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# Postpartum hemorrhage management in Canadian emergency nursing practice

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## Abstract

**Background:** Postpartum hemorrhage (PPH) remains a leading cause of maternal mortality globally, claiming approximately 70,000 lives annually. Despite preventive efforts, high-income countries, including Canada, have reported increasing rates of PPH. The rising incidence and associated complications indicate that improved emergency nursing practices in managing PPH are needed.

**Methods:** PPH guidelines from the Society of Obstetricians and Gynecologists of Canada (SOGC), Federation of International Gynecologists and Obstetricians (FIGO), and the Canadian Association of Perinatal and Women's Health Nurses (CAPWHN), were compared to National Emergency Nurses Association (NENA) guidelines. The competencies, medications, and obstetric manoeuvres for PPH that may be relevant to emergency nurses were extracted and categorized for the emergency nursing 'History & Red Flags, Assessment, Interventions, & Diagnosis' (HIRAID) framework.

**Findings/results:** We found 13 discrete skills across the PPH guideline recommendations that apply to emergency nurses. There is near-perfect overlap in medical recommendations, but gaps exist between FIGO and SOGC guidelines and NENA and CAPWHN guidelines. There are SOGC and FIGO guidelines that apply to emergency nurses that are not addressed in NENA guidelines.

**Discussion:** There was significant overlap on treatment recommendations from maternal health bodies such as uterotonic drugs, hemorrhage control, and hemostatic resuscitation. There were significant gaps in NENA recommendations.

**Conclusion:** The comparison of PPH guidelines highlights where NENA guidelines need further detail. These skills are particularly significant for providing nursing care in rural and remote areas. Standardized protocols for PPH management, interprofessional collaboration, and regular competency assessments are included in most guidelines but are conspicuously absent for emergency nurses. To address the gap, NENA could integrate national emergency nursing PPH competencies standards or develop recommendations for the care of maternal emergencies.

*Keywords:* maternal health, obstetrics, gynecology, competencies, perinatal health

## Introduction and background

Postpartum hemorrhage (PPH) is the leading cause of maternal death globally and occurs in up to 10% of all deliveries (Escobar et al., 2022; Robinson et al., 2022; World Health Organization, 2015). In Canada, a diagnosis of PPH was associated with 1.4 maternal deaths per 100,000 hospital deliveries from 2002 to 2010. From 2010 to 2015, it was the second most common severe maternal morbidity, at a rate of 483.9 per 100,000 hospital deliveries (Moola et al., 2018). A 2020 Canadian survey by the Team on Improved Perinatal

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Health Care Regionalization demonstrated that most hospitals in Canada could respond to PPH (2020). From 2017 to 2022, there were 14 maternal deaths attributed directly to PPH.

Postpartum hemorrhage occurs when excessive bleeding happens after delivery. There has been a significant shift from basing PPH on estimated blood loss in favour of looking at the hemodynamics of the mother. Typically, PPH is defined as blood loss of more than 500ml with a vaginal delivery and greater than 1,000ml with a cesarean delivery (Escobar et al., 2022; Post et al., 2023; Wormer et al., 2023). Because blood loss is often underestimated, PPH should be considered at lesser estimated volumes when signs of hemodynamic compromise, such as hypotension, coagulopathy, or alterations in mental status arise (Escobar et al., 2022; Hancock et al., 2015; Robinson et al., 2022). Defining PPH based on hemodynamics is especially important in patients with pre-existing anemia or volume-contracted states (Robinson et al., 2022; Wormer et al., 2023).

Despite efforts to prevent PPH, such as using uterotonics (drugs which cause the uterus to contract) like oxytocin, and active management in the third stage of labour (prophylactic uterotonics, early cord clamping/controlled cord traction, and fundal massage), high-income countries, including Canada, have reported increasing rates of PPH (Nakajima & Barret, 2016). There is a paucity of data on how frequently women present to the emergency department (ED) with PPH, but in Canada, PPH with blood transfusion increased by 37.33% from 36.7 in 2003 to 50.4 per 10,000 deliveries in 2010, while PPH with hysterectomy increased by 18.37% from 4.9 to 5.8 per 10,000 deliveries over the same period (Mehrabadi et al., 2014). PPH necessitates additional interventions, such as uterine exploration, evacuation, or surgical procedures (Robinson et al., 2022; Wormer et al., 2023). The consequences of PPH-related interventions include exposure to blood products, coagulopathy, organ damage, and potentially jeopardized future fertility (Nakajima & Barret, 2016).

