fatalities per year. Consequently, PPH accounts for 27% of maternal deaths globally (Cresswell, 2023), with one woman succumbing to this condition every 6 minutes (Gallos & Coomarasamy, 2019). About 90% of the annual PPH deaths occur in countries with lower or lower-middle sociodemographic indices (Weeks, 2024). For example, the PPH fatality reaches 36.9% in North Africa, compared to 16.3% in developed regions (Weeks, 2024). PPH diagnosis and treatment require exact quantification of blood and rapid interventions, which are often not possible in LMICs due to staffing scarcity and a fragile supply chain.

The main PPH treatments methods include first intervention actions such as massive transfusion protocol, cause identification and uterine massage. The next step are pharmacological interventions such as first-line uterotonics (often oxytocin), second-line uterotonics (methylergonovine/ergometrine, carboprost, misoprostol, carbetocin), tranexamic acid (TXA) and fibrinogen concentrate. If the situation does not stabilize, there is the use of mechanical interventions such as intrauterine balloon tamponade or vacuum-induced haemorrhage-control devices. The last resort are surgical options such as uterine compression sutures, arterial ligation and hysterectomy.

However, the correct and timely application of these procedures widely depends on the availability of supplies and the staff preparedness. Moreover, care is often delivered through a “wait and see” approach, which involves acting only upon the escalation of symptoms (Forbes et al., 2023). For this reason, in 2023 the World Health Organization (WHO) created a bundled approach called E-MOTIVE to respond to PPH.

In medicine, a care bundle is a small, structured set of 3-5 evidence-based practices that, when performed together reliably, significantly improve patient outcomes and reduce variability in care. The E-MOTIVE trial was conducted over 16 months between 2021 and 2023 in collaboration with the University of Birmingham and featured three phases: a 7-month usual care monitoring period, a 2-month transition phase for training, and a 7-month intervention period. It has included 80 secondary-level hospitals, two of which were excluded from the trial due to conflicting programs; E-MOTIVE has been associated with a 60% lower risk of the primary outcome, a composite of severe postpartum hemorrhage, laparotomy for postpartum hemorrhage, or maternal death from postpartum hemorrhage, after vaginal birth across 78 hospitals in Nigeria, Kenya, Tanzania and South Africa (Gallos et al., 2023). This protocol aimed specifically to reduce maternal mortality and morbidity in low-resource settings where more women experience the escalation of PPH due to less rapid and effective intervention; therefore, it has not been implemented in developed countries since they currently have lower PPH mortality rates. According to a cost-effectiveness evaluation, E-MOTIVE only increases adjusted care costs by 0.30 USD per patient in comparison with the less effective single-intervention PPH protocols (Williams et al., 2024).

Nevertheless, the challenges of understaffing and the inability to ensure the quality of certain uterotonic, such as oxytocin, due to difficulties in maintaining appropriate cold temperatures, are issues faced by low-resource countries. These raise concerns regarding the sustainability of the E-MOTIVE protocol following the conclusion of the trial. Once funding is withdrawn, research midwives will no longer be available to support regular staff, resulting in a loss of adherence to the protocol if regular training is not enacted. On the other hand, single-intervention protocols tend to be more easily sustained due to lower economic burden and operative structure; nevertheless, their efficacy is considered to be lower than a bundled approach.

This paper will examine the E-MOTIVE protocol in comparison with single-interventions protocols in the context of PPH treatment in low and middle-income countries. Particular attention will be directed toward staffing, supply chain constraints and cost-effectiveness, areas that remain understudied, to evaluate the potential long-term sustainability of the bundled approach beyond trial funding ends. The paper will then discuss evidence-based protocol adaptations to make it more applicable in LMICs such as heat-stable misoprostol. In addition, positive examples of stakeholder-state policies which have allowed the distribution of PPH treatment drugs will be examined and case studies of positive staff training examples will be discussed. Overall, the aim of this paper is to provide a literature review about the implementation of the E-MOTIVE protocol in LMICs and discuss its long-term sustainability.

METHODOLOGY

A literature review presented as a narrative review informed by realist principles has been chosen to convey the findings. In fact, the recentness of the E-MOTIVE protocol necessitated flexibility to explore new angles, such as staffing, issues in the medication and devices supply chain, and the long-term economic sustainability of the bundle. A realist-informed paper not only replies to the effectiveness of a measure, but also analyses its context and implications.

Initially, after defining the area of interest as maternal healthcare in LMICs and electing to concentrate on PPH, a literature review was performed to identify the gaps in the existing research on this topic. The research question was developed to investigate the E-MOTIVE care bundle's implementation in LMICs, considering the constraints of staffing shortages, supply chain fragility and financial availability.

The literature search was conducted through the online databases PubMed, Cochrane Library and Google Scholar. The inclusion criteria have been set for papers published between 1 January 2018 and 15 January 2026 using the framework PICO (Patient/Population, Intervention, Comparator, and Outcome).

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Eligibility criteria	Inclusion	Exclusion
Population	• Women suffering from PPH after vaginal delivery • Healthcare workers involved in PPH treatment	• Animals • Women experiencing PPH during or after Caesarean section
Intervention/exposure	• E-MOTIVE bundled protocol	• Other protocols
Comparator/context	• First line uterotonics (oxytocin) • Second line uterotonics (methylergonovine/ergometrine, carboprost, misoprostol, carbetocin) • Balloon tamponade • Blood transfusions • Tranexamic acid • Surgical interventions • Bakri balloon • Fibrinogen concentrate • Vacuum induced haemorrhage control devices • Uterine compression sutures • Arterial ligation • Hysterectomy • Other single-intervention protocols • Other methods to measure blood loss	• Other single-interventions
Outcome	• Staff training • Supplies availability • Economic sustainability • Implementation of the bundle • Treatment of PPH effectiveness • Blood quantification efficacy • Timing • Women's experience	• Prevention of PPH • Pharmacological perspective
Study Characteristics	• Peer reviewed papers • Last 8 years • Lower or lower-middle-income countries (LMICs) • Hospital settings	• Non peer reviewed papers • More than 8 years ago • High-income countries • Home-birth or community birth

Other		• Non-English papers without translation
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Table 1: PICO framework with inclusion and exclusion criteria.

Database search

PubMed

Nine searches were conducted using the search strings: "postpartum haemorrhage" AND "E MOTIVE"; "postpartum haemorrhage" AND "E-MOTIVE" AND ("low-resource settings" OR "low-income countries" OR LMICs); "postpartum haemorrhage" AND "E MOTIVE" AND (implementation OR feasibility OR sustainability) AND (staffing OR workforce OR "supply chain"); "postpartum haemorrhage" AND (oxytocin OR uterotonics OR "single intervention") AND ("low resource settings" OR LMICs); "postpartum haemorrhage" AND oxytocin AND (implementation OR feasibility) AND (staffing OR "supply availability"); ("postpartum hemorrhage" OR "post-partum haemorrhage" OR "obstetric hemorrhage") AND (E-MOTIVE OR "care bundle*" OR "obstetric care bundle*" OR "massive transfusion protocol" OR oxytocin OR "balloon tamponade"); ("postpartum hemorrhage" OR "post-partum haemorrhage" OR "obstetric hemorrhage") AND (staffing OR workforce OR "human resources for health" OR workload OR "task shifting"); ("postpartum hemorrhage" OR "post-partum haemorrhage" OR "obstetric hemorrhage") AND (supplies OR "supply chain" OR "resource availability" OR equipment OR "blood supply") AND ("low-resource setting*" OR "resource-limited setting*" OR LMIC*); ("postpartum hemorrhage" OR "post-partum haemorrhage" OR "obstetric hemorrhage") AND (staffing OR workforce OR "human resources for health" OR workload OR "task shifting") AND ("low-resource setting*" OR "resource-limited setting*" OR LMIC*). Word variations have also been searched. Papers have been selected based on the eligibility criteria, and duplicates have been excluded.

Cochrane Library

There were two searches on Cochrane Library in the sectors "Reviews" and "Trials". The search strings have been ("Postpartum haemorrhage" OR "postpartum haemorrhages") AND "treatment" AND "LMICs" for the "Reviews" section and "E-MOTIVE" for the "Trial" section. The papers were chosen for adherence to the eligibility criteria and duplications of PubMed papers have been eliminated.

Google Scholar

Preliminary searches to build a background on the topic were conducted on Google Scholar. There was also one search after the completion of the other platforms' screening to include any missing papers; the search string used was "E-MOTIVE".

Consensus

This tool was used to identify additional literature on PPH management, LMIC settings and E-MOTIVE implementation. It was employed as an exploratory tool, where searches were conducted iteratively by

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entering the research question and refining or expanding the search based on the results obtained. The initial question was: “How do staffing constraints and supply availability shape the implementation and long-term sustainability of the E-MOTIVE bundle compared with single-intervention postpartum haemorrhage protocols in low-resource settings?” This was followed by the queries: “What is the percentage of PPH occurrence and mortality in the world? What about low-resource settings in particular?” and “Which are the main PPH treatment methods?”. Relevant sources identified through these searches were assessed employing the eligibility criteria.

Selection of studies

Literature management software Covidence was used for all aspects of screening. Two reviewers completed the screening. One reviewer (AG) completed the screening for all records, while the second reviewer (JC) independently conducted a parallel screening. Papers were first screened by title and abstract, then by full text. Any disagreement between the reviewers was solved through discussion and consensus.

Data extraction

The data extraction was conducted using Identification, Methods, Population, Interventions, Outcomes categories in a single reviewer mode. A data extraction template was customised in Covidence.

Study design

PRISMA guidance was used as a way to transparently report the identification, screening, eligibility assessment and inclusion of studies. The review consisted of a narrative review informed by realist principles and did not aim to constitute a systematic review or meta-analysis.

Study selection process

The records initially included were 101; 9 duplicates were removed manually and 6 duplicates were identified by Covidence, leaving 86 records for screening. Out of the remaining 86 reports, 9 were eliminated during the title and abstract screening as not relevant for the research question. 77 reports underwent full-text assessment and 46 of them were excluded as they did not meet the predefined eligibility criteria. 31 studies were included in the final narrative review.

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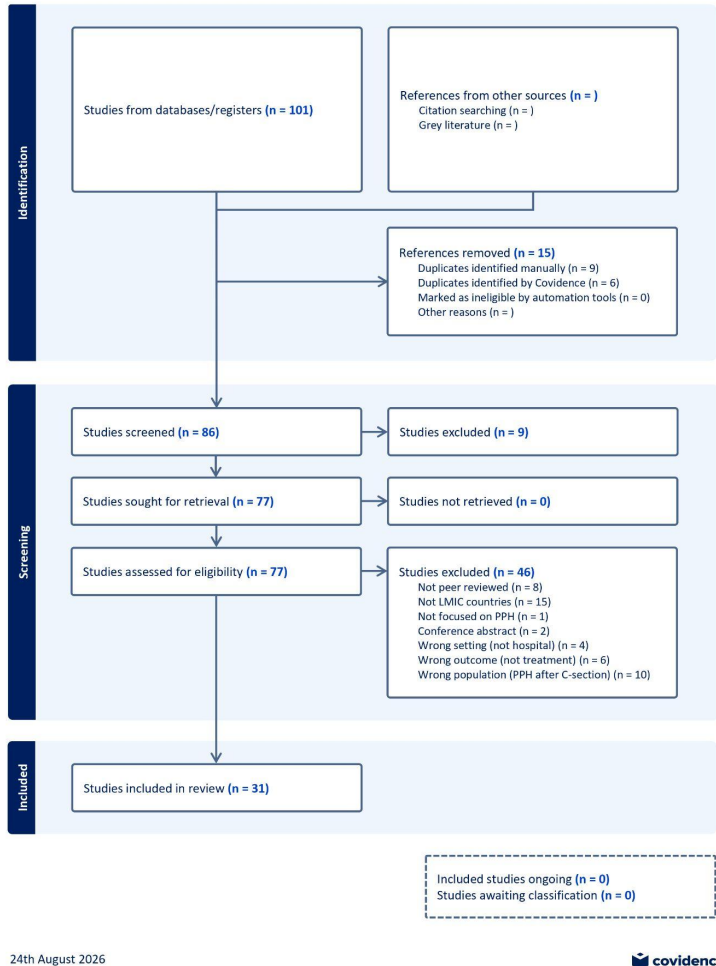


Figure 1: PRISMA diagram

Identification	Methods	Population	Interventions	Outcomes (qualitative data)
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Sponsorship source	Study design	Inclusion criteria	E-MOTIVE treatment bundle	Blood quantification efficacy
Country	Group (parallel group, crossover, N/A)	Exclusion criteria	Supply chain	Outcomes on staff
Setting	Notes about methods used in conducting qualitative studies	Group differences	Staff	Bundle implementation
Lead author and their institution		Total sample size	First intervention actions	Women's experience
Study ID		Patients	Pharmacological interventions	Effectiveness of the treatment
Title		Healthcare providers (midwives, doctors, others) and experience (in years)	Mechanical interventions	Supplies availability
Publication year			Surgical interventions	Practical and financial sustainability
World Bank Income classification of the country			Blood loss monitoring methods	Notes section
			Notes section	

Table 2: Extraction template.

The decision to present the results in a narrative way aimed to provide support for E-MOTIVE implementation strategies and policy implications.

LITERATURE REVIEW

PPH and E-MOTIVE protocol

PPH is widely recognised as the leading cause of maternal mortality and morbidity worldwide, with a particularly high incidence in LMICs. As for its treatment, general guidelines emphasise the importance of accurate measurement of blood loss through the weighing of soaked sponges, towels, and drapes (Robinson et al., 2022). Additionally, the consideration of risk factors of the single case, such as anaemia, is regarded as highly relevant.

After a diagnosis of PPH, initial intervention actions include pharmacological administration of first-line uterotonics. Oxytocin is currently the preferred agent; it acts directly on oxytocin receptors and is administered either by intravenous or intramuscular injection, though some research has been conducted into inhalation and intramyometrial routes. (Robinson et al., 2022). Compared with placebo, ergometrine, carboprost, or misoprostol, oxytocin is more effective and has been proven to produce fewer side effects (Robinson et al., 2022). Carbetocin is also considered a valid prevention alternative: in 2015, the National

Institute for Health Research funded an evidence synthesis programme which suggested that three uterotonic drugs, including carbetocin, were more effective than oxytocin in PPH prevention (I. D. Gallos & Coomarasamy, 2019). Simultaneously, bimanual uterine compression and bladder emptying should be enacted in order to allow the uterus to contract (Robinson et al., 2022).

If bleeding continues, second-line uterotonics are involved; ergometrine and carboprost are usually employed, while misoprostol is usually administered sublingually as a valuable adjunct to both prophylactic and therapeutic uterotonics (Robinson et al., 2022). In this stage, the administration of intravenous tranexamic acid is advised (Robinson et al., 2022).