Healthy women can compensate for significant blood loss before exhibiting signs and symptoms (Nakajima & Barret, 2016). PPH can occur days to weeks after delivery with the most common cause of delayed PPH being retained tissue (Perlman & Carusi, 2019). Appreciating that the postpartum period is six weeks long, we can then anticipate that emergency nurses will encounter PPH under one of two scenarios: PPH due to pre-hospital or in-ED delivery, or a delayed presentation of PPH. These scenarios are particularly true in the rural or remote EDs because women in these areas are more than twice as likely than urban women to present to the ED in the postpartum period (Matenchuk et al., 2022).

In rural hospitals in the USA, without obstetrical services, emergency room births with unanticipated adverse birth outcomes and a delay in transport to specialized facilities often are reported (Kozhimannil et al., 2021). Similarly, in Canada, severe maternal morbidity is higher in rural than urban settings at 2.4% versus 1.7% (Canadian Institute of Health Information, 2013). In some Canadian rural and remote hospitals or nursing stations, an emergency nurse may be the only person on-site with the skills and training to evaluate labour and its complications (Miller et al., 2017). A study examining pregnancy in Alberta found that almost half of pregnancies in the province result in one or more ED visits, and incidences were higher in rural and remote regions (Matenchuk et al., 2022). Another study examining a large health network found that up to 25% of women sought care in the ED within the first six months postpartum and, of that number, up to 50% happened within 10 days of discharge home(Brousseau et al., 2018).

For this reason, clinical vigilance, and knowledge of PPH are required for emergency nurses who may not have in-hospital obstetric services, but may be the closest facility for patients experiencing acute PPH. A 2021 scoping review of more than 5,000 studies examining PPH education found only 38 studies examining PPH; despite the clear need for ED nurses to possess specialized PPH knowledge and skills, none of the included studies addressed PPH in the ED (Lavoie et al., 2022). Our study will take the first step to address this shortcoming by comparing international guidelines to what is offered by NENA to identify where additional education and guidance are needed.

## Methods

Our review compared PPH guidelines published by the Society of Obstetricians and Gynecologists of Canada (SOGC; Robinson et al., 2022), the Federation of International Gynecologists and Obstetricians (FIGO; Escobar et al., 2022), and the Canadian Association of Perinatal, and Women's Health Nurses (CAPWHN; Attenborough et al., 2018). These organizations were selected because they are the specialty maternal organizations in Canada and their recommendations were set as the Canadian standard for clinical practice. We navigated each site and examined their clinical practice guidelines. These resources were then downloaded, and the contents were extracted verbatim and then compared in a tabular fashion utilizing the emergency nursing 'HIRAID' (History, Identify Red flags, Assessment, Interventions, Diagnostics, reassessment, & communication) framework (HIRAID Research Group, 2021).

We then analyzed the Canadian Institutes of Health Research (CIHR)-funded Tiers of Service survey, performed by the Team on Improved Perinatal Health Care Regionalization (TIPHCR), to compare provinces and determine if there was a specified service threshold for managing PPH (Team on Improved Perinatal Health Care Regionalization [TIPHCR], 2020). We compared the provincial tiers for language about PPH, transfusion capacity, and access to obstetrical care.

The core competency documents of the Canadian emergency nursing specialty organization, the National Emergency Nurses Association (NENA), were then examined and compared to the SOGC, FIGO, and CAPWHN recommendations to establish the competencies and medications deemed foundational to general emergency nursing care. Identifying specialized obstetric manoeuvres that a nurse would need to be proficient in or assist with during a PPH scenario was the key focus. The critical obstetric aspects inform the development of targeted training programs and are based on the emergency nursing framework (HIRAID Research Group, 2021). The guidelines based on each organization (SOGC, FIGO, CAPWHN, and NENA) were categorized to identify gaps in emergency nursing education (Table 1).