The next line of management involves mechanical intervention. A uterine balloon tamponade, most commonly the Bakri balloon, is inflated with 300-500 mL of sterile solution, left in situ for 8-48 hours and then gradually deflated. This provides compression to the uterus walls and eventually reduces the uterotonics needed (Robinson et al., 2022). A lower cost alternative is a condom-loaded Foley's catheter, which is a more comfortable option for women, even if the time needed to stop bleeding is proven to be higher (Darwish et al., 2018). Alternatively, vacuum-assisted uterine contraction using a suction cannula that applies negative suction to aspirate all blood accumulated in the uterine cavity and causes the uterine wall to conform to the cannula, thereby enhancing rigidity, is regarded as a viable option (Shajahan et al., 2024).

If the situation escalates, surgical interventions may be required. These include the transvaginal uterine artery clamp, acting to temporarily occlude the uterine arteries to control bleeding (Shajahan et al., 2024). Other options include uterine compression sutures, such as B-Lynch technique, which use an absorbable suture to create compression "suspenders" (Robinson et al., 2022). Similarly, arterial ligations, which may be uterine or bilateral internal iliac, slow blood flow, and their positioning depends on the source of bleeding (Robinson et al., 2022). The final options are uterine or internal iliac artery embolization and hysterectomy, with the first one being fertility sparing whereas the latter providing a life-saving effect in severe PPH cases (Robinson et al., 2022). All surgical interventions should be supported by resuscitation measures including oxygen and blood products. In terms of transfusions, the initial step involves administration of red blood cells, followed by platelets, fresh frozen plasma, fibrinogen concentrates, and the implementation of a massive haemorrhage transfusion protocol if the situation escalates (Robinson et al., 2022).

It is evident that the effectiveness of PPH treatment heavily relies on the availability of medical supplies and advanced equipment, particularly during the second-line interventions. This underscores the importance of prevention, timely diagnosis, and timely management of PPH in LMICs, where such measures are essential to reduce reliance on limited clinical resources. In this context, care bundles offer a particularly valuable strategy. These bundles comprise a small set of evidence-based practices, typically three to five, and have been shown to improve clinical outcomes when implemented collectively, concurrently, or in rapid sequence (Vogel et al., 2024). Developed by the Institute for Healthcare Improvement (IHI) to increase care reliability, they are widely used in intensive care and sepsis prevention, but are relatively new in maternal healthcare (Vogel et al., 2024).

Building on this concept, the E-MOTIVE trial ran between 2021 and 2023 in 80 secondary-level hospitals across Kenya, Nigeria, South Africa, and Tanzania, two of which were excluded from the trial due to conflicting programs, determining a reduction to a sample of 78 hospitals. Between August and October 2021, all the participating hospitals entered a 7-month baseline period during which they provided usual care for postpartum haemorrhage; then they were randomly assigned either to continue providing usual care or to receive the trial intervention for 7 months, with an allowance of 2 months for transition (I. Gallos et al., 2023). The E-MOTIVE bundle comprises a structured set of interventions designed to be delivered within 15 minutes of PPH onset. These include early detection using a calibrated drape to measure blood loss, uterine massage, administration of uterotonics such as oxytocin, tranexamic acid, intravenous fluids, examination, emptying the bladder and escalation of care, when necessary (I. Gallos et al., 2023).

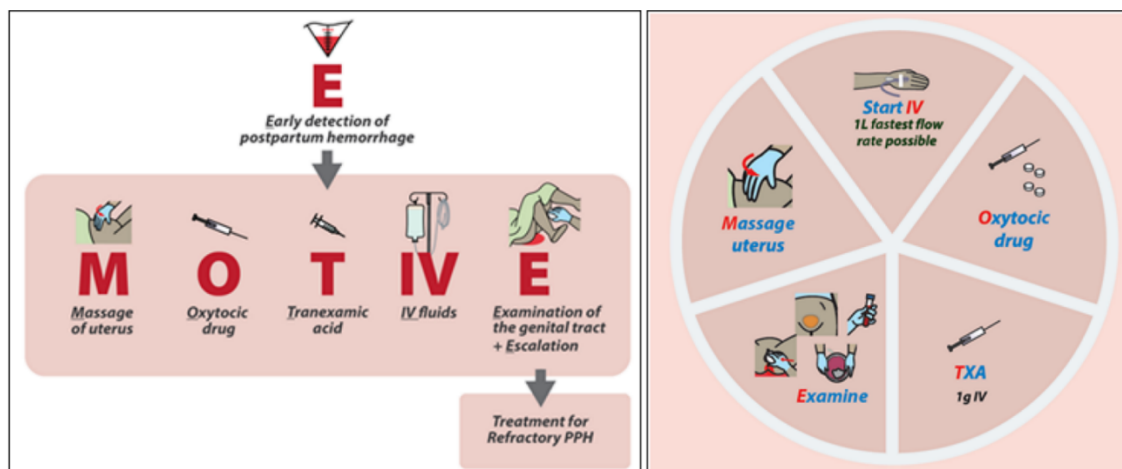


Figure 2: The E-MOTIVE workflow and the meaning of the acronym E-MOTIVE.

Creative Commons Licence <https://creativecommons.org/licenses/by/4.0/> No changes were made. (Forbes et al., 2023)

The main distinctions between the bundle and the usual care are the time needed to initiate treatment and the completeness and timing of the interventions' administration. This is related to the inclusion of a blood collection calibrated drape in the bundle, which enables early identification of the 300 mL and 500 mL thresholds in order to diagnose PPH timely (Akter et al., 2022). Related studies evaluating the E-MOTIVE trials in Asia following the success of the original one in Africa showed how the drape reduced not diagnosed PPH 50% at baseline to 0% (7% in original trial) (Akter et al., 2022). In contrast, usual care proves flawed in the blood quantification system, as visual estimation may be challenging for inexperienced midwives, families may invigilate wrongly when asked to do so and women might throw pads without showing them to healthcare personnel (Akter et al., 2022). However, too strict reliance on blood loss thresholds undermining vital signs and risk factors (weight, anaemia) is counterproductive. (Akter et al., 2022).

In comparing E-MOTIVE and usual care, evidence shows substantial improvements in both the timeliness and completeness of PPH management. One study reported a median diagnosis time of 17 minutes in the

E-MOTIVE group and 90 minutes in the usual care group (Mammoliti, Martin, et al., 2025). The median time to initiate the treatment was zero minutes in E-MOTIVE group versus one minute in usual care group, and the median procedure time was shorter with E-MOTIVE, 13 minutes compared with 18 minutes (Mammoliti, Althabe, Easter, Devall, et al., 2025). The intervention also improved adherence to clinical protocols: all women received medicines in E-MOTIVE, compared with 89% in usual care, and tranexamic acid and intravenous fluids use was more consistent (Mammoliti, Althabe, et al., 2025). Overall, E-MOTIVE protocol showed a 60% lower risk of the primary outcome, a composite of severe postpartum hemorrhage, laparotomy for postpartum hemorrhage, or maternal death from postpartum hemorrhage, after vaginal birth (I. Gallos et al., 2023).

Moreover, the nature of the bundled approach facilitated the development of dedicated E-MOTIVE trolleys containing all the necessary equipment and supplies. These trolleys streamlined emergency response by reducing disorganisation and delays during critical moments (Bohren et al., 2025).

However, despite the proven high effectiveness of E-MOTIVE, its implementation in low-resource settings remains constrained by several significant challenges. Firstly, the insufficient number of health workers and their insufficient training in dealing with PPH has created difficulties, as a team approach is strongly needed (Fawcus, 2019). In addition, limited equipment, essential medications, blood products and emergency transport have been reported; also, failing to respect the special transport and storage temperatures for oxytocin has impacted the delivery of quality care (Fawcus, 2019). Finally, the general cost of the bundle has been evaluated to verify its cost-effectiveness. These constraints have been explored in greater depth to inform and support future strategies for scaling up E-MOTIVE implementation.

Workforce capacity and training

The E-MOTIVE implementation faced some issues concerning the staffing aspects; in fact, a bundled approach requires more staff members cooperating around the same patient, which may become challenging in overly crowded hospital wards. In some papers, it was in fact highlighted how understaffing was often associated with long shifts, preciseness decline and tensions in the team, leading to less effective PPH treatments (Alwy Al-Beity, Pembe, Kwezi, et al., 2020). This could also impact patients' psychological situation during the emergency treatment (Briley et al., 2021). On the other hand, usual care may be considered less demanding for the staff and easier to conduct due to being entrenched in the hospital practices. However, a bundled approach has shown to improve staff response in situations of time pressure, avoiding cognitive overload. In fact, many staff members have highlighted how the use of posters showing E-MOTIVE steps has helped them to feel confident during an emergency (Akter et al., 2022). Moreover, the high success rate of E-MOTIVE has led to investigations regarding techniques to deal with the bundle despite understaffing.

Firstly, task shifting has been shown to be effective in reducing the burden on hierarchically higher healthcare providers; this was enacted by modifying policies to allow low cadre personnel to conduct advanced care. In fact, mirroring the situation in rural care centres, midwives were trained and allowed to perform all components of PPH care, including TXA administration and upper genital tract examination,

and this resulted in higher treatment efficacy and acceptability. Moreover, the lower cadre midwives were often perceived as part of the culture and therefore more trustworthy (Alwy Al-Beity, Pembe, Marrone, et al., 2020). Also, the training on interprofessional collaborative practices was shown to fasten PPH detection and initiation of treatment, lowering severe PPH outcomes and eventually hospital stays (Zenani et al., 2025). A review then highlighted the importance of establishing good communication with colleagues from referral structures, because the tensions often decreased the availability of clinical information about the patients and impacted their treatment (Alwy Al-Beity, Pembe, Kwezi, et al., 2020). In some studies it was also emphasised how strong and fair leadership was crucial in motivating the team and allowing quality care (Alwy Al-Beity, Pembe, Kwezi, et al., 2020).

To allow effective teamwork and emergency management, training has to be effective and continuative. In particular, several studies stressed the efficacy of a “low dose, high frequency” approach, with training every week and repetition of the assessments at fixed thresholds. This approach has showed to increase staff skills by 7% (Christiansen et al., 2023), and the continuative trainings allowed this value to be maintained for a discrete amount of time; however, skills decay and lower adherence after a period of time still occurred in some cases (Alwy Al-Beity, Pembe, Marrone, et al., 2020). A particularly new and effective training method has been identified in simulation e-learning apps, which allowed an interactive approach and a tracking of progress to boost motivation (Nishimwe et al., 2021). Furthermore, including the training in midwives’ formation allowed student-midwives to be equipped with the skills to tackle an emergency during their rotations; this limited shock effect and had a positive outcome on their motivation due to the receival of positive feedback (Faustine et al., 2025). However, some constraints were present in training methods: firstly, the belief that daily treatments were sufficient to maintain advanced PPH care skills; secondly, the over crowdedness of the hospitals wards which made health professionals unable to allocate part of their working time for the training; then, the lack of motivation from their trainers and, finally, the lack of extra compensation or general benefits (E. Williams et al., 2019). The frequent staff turnover was mentioned as a potentially intrusive factor for consistency in PPH treatment training (Alwy Al-Beity, Pembe, Marrone, et al., 2020).

Therefore, staff preparedness and training have been identified as vital aspects in PPH management. However, the nature of the E-MOTIVE bundle may pose issues to the condition of understaffing of LMICs health centres.

Supply chain reliability

Supply chain has been identified as one of the greatest constraints to the E-MOTIVE bundle implementation in LMICs, as having a fixed bundle does not facilitate the adaptations to local resources that single interventions do. Inconsistencies in supplies are noticeable in medical equipment, transfusion blood and medicines. Often the staff have to request that the patients or their relatives purchase the items necessary for treatment, undermining professionalism and placing an economic burden on the population. (Alwy Al-Beity, Pembe, Kwezi, et al., 2020).

Reviews emphasise how basic medical tools such as blood pressure measuring devices, point of care haemoglobinometers and anaesthetic machines may be unavailable or damaged due to inadequate maintenance, limiting the patients monitoring possibilities (Fawcus, 2019). Moreover, the small blood amount stored by hospitals is often insufficient for massive obstetric haemorrhage transfusions whereas rural hospitals seldom do not possess a blood bank (Fawcus, 2019). When blood donation is requested to patients' families, it is often denied due to the fear of being diagnosed with HIV, showing how settings pose high constraints on PPH care (Alwy Al-Beity, Pembe, Kwezi, et al., 2020).

Also, uterotonics face high availability fluctuation in LMICs. In particular, oxytocin supply is often hampered by the necessity of a cold transport and storage chain, as the medication has to be kept at a constant temperature between 2°C and 8°C (Lambert et al., 2020). The greatest breaches of this norm happen in LMICs, which often belong to climatic zones III and IV. Country regulations are not consistent with WHO ones or additional oxytocin doses are imported illegally and do not abide by transport rules; once received, oxytocin in fact is often kept on room temperature shelves due to lack of alternatives or habit (Oliver et al., 2018). This leads to staff perceiving oxytocin as low quality and low effectiveness but avoiding reporting it due to the consciousness about the hospitals' possibilities; instead, the administration of a higher dose than the standard one is preferred, with the consequence of faster use of resources (Torloni et al., 2023). The most applicable alternative for oxytocin is represented by misoprostol, known for its heat stability (Mary et al., 2019) and shown to be trusted more than oxytocin by healthcare professionals. However, it has been proved that opening the blister quickly impacts the medication's effectiveness if exposed to humidity and ambient temperature (Torloni et al., 2023).

The fact that often supplies are insufficient for the country's population (Nadkarni et al., 2018) or are unable to reach community centres in areas where a high percentage of women do not deliver in hospitals pose concerns regarding the efficacy of PPH treatments and the potential E-MOTIVE implementation (Fawcus, 2019).

Economic sustainability

Another factor involved in E-MOTIVE implementation is the bundle cost-effectiveness in comparison with usual care after trial fundings will end. Usual care may be considered more cost-effective due to the absence of a calibrated drape use and the limited use of TXA and IV fluids. However, the incidence of severe PPH in the usual care group of the papers analysed was higher, requiring more blood transfusions, marginally longer hospitalization, additional treatment intervention and longer time spent by the physician with the patient (E. V. Williams et al., 2024). In the original E-MOTIVE trial, the mean Disability-Adjusted Life Year (DALY) per patient in the intervention group was 0.00767, whereas in the usual care group, the mean DALY per patient was 0.01158, showing the reduction of additional costs due to the higher effectiveness of the bundled approach (E. V. Williams et al., 2024).

An economic evaluation conducted on the E-MOTIVE trial shows that the total unadjusted mean per patient cost was 45.15 USD in the E-MOTIVE group and 43.19 USD in the usual care group, but lowering the calibrated drape cost to 1 USD, modelling 2023 values, the two interventions could be comparable in cost, with the E-MOTIVE guaranteeing higher efficacy (E. V. Williams et al., 2024).

Moreover, the bundle implementation does not require additional staff and the training of the existing ones can be achieved through short seminars, frequent practice and e-learning (often available in the country's language and therefore easy to spread). (Christiansen et al., 2023).