**Table 1**

*Comparisons of Intervention Recommendations*

| HIRAID element | Practice Organization | FIGO | SOGC | CAPWHN | NENA |
|---|---|---|---|---|---|
| **History and Red Flags** | History | Prevention and recognition are two key factors in reducing maternal morbidity | Prevention is key to reducing maternal morbidity. Focus on early identifiable risk factors | Screen for hemorrhage risk | Assess for and know obstetrical emergencies |
| | Red flags | Understanding of the four Ts (tone, tissue, trauma, thrombin) and their associated risk factors | Understanding of the four Ts (Tone, Tissue, Trauma, Thrombin) and their associated risk factors | Knowledge of interventions for labour complications such as risk for postpartum hemorrhage | Understand reproductive emergencies across ages |
| **Assessment** | Physical exam | Assess uterine tone | Assess uterine tone | Assessment of the fundus | Inspection, auscultation, and palpation of the abdomen |
| | Blood loss estimation | Estimation of blood loss has potential to misrepresent the clinical presentation. More direct measurements should be used | Estimation of blood loss is not best practice but can be used. More direct blood loss measurements should be used | Not specified | Estimate vaginal blood loss. |
| | Physiologic monitoring | Physiological monitoring (i.e. vital signs, ECG, lab work) | Physiological monitoring (i.e. vital signs, ECG, lab work) | Vital signs monitoring | Acquisition and interpretation of vital signs |
| **Intervention** | Vascular access | Establish parenteral access (IV/IO) in two sites and begin fluid resuscitation | Establish parenteral access (IV/IO) in two sites and begin fluid resuscitation | Not specified | Perform and/or assist with insertion and maintenance of IV/IO access. Administering all types of fluid replacement |
| | Bladder management | Urinary bladder emptying via catheter | Urinary bladder emptying via catheter | Urinary bladder emptying via catheter | Insertion/application and care of urinary catheters |
| | Manual interventions | Uterine massage, bimanual uterine compression and external aortic compression | Uterine massage, bimanual uterine compression | Interventions for hemorrhage, uterine atony, laceration, retained placental tissue | Assist with emergency childbirth and care of the newborn |
| | Medication administration | Oxytocin administration as first line. Additional medications include carbetocin, ergometrine, misoprostol, carboprost, TXA | Oxytocin administration as first line. Additional medications include: carbetocin, ergometrine, misoprostol, carboprost, TXA | Not specified | Medication administration |
| | Blood product administration | Massive transfusion protocols are essential in resuscitation and early administration of blood products is recommended | In the setting of ongoing hemorrhage, blood products should be administered before deterioration worsens. Massive transfusion protocols are the standard for obstetric emergencies | Not specified | Utilizes principles of blood transfusion. Utilizes principles of massive transfusion |
| | Point of care devices | Uterine balloon tamponade | Uterine balloon tamponade | Not specified | Not specified |
| | Surgical interventions | Uterine artery embolization and further surgical intervention | Uterine artery embolization and further surgical intervention | Not specified | Not specified |
| **Diagnostics** | Diagnostic criteria | Blood loss following the intrapartum period that leads to hemodynamic instability | Blood loss following the intrapartum period that leads to hemodynamic instability | Not specified | Not specified |

*Note*. FIGO = Federation of International Gynecologists and Obstetricians; SOGC = Society of Obstetricians and Gynecologists of Canada; CAPWHN = Canadian Association of Perinatal and Women's Health Nurses; NENA = National Emergency Nurses Association, IV = Intravenous); TXA = tranexamic acid.

The NENA Emergency Nursing Core Competencies framework and Canadian Triage and Acuity Scale (CTAS) education program (Bullard et al., 2017) were used to guide the categorization process, emphasizing the expected levels of performance that integrate knowledge, competencies, abilities, and judgment for emergency nurses. The systematic approach was used as a method to determine the competencies required for effective PPH management. The identified competencies were prioritized and aligned with the practical NENA needs for emergency nurses, in turn, to develop targeted training initiatives that would bridge the existing PPH competency gaps.

## Findings/results

The HIRAID framework was used to categorize the SOGC, FIGO and CAPWHN PPH recommendations into four groups: History and Red Flags, Assessment, Interventions, and Diagnostics. NENA similarly has recommendations, which were also grouped according to the HIRAID framework (Table 1).

### History and red flags

The SOGC guidelines emphasize a focus on risk identification and knowledge of the four Ts (tone, tissue, trauma, and thrombin). The FIGO guidelines similarly identify the four Ts. The CAPWHN and NENA guidelines both discussed the histories and red flags to be aware of; namely, that nurses need to be vigilant about reproductive health, in general, and that there is a need to know and understand obstetrical emergencies. The NENA guidelines were vague as to what these emergencies may be, but the CAPHWN guidelines were specific in suggesting that their members be aware of PPH.

The NENA guidelines were more specific in their assessment recommendations, and they outline some very basic skills that are deemed essential (inspection, palpation, percussion, and auscultation) and estimating blood loss in the standards of practice document (NENA Core Competencies, 2019). The most recent update on the CTAS participant manual did specify that massive vaginal bleed should be assigned an acuity score of 2 and that third trimester vaginal bleeding should be assigned the highest possible (CTAS 1) score, but did not specify any assessment or intervention skills for nurses (Bullard et al., 2017).