As for the medications' supply chain, the establishment of end-to-end planning on the chain and the designation of a product owner could reduce access barriers and foster more consistent investments. This would allow prompter distribution of TXA and uterotonics for both PPH prevention and treatment in LMICs (Gülmezoglu et al., 2024).

Therefore, the general sustainability of the bundle has been proved theoretically but further supply chain implementations could improve the long-term E-MOTIVE bundle sustainability.

RESULTS

The review facilitated the extraction of data from 31 papers.

Paper type	Frequency
Qualitative interview study	6
Prospective cohort study	4
Cluster randomised controlled trial	4
Mixed-methods study	4
Pre-post intervention study	3
Systematic review	3
Retrospective cohort study	2
Observational study	1
Economic evaluation study	1
Qualitative study using the COM-B model	1
Prediction modelling study	1
Narrative review	1

Table 3: Types of papers included in the review.

Seven studies were qualitative, 16 quantitative, four involved mixed methods and four were part of secondary research. The qualitative studies analysed were characterised by the use of interviews as part of the assessment. Further details of the systematic search can be found in the PRISMA diagram (Figure II).

Due to the heterogeneity of the included studies, a quantitative synthesis was not performed. The evidence was interpreted based on study design, study design strengths and relevance to the research question. Cluster-randomised controlled trials were given greater weight when analysing clinical effectiveness, whereas cohort and observational studies provided valuable evidence on clinical outcomes and real-world implementation. Qualitative, mixed-methods and interview-based studies were used to examine contextual factors, including staffing, training and supply availability. Systematic and narrative reviews provided supporting background knowledge, while economic evaluations and prediction modelling served

to analyse financial feasibility and economic implications. Therefore, the heterogeneity of the studies allowed different dimensions of PPH management and E-MOTIVE to be considered; nevertheless, they also partially limited the extent to which precise comparative conclusions could be drawn.

Country	Frequency	World Bank Income classification
Nigeria	12	Lower-middle
South Africa	11	Upper-middle
Tanzania	11	Lower-middle
Kenya	9	Lower-middle
Ethiopia	5	Low
India	4	Lower-middle
Uganda	4	Low
Egypt	3	Lower-middle
Ghana	3	Lower-middle
Malawi	3	Low
Pakistan	3	Lower-middle
Myanmar	2	Lower-middle
International	2	Lower-middle countries
Namibia	1	Lower-middle
Rwanda	1	Low
No country	1	N/A

Table 4: Countries, frequency and world bank income classification.

Frequency represents the number of studies involving each country; as some studies include several countries, the frequencies are not mutually exclusive and therefore sum to more than 31 included studies. Moreover, two papers were classified as international and referred to lower-middle-income countries without explicitly clarifying the countries and one review used for background theoretical knowledge was not based on a specific country.

Most of the included studies were conducted in lower-middle-income countries; South Africa was included despite being classified as an upper-middle-income country as it was part of the E-MOTIVE trial, constituting an essential source of evidence for the review. Country income classifications were based on the World Bank's 2025 Income Classification, corresponding to Fiscal Year 2026.

Year	Frequency
2018	4
2019	4
2020	1

2021	2
2022	2
2023	4
2024	6
2025	8

Table 5: Publication year.

The E-MOTIVE trial has increased exponentially the research in PPH treatment in LMICs from 2023.

As for the population, 17 studies involved healthcare providers, with a prevalence of midwives, followed by doctors and obstetrics and by other healthcare professionals (nurses, supply chain experts, auxiliary staff, managerial staff); the years or experience varied significantly and are included in a range from seven months to 30 years. 14 studies involved patients experiencing PPH, which were often divided into an intervention and a control group.

Intervention	Frequency
E-MOTIVE treatment bundle	12
Staff	12
Blood loss monitoring methods	8
Supply chain	8
Pharmacological interventions	6
First intervention actions	5
Mechanical interventions	4
Surgical interventions	0

Table 6: Intervention methods.

The most recurring interventions in the papers were E-MOTIVE treatment bundle, supply chain, staff and blood loss monitoring methods.

Outcome	Frequency
Effectiveness of the treatment	25
Outcomes on staff	10
Bundle implementation	10
Blood quantification efficacy	8
Supplies availability	7
Practical and financial sustainability	5
Women's experience	1

Table 7: Outcomes considered.

Therefore, the greater focus of the papers were the implications for staff, the bundle implementation and the treatment effectiveness to manage PPH.

The results retrieved will firstly be reported following a thematic organisation.

Effectiveness of the treatment was mentioned in 25 of the 31 papers. Quantification of blood, initiation of treatment, median blood loss and severe outcomes were reported as being lower in the E-MOTIVE group than in the control group by direct comparison sources. 14 of the 31 papers showed that more training was necessary to enforce E-MOTIVE, particularly in relation to advanced medical procedures such as TXA administration and upper genital tract examination. Seven papers of 31 included a pharmacological perspective, emphasising how the lack of knowledge about oxytocin degradation due to high temperatures led to lower bundle effectiveness.

Bundle implementation considerations were included in 10 of 31 papers and overlapped with financial sustainability, supplies availability and staff sections.

Eight papers of 31 focused on blood quantification efficacy of the E-MOTIVE bundle due to the use of a calibrated blood drape, and reported an increase in early detection rate and a decrease in severe PPH cases. The main advantages of the drape were reported to be an accountable measure of blood loss and fixed thresholds (at 300 mL and 500 mL) to increase attention and start treatment respectively. However, two papers of 31 mentioned rare issues in drape acceptability. The measure was reported to be cost-effective by the only economic evaluation included.

Implications on staff were mentioned in 10 of 31 papers. The papers reported that the main issues included lack of proper and continuative training, heavy workload characterised by poor team management and supply constraints. One paper also mentioned that higher level health professionals considered clinical rotations to be sufficient as a measure for PPH preparedness, consequently neglecting the recommended training. However, three papers emphasised how higher-level professionals with more years of experience were also the ones to benefit the least from training already having strong skills and, in one paper, a relation was found between having treated a PPH case in a clinical rotation and scoring higher in the knowledge tests.

In five of the 31 papers, online or in-person training conducted with the “low dose, high frequency” approach were proven to be effective by pre-post trials, where tests were enacted before the training, after it and at a 10-month threshold. Eight of the 31 papers also mentioned the difficulty in treating patients who arrived by referral, reported as a situation of tension and uncertainty due to the lack of clinical information.

Supply chain was mentioned in seven of 31 papers. These papers mentioned the scarcity of medicines, blood supplies and medical equipment for the needs of the population. They also reported that the integrity of the oxytocin cold chain during transport and storing was not maintained.

Practical and financial sustainability of the E-MOTIVE bundle were mentioned in five of 31 papers, some of which consisted of direct comparison with other interventions for treating PPH. Five of the 31 papers emphasised the necessity for clearer national and international policy frameworks in regard to supplies provision.

Direct women’s experience was mentioned in one of the 31 papers in regard to the postpartum infection, pain and experiences of women managed with and without condom-catheter uterine balloon tamponade.

However, the heterogeneity of the sources led to the organisation of papers into three evidence categories: direct comparison between E-MOTIVE and usual care; individual PPH interventions; implementation factors. The 31 studies included have therefore been mapped following this framework in order to avoid the use of excessively strong comparison.