Unfortunately, the NENA guidelines do not offer recommendations on how best to estimate blood loss. FIGO and SOGC recommend physiological monitoring and fundal assessment. These are not mirrored in either of the nursing guidance documents. The guidance from FIGO and SOGC is sufficiently detailed for nurses. According to the Canadian Association of Schools of Nursing (CASN), undergraduate nursing programs in Canada must include competencies related to the care of the childbearing family (MacKinnon & Wight-Moffat, 2017).

### Interventions

There were 10 recommended assessments and interventions listed by the SOGC and FIGO (Table 1). The CAPWHN had nursing-specific recommendations on 60% ($n$ = 6) of these recommendations. NENA had a 100% overlap with all the CAPWHN guidelines ($n$ = 6) and 80% of the SOGC/FIGO guidelines ($n$ = 8). The manoeuvres that were shared across all the organizations included uterine tone assessment, vital sign monitoring, and bladder care (urinary catheterization; Table 2). The SOGC and FIGO explicitly mention manual manoeuvres that nurses could either perform independently or assist with, but were not mentioned by NENA or CAPWHN, specifically bimanual uterine compression, uterine balloon tamponade, and proximal external aortic compression.

The NENA guidelines go further than the CAPWHN guidelines on fluid resuscitation and hemorrhage protocols, while CAPWHN guidelines are more specific with causes of hemorrhage. The FIGO and SOGC make similar specific recommendations as to medication regimens, fluid resuscitation, intrauterine balloon, and bimanual uterine compression. Despite external aortic compression being a manoeuvre nurses can perform, only FIGO refers to the procedure.

### Diagnosis

Neither CAPWHN nor NENA specifically listed diagnostics that relate to PPH. The SOGC and FIGO both recognized prior diagnostic criteria of PPH as being based on a quantitative blood loss value. Current definitions have been updated by both agencies to focus attention on the hemodynamic status of the mother. There is a shift from waiting for a certain amount of blood loss to trigger intervention and any signs of hypovolemic shock should necessitate evaluation and intervention, if needed. NENA states that the assessment, intervention, and monitoring of hemodynamic status is a competency required by all emergency nurses (NENA Core Competencies, 2019).

### Tiers of service

The Team on Improved Perinatal Health Care Regionalization (TIPHCR) report specified the care levels provided by 449 hospitals across Canada (2020). Our secondary analysis of these results allowed us to compare data on 78% of hospitals ($n$ = 350) across Canada and make comparisons across all provinces and territories in Canada with the exceptions of Alberta and Newfoundland and Labrador (Table 3).

Alberta and Newfoundland & Labrador did not comparably report their tiers of service and did not specify their service levels in a way that facilitated discerning the care needed to provide PPH care (Team on Improved Perinatal Health Care Regionalization, 2020). British Columbia, Nova Scotia, Prince Edward Island, and the territories (Northwest Territory, Nunavut, Yukon) had comparable data and specified that the tier of service needed to provide non-life-threatening PPH care was level 2A. Saskatchewan, Manitoba, Ontario, Quebec, and New Brunswick did not specify the tiers of service needed for PPH care; but Ontario did specify that obstetric coverage was set at the 2A tiers of service level, thus 2A was set as the threshold for anticipating PPH care availability.

Our analysis of hospitals in Canada that reported their service levels shows that the majority, 64.3% ($n$ = 225), did not have sufficient resources in place to manage PPH, that 23.11% did have the capacity to manage PPH, and that the remainder did not report with sufficient detail to determine the PPH capacity.

**Table 2**

*Nurse Considerations for the Most Suggested Postpartum Hemorrhage Interventions*