Evidence category	Study	Focus	Is comparison directly present?	Main findings
<i>Direct E-MOTIVE vs standard care comparison</i>	Bohren et al. (2025)	Comparison between the outcome of E-MOTIVE care including calibrated drapes and standard PPH interventions using uncalibrated drapes.	Yes	High utility of calibrated drape integrated in E-MOTIVE and effectiveness of the treatment bundle.
<i>Direct E-MOTIVE vs standard care comparison</i>	Williams et al. (2024)	Assessing the cost-effectiveness of the E-MOTIVE bundle considering the cost of the calibrated blood drape and the interventions in comparison with usual care.	Yes	E-MOTIVE is cost-effective and is a worthwhile use of budget.
<i>Direct E-MOTIVE vs standard care comparison</i>	Gallos et al. (2023)	Cluster-randomised trial to compare E-MOTIVE and standard care in terms of severe PPH, laparotomy for bleeding, maternal death from bleeding.	Yes	E-MOTIVE allowed early detection of PPH and the bundle led to a lower risk of the identified primary outcome in comparison with standard

				care.
<i>Direct E-MOTIVE vs standard care comparison</i>	Kamanga et al. (2025)	The COM-B framework was used to evaluate the interviews conducted with midwives regarding PPH care and components of E-MOTIVE were compared as ways to partially address those concerns.	Yes	Embedding the E-MOTIVE bundle has the potential to support the system in capacity building, resources and motivation.
<i>Direct E-MOTIVE vs standard care comparison</i>	Vogel et al. (2024)	Analysis of the effectiveness and safety of care bundles for PPH prevention and/or treatment.	Yes	E-MOTIVE improves PPH-related outcomes among women delivering vaginally.
<i>Direct E-MOTIVE vs standard care comparison</i>	Forbes et al. (2024)	Qualitative findings about PPH care and E-MOTIVE bundle were collected and an E-MOTIVE pre-post implementation study allowed to analyse feasibility, acceptability and fidelity.	Yes	E-MOTIVE was recognised to provide advantages in comparison with usual protocols. Furthermore, implementations such as a PPH trolley, combining E-MOTIVE with staff training, and local PPH protocols were proposed.
<i>Direct E-MOTIVE</i>	Mammoliti et al.	Descriptive	Yes	PPH was

<i>vs standard care comparison</i>	(2025)	analysis of frequency and timing of PPH assessments, diagnostic methods and blood loss thresholds used to diagnose PPH, comparison E-MOTIVE with usual care.		diagnosed earlier and more frequently at E-MOTIVE hospitals.
<i>Direct E-MOTIVE vs standard care comparison</i>	Mammoliti et al. (2025)	Analysis of the frequency and timing from PPH detection to treatment initiation between E-MOTIVE and usual care.	Yes	Timely and comprehensive management of PPH was achieved using E-MOTIVE in comparison with standard care.
<i>Direct E-MOTIVE vs standard care comparison</i>	Devall et al. (2025)	A pre-post intervention aimed to verify the consequence of implementing E-MOTIVE in comparison with standard care. The primary composite outcomes comprised severe PPH, laparotomy from bleeding and death from bleeding.	Yes	E-MOTIVE implementation was associated with improvements in clinical outcomes and increased rate of PPH detection and successful treatment.
<i>Individual PPH Interventions</i>	Alwy Al-Beity et al. (2020)	Health workers' perceptions about	No	Inconsistencies in supplies, referral

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		readiness to provide PPH care. HMS BAB single-component intervention.		system, communication. Potential positive effect of single-component s intervention such as HMS BAB training.
<i>Individual PPH Interventions</i>	Mary et al. (2019)	Analysis of the implementation of Niger's initiative to reduce PPH mortality.	No	Shortages in misoprostol and uterine balloon tamponade influenced treatment but the experience provides guidance for implementing new PPH initiatives.
<i>Individual PPH Interventions</i>	Shajahan et al. (2024)	Effectiveness of three PPH interventions in relation to ability to control the bleeding, time to achieve bleeding stopping, need to insert a second instrument or a surgical intervention, requirement from blood transfusion.	No	Transvaginal uterine artery clamp and vacuum-assisted uterine contraction were more effective than condom tamponade.
<i>Individual PPH Interventions</i>	Mammoliti et al. (2025)	Analysis of the consequences of fixing different blood loss thresholds in PPH	No	Countries implementing a 300 mL threshold with at least one abnormal clinical

		diagnosis and treatment.		sign the interventions were faster than countries using a 500 mL threshold.
<i>Individual PPH Interventions</i>	Darwish et al. (2018)	Investigating the effectiveness of Bakri balloon versus condom-loaded Foley's catheter to stop the PPH bleeding, analysing the time needed after insertion, the amount of blood transfusions and maternal complications.	No	Condom-loaded Foley's catheter is as effective as Bakri balloon in managing PPH bleeding but it required a significantly higher amount of time.
<i>Individual PPH Interventions</i>	Anger et al. (2021)	Risk of postpartum infection and increased pain associated with use of uterine balloon tamponade to deal with PPH in LMICs.	No	UBT did not increase infection risks but did increase discomfort.
<i>Individual PPH Interventions</i>	Anger et al. (2019)	Cluster-randomised trial about the use of condom-catheter for PPH management in LMICs.	No	UBT did not improve maternal outcomes.

<i>Implementation factors</i>	Lambert et al. (2020)	Oxytocin quality and regulations.	No	Necessity of consistent regulatory measures to preserve the quality of oxytocin, an essential component of PPH care.
<i>Implementation factors</i>	Tancred et al. (2025)	Assessment to verify the structural readiness (drugs, equipment, staff) for PPh care in Ghana and Uganda.	No	There is good readiness but some elements could be further aligned with WHO guidance.
<i>Implementation factors</i>	Torloni et al. (2023)	Synthesise evidence and perception about uterotronics quality and availability (oxytocin and misoprostol) in LMICs.	No	A proportion of health professionals considered the oxytocin of low quality, another portion does not explicitly but administers a double dose or other drugs instead. There are less perceptions about misoprostol.
<i>Implementation factors</i>	Danquah et al. (2025)	Review of how the active management of the third stage of labour is perceived and	No	Implementation of AMTSL reduces PPH enhancing maternal outcome but policies are needed to preserve

		implemented by midwives in Sub-Saharan Africa.		oxytocin quality and teamwork should be revised.
<i>Implementation factors</i>	Akter et al. (2022)	Qualitative study of PPH detection and treatment knowledge and practices to inform the design and implementation of E-MOTIVE.	No	Needs for timely detection and management of PPH. Training and blood loss measurements are seen as essential and will be incorporated in E-MOTIVE.
<i>Implementation factors</i>	Williams et al. (2019)	Analysis of multiple strategies to increase knowledge retention about PPH management.	No	Simulator-based sessions were easier to organise when a specific figure was present. Health staff who practised was more motivated, in some hospitals continued education is a practice, in others not.
<i>Implementation factors</i>	Nadkarni et al. (2018)	Modelling the barriers of patient access to oxytocin in Zanzibar.	No	Gap between procurement and availability, necessity to enlarge reserves, supply storage and temperature until 30°C has minimal influence on quality, distance

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				from birth facility has small effect on access.
<i>Implementation factors</i>	Alwy Al-Beity et al. (2020)	Effect of training on PPH response.	No	“Low dose, high frequency” training is a viable option to improve PPH care.
<i>Implementation factors</i>	Nishimwe et al. (2021)	Comparison of skills of health personnel before, after training, and at different future intervals.	No	The online learning improved skills up until 6 months after the training as is a valuable educational tool in LMICs.
<i>Implementation factors</i>	Gülmezoglu et al. (2024)	Analysis of the availability of carbetocin and tranexamic acid.	No	Need to facilitate access in LMICs.
<i>Implementation factors</i>	Oliver et al. (2018)	Analysis of oxytocin storage and cold chain practices.	No	Targeted training and advocacy are needed to ensure oxytocin correct storing and quality.
<i>Implementation factors</i>	Forbes et al. (2023)	Barriers to the implementation of the E-MOTIVE bundle in LMICs.	No	Staff and supply shortages, limited training, variable understanding, emotional stress, teamwork, role clarity, lack of guidelines usage, confidence were some of the

				barriers to implementation. It has been suggested how to address them.
<i>Implementation factors</i>	Bewket et al. (2022)	Barriers in delivering high-quality PPH care in Ethiopia.	No	Five limiting fields were identified: workforce, communication, systemic issues, education/training /resources, lack of identification and referral.
<i>Implementation factors</i>	Christiansen et al. (2023)	Use of Safe Delivery App for knowledge and skills about managing PPH in LMICs.	No	The Safe Delivery App more than doubled the clinical skills of the analysed birth attendants.
<i>Implementation factors</i>	Faustine et al. (2025)	Evaluate the experience of student nurses in treating PPH after undergoing specific training.	No	Student nurse-midwives' experience of managing PPH after simulation training showed great effectiveness; however, systemic failures such as inadequate supply and staffing can lead to practice shock.

Table 8: Classification of sources.

As illustrated in Table 8, not all the included studies constituted a comparison between E-MOTIVE and single-intervention protocols. Some studies provided evidence on individual PPH interventions, while others explored implementation factors such as staffing, training and supply chains, which were equally relevant in advancing the findings of this review.

DISCUSSION

The literature review for this paper included an heterogeneous body of sources, thus the discussion of the results will be divided in sections based on the nature of the sources, as illustrated in Table 8: direct comparison between E-MOTIVE and usual care; individual PPH intervention evidence; implementation evidence. While the first section provides the strongest comparative evidence on the topic, the following two sections are valuable to explain the context of implementing the E-MOTIVE bundle in LMICs.

1 Direct comparison between E-MOTIVE and usual care

The directly comparative evidence favours E-MOTIVE over usual care. The bundled approach demonstrated superior effectiveness, largely attributable to the implementation of a calibrated blood drape, which facilitated accurate and timely blood loss management. This method reduced reliance on subjective personal perception by providing objective quantification (Devall et al., 2025). Healthcare staff reported that the drape was user-friendly and could be positioned with high precision, opened immediately after birth and rolled up before the two-hour monitoring period (Bohren et al., 2025). The findings suggest that objective blood-loss measurements constitute a central reason underlying the effectiveness of the E-MOTIVE bundle.

1.1 Detection and treatment of PPH

A relevant difference between the E-MOTIVE sample and the control group was the increased speed of diagnosis (Mammoliti, Martin, et al., 2025) and treatment (Forbes et al., 2024). Early diagnosis is essential in PPH treatment, as delays determine heavier bleeding and require escalation of care, causing a burden on already overstretched hospital systems. In this regard, the sources highlighted how E-MOTIVE was connected with less complications in comparison with single-intervention protocols (E. V. Williams et al., 2024).

Overall, a bundled approach seems to offer advantages in LMIC settings, where delays in diagnosis and treatment could determine the usage of more resources due to the necessity of care escalation. In fact, the bundle provides a clearer framework for midwives and limits the escalation of patients' situations by ensuring a more effective use of resources and maintaining a good degree of cost-effectiveness. On the other hand, single-intervention protocols may be already entrenched in clinical practices, need less staffing and provide wider supply chain flexibility, but they may be less effective than the E-MOTIVE

bundle in reducing adverse PPH outcomes. Thus, the effectiveness of the bundle lies in the timing and coordination of delivery.

1.2 Economic implications

The overall aim of the review was linked to the long-term sustainability of the E-MOTIVE protocol in LMICs. Comparing the bundle with single-interventions, it has been shown how the economic difference is minimal (Williams et al., 2024) and DALY in the single intervention protocols is higher. Controlled ownership of medicaments and recognition of oxytocin as a life-saving medicine can help to subsidise it more and increase accessibility. However, it would be extreme to claim that E-MOTIVE is universally more cost-efficient, as several implementation factors including staffing, training, supplies and equipment have to be taken into account.

1.3 Generalisability of the evidence

The evidence was mainly based on African LMICs, with a smaller portion of studies conducted in Asia. It was noticed how the success of the first trial (I. Gallos et al., 2023) led to the blood collection drape and the bundle being applied with increased adherence in a successive trial (Devall et al., 2025). Such analysis proves that the E-MOTIVE model may be transferable beyond African countries, where the original trial was conducted (I. Gallos et al., 2023). Nevertheless, LMIC settings often face unique challenges, therefore the transferability of the bundle should be discussed depending on the specific context.

2 Evidence concerning individual PPH interventions

The second category includes studies which illustrate individual PPH intervention rather than directly comparing the E-MOTIVE bundle with usual care. These studies provide complementary rather than central evidence as they cannot prove the superiority of E-MOTIVE.

2.1 Blood-loss measurement and the calibrated drape implications

The calibrated blood-collection drape shows how an individual intervention can enhance the timeliness of diagnosis. However, it was observed that many women felt discomfort lying on the drape and often removed it prematurely without staff authorization (Bohren et al., 2025). This highlights the critical role of effective communication, as women emphasized the importance of clear dialogue during and after emergencies. They frequently experienced fear due to unfamiliar terminology and non-verbal cues from healthcare professionals (Briley et al., 2021). Enhancing communication strategies could therefore mitigate patient discomfort and improve adherence to monitoring protocols.

2.2 Mechanical interventions and uterotonics

Evidence concerning individual PPH interventions confirms the importance of timely administration and supplies availability. Studies examining uterine balloon tamponade and other mechanical intervention reported differences in effectiveness based on the time to stop the bleeding (Darwish et al., 2018).

Nevertheless, as mentioned for the collection drape, patient comfort remained an important element (Anger et al., 2021).

Regarding uterotonics, misoprostol is currently the most widely available and cost-effective heat stable alternative for oxytocin, even if healthcare workers are not aware of its potential degradation due to humidity and high temperature (Lee et al., 2025) (Torloni et al., 2023). Another alternative is inhaled oxytocin, which is being studied as a heat stable formulation and may become a valid choice combining heat stability with the excellent therapeutic outcomes of oxytocin (Lee et al., 2025).

However, these studies should not be treated as direct evidence supporting the superiority of E-MOTIVE. Rather, they provide an explanation about why individual components integrated in E-MOTIVE may offer advantages in comparison with individual interventions alone.

3 Evidence concerning implementation factors

The third category consists of studies exploring the factors which should be addressed in order to implement E-MOTIVE consistently in LMICs. These studies were particularly relevant in the evaluation of the long-term feasibility and sustainability of E-MOTIVE.

3.1 Staffing and teamwork

The majority of the papers considered involved healthcare professionals, and this allowed to investigate the effectiveness of training methods, the consequences of understaffing on PPH treatment and the perceptions of medical personnel towards the supply chain of uterotonics. The professional level (midwife, doctor or other) and the years of experience mattered especially in the training studies. In one study, it was shown that doctors started with a higher level of experience than other healthcare personnel members by 16% (Alwy Al-Beity, Pembe, Marrone, et al., 2020); more experienced workers were less willing to involve in continuative training and instead would have preferred more supervision of juniors to facilitate the teamwork (Bewket et al., 2022). This attitude is comprehensible but, due to the recent nature of E-MOTIVE, staff full participation is regarded as essential to implement the measure more rapidly and avoid relying on habits in clinical practice.

The focus was also directed towards the consequences of the E-MOTIVE bundle on staffing. The bundled approach was perceived both as overwhelming for the several steps that had to be initiated at the same time, and helpful for coping with stressful emergencies by providing a clear framework, especially when shown through posters in the delivery ward (Bohren et al., 2025). The presence of clear steps could also limit the imprecisions due to long rotations related to understaffing. However, the bundled approach requires a higher team coordination and stronger leadership than the single-intervention one (Alwy Al-Beity, Pembe, Kwezi, et al., 2020).

The research also reported data on the condition of understaffing of LMICs. This problem has been partially solved by allowing lower cadre health personnel to initiate the E-MOTIVE treatment without necessarily asking to a doctor, even because the communication often happened by phone call and the doctor evaluation had low reliability (Alwy Al-Beity, Pembe, Kwezi, et al., 2020). This form of task shifting was allowed by the modification of existing protocols in the PPH opposition interventions of WHO. The decision also increased the acceptability of the treatment itself, which was sometimes restrained by cultural norms and beliefs (Mammoliti, Althabe, Easter, Martin, et al., 2025). Another issue identified in connection with understaffing is the number of referrals that LMICs hospitals face due to the high percentage of women giving birth in rural community care centres (Akter et al., 2022). It could be with medium confidence stated that E-MOTIVE has the potential to be inserted in lower-level care centres due to the clear framework and fixed supplies needed, potentially reducing the disorganisation and tension which result from referrals.

3.2 Training

The study also investigated the training implications of the E-MOTIVE bundle implementation. E-MOTIVE requires additional training in comparison with single-intervention protocols, but it was shown that PPH knowledge was not sufficient even before the bundle, so training is highly beneficial to healthcare workers in general. Moreover, the possibility of achieving good results through a “low dose, high frequency” approach and through the use of e-learning apps lowers the training costs significantly (Christiansen et al., 2023). Training during nurses’ formation was also shown to increase their self-effectiveness perception and overall motivation; in fact, the acquisition of new skills made midwives feel less stressed about emergencies and more willing to act (Faustine et al., 2025). However, it was also highlighted how training faced constraints due to understaffing in the ward, low staff motivation, lack of leadership on sessions and staff turnover (Alwy Al-Beity, Pembe, Marrone, et al., 2020). In addition, research midwives were often involved in the procedures for ethical reasons during emergencies, so the real preparedness of staffing in dealing with PPH using the E-MOTIVE protocol may have been overestimated (Bohren et al., 2025). Overall, evidence suggests that training is not only necessary for E-MOTIVE implementation, but could strengthen PPH preparedness more broadly. Nevertheless, challenges including staff turnover, workload in an understaffed system and resource constraints need to be taken into account.

3.3 Supply chains

The review also aimed to offer an analysis of the supply chain fragility in LMICs and its impact on E-MOTIVE implementation. The single-intervention protocols were more impacted due to the frequent need for escalation of care measures which could not be supported by appropriate advanced mechanical and surgical resources. On the other hand, E-MOTIVE limited escalation but still implied less flexibility than single-intervention protocols due to the need for oxytocin. The cold supply chain was impacted by both wrong national regulations and absence of refrigeration in some health structures (Lambert et al.,

2020), and more medications than prescribed would be used by doctors due to their perceptions of its low quality (Torloni et al., 2023). However, recent regulations have shown the potential of including oxytocin into the vaccines Expanded Program on Immunization (EPI) cold chain or using time-temperature indicators (TTI) in order to monitor stability in risk places (Lambert et al., 2020). These alternatives could help with the cold chain and allow quality products to be used more effectively.

These findings demonstrate that the effectiveness of E-MOTIVE cannot be separated from the availability and quality of the medications required by the bundle; therefore, supply chain strengthening is necessary to support E-MOTIVE's long-term functioning.

3.4 Sustainability over the long term and practical implementation

As for practical guidelines for implementation, this study has identified continuative staff training as essential in order to implement the use and adherence to the bundle; task shifting and lower cadre workers' involvement could be used to face understaffing constraints. Moreover, the regularisation of the current uterotonics supply chain and the creation of alternative ones could deal with the shortage of resources. In fact, one of the main challenges emerged is that the E-MOTIVE trial benefited from specific funding, the feasibility of a similar initiative supported by LMICs health systems still has to be verified.

4 Overall interpretation and future research

The three categories of evidence presented provide complementary conclusions. Direct comparative studies provide the strongest evidence that the E-MOTIVE bundle improves early detection and rapid management of PPH compared with usual care. Evidence regarding individual interventions helps explain how single elements contribute to the effectiveness of the E-MOTIVE bundle, while implementation studies explore the conditions and the challenges which need to be met in order to support the long-term feasibility of the E-MOTIVE bundle.

The WHO has developed a 2023-2030 Roadmap to follow the E-MOTIVE trial development. In 2027 the publication of results of the first batch of priority funded research will be available and it will allow to fill research gaps and work towards a full implementation of the policy (World Health Organization [WHO], 2023). This study has to be intended as a broad angle analysis on the current stage of E-MOTIVE insertion into LMICs PPH frameworks. It aimed to provide a comparison with single-intervention protocols by discussing understudied aspects such as staffing and supply chain in order to evaluate the long-term sustainability of the bundle.

Limitations

As the first official E-MOTIVE implementation research result batch will be available in 2027, this study has offered an overview by combining current and past papers. This could be seen as a limitation because not much long-term data is available.

Moreover, risk of bias has occurred in the papers' selection and data extraction phases. In fact, literature not available in English has not been considered, several studies were qualitative and therefore there could have been potential subjectivity in the synthesis process. The language barrier may have restricted the results partially, but the majority of the countries included in the search have English as their official language, lowering the risk of bias. In addition, the use of Covidence as a reliable screening tool and the double reviewer mode during full text screening have minimised the risk of bias.

Furthermore, substantial heterogeneity existed among the studies in regard to study design, populations, interventions, clinical settings and outcome definitions. The review included these different typologies basing on their specific strengths but, as these studies addressed different aspects of PPH management and E-MOTIVE implementation, a quantitative synthesis was not possible and direct comparison between studies was limited. Hence, the sources did not allow a definitive conclusion on whether E-MOTIVE is superior to all single-intervention approaches.

Concerning the papers themselves, some randomised controlled trials presented an imbalance in members of the usual care and intervention group, because PPH occurrence and gravity percentages varied (Anger et al., 2021). Lastly, some PPH mortality and morbidity outcomes were characterised by complexity in origin and a causative relation between the intervention used and the outcome achieved is difficult to establish (Anger et al., 2019).

CONCLUSION

In conclusion, the evidence suggests that the E-MOTIVE bundle may be more effective than usual care in improving the early detection and management of PPH in LMICs. In fact, E-MOTIVE provides the staff with a clear framework to help address some of the challenges associated with understaffing, potentially limiting the escalation of care and the associated mortality and morbidity. However, the recent introduction of the project and the structural challenges affecting LMICs healthcare systems require some bundle implementation strategies. Attention should be devoted to appropriate staff training and task shifting; new regulations should also be developed to make the supply chain more reliable and minimise the degradation of oxytocin due to high temperatures.

The analysed economic evidence indicated that E-MOTIVE may be cost-effective within the settings evaluated, but its long-term sustainability, following the end of trial funding and across different implementation settings, has not been established yet. Its sustainability will depend on the ability of countries to adapt the bundle to their own challenges and strengthen the aspects of staffing, training and supplies. The WHO Roadmap is providing a strong framework for future development and implementation of the bundle, although further research will be needed.

ACKNOWLEDGEMENTS

I would like to thank my mentor, Jolie Chantharath, for her support and guidance through the production of this work.

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