| Intervention | Name | Mechanism of Action, Dose, and Route | Side Effects | Takeaways |
|---|---|---|---|---|
| **Medications** | Oxytocin (FIGO/SOGC) | Stimulates uterine contractions by binding to oxytocin receptors.<br>DOSE: 3IU IV rapid injection or 10IU IM | Nausea, vomiting, and ST depression | First line in all cases of postpartum hemorrhage |
| | Carbetocin (FIGO/SOGC) | Same as oxytocin, longer duration of action.<br>DOSE: 100μg slow IV injection or IM | Nausea, vomiting, and abdominal pain | Can be used as a first line when oxytocin is not available |
| | Ergometrine (FIGO/SOGC) | Activates adrenergic and dopaminergic receptors in uterine and vascular smooth muscle<br>DOSE: 250μg IM q2hours | Nausea, vomiting, ST depression secondary to vasoconstriction, hypertension | Avoid in hypertensive patients |
| | Misoprostol (FIGO/SOGC) | Binds prostaglandin receptors.<br>DOSE: 200–400μg sublingual | Fever/chills, nausea, vomiting, diarrhea, and abdominal pain | Addition of misoprostol with oxytocin prevented the need for other uterotonics |
| | Carboprost (FIGO/SOGC) | Causes generalized smooth muscle contraction, including uterine contraction.<br>DOSE: 250μg IM q15minutes (max 8 doses) | Fever/chills, nausea, vomiting, and diarrhea | Contraindicated in poorly controlled asthma |
| | Tranexamic acid (FIGO/SOGC) | Antifibrinolytic agent – inhibits activation of plasminogen to plasmin.<br>DOSE: 1g IV over 30–60s; 2nd 1g dose after 30min | Nausea, vomiting, and diarrhea | Should be given as soon as possible. Doses three hours after bleeding have shown no benefit |
| **Core Nursing Competencies** | Fluid resuscitation, physiological monitoring, two large bore IVs, euthermia, and indwelling catheter | IV access –Two large bore IVs (16 or 18 gauge) for fluid resuscitation and possible transfusions; initiate RL or NS and ensure the infusion is running well. | Guidelines vary on fluid resuscitation but should be based on the hemodynamic presentation of the mother; monitor for pulmonary edema, monitor urine output, and record fluids given. | In situations where aggressive volume replacement via two large bore IVs is insufficient, intraosseous access should be considered for a more rapid infusion. |
| | Uterine tone assessment and fundal massage | Nurse should assess the uterine tone by stabilizing the uterus at the symphysis with one hand and cupping the fundus firmly with the other; determine if the fundus is firm, midline, and at or below the umbilicus. | Uterine massage is recommended for the initial assessment and treatment of PPH; the fundus should be firm like a softball, but if it is boggy then massage it until firm. | When well contracted, rubbing/massaging the fundus of the uterus down until you push out all the clots; collect blood in a container placed close to the vulva; measure blood loss and record. |
| **Specialized Competencies** | Bimanual uterine compression | Manual compression of the uterus with one hand externally on the fundus and the other used to grasp the uterus internally. | Two fingers are inserted into the vagina to elevate the uterus from the posterior fornix and compress the uterus between your fingers and the fundal hand. | Used to treat atony non-responsive to pharmacological interventions; also, can help with retained blood/products to reduce bleeding. |
| | Uterine balloon tamponade | Intrauterine balloon tamponade may control mild-moderate bleeding and prevent the need for further intervention in up to 95% of cases. | System can be used by filling an intrauterine balloon with 250 to 500 mL of NS. | If no intrauterine balloon readily available, the uterus may be packed with gauze or multiple large Foley catheters. |

*Note*: CAPWHN = Canadian Association of Perinatal and Women's Health Nurses; FIGO = Federation of International Gynecologists and Obstetricians;IM = intramuscular; IU = International Unit; IV = intravenous; NENA = National Emergency Nurses Association; NS = Normal Saline; RL = Ringer's Lactate; SOGC = Society of Obstetricians and Gynecologists of Canada.

**Table 3**

*Canadian Hospitals' Reported Tiers of Obstetric Services*

| Province | Tiers of Service Levels | | | | | | | | | | | Able to manage PPH | | Unable to manage PPH | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 1a | 1b | 2 | 2a | 2b | 3 | 4 | NA | Total | n | % | n | % |
| British Columbia[1] | 17 | 3 | 0 | 38 | 0 | 6 | 3 | 3 | 1 | 0 | 71 | 13 | 18% | 58 | 82% |
| Alberta[2] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 71 | - | - | - | - | - |
| Saskatchewan[3] | 15 | 9 | 0 | 0 | 8 | 0 | 0 | 0 | 2 | 0 | 34 | 10 | 29% | 24 | 71% |
| Manitoba[3] | 26 | 1 | 0 | 0 | 11 | 0 | 0 | 2 | 0 | 0 | 40 | 13 | 33% | 27 | 68% |
| Ontario[4] | 12 | 0 | 18 | 32 | 0 | 22 | 18 | 8 | 0 | 0 | 110 | 48 | 44% | 62 | 56% |
| Quebec[3] | 0 | 0 | 25 | 21 | 0 | 0 | 12 | 6 | 0 | 0 | 64 | 18 | 28% | 46 | 72% |
| New Brunswick[3] | 0 | 1 | 0 | 0 | 0 | 4 | 1 | 3 | 0 | 0 | 9 | 8 | 89% | 1 | 11% |
| Nova Scotia[1,3] | 5 | 0 | 0 | 0 | 0 | 5 | 3 | 1 | 0 | 0 | 14 | 9 | 64% | 5 | 36% |
| Prince Edward Island[1,3] | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 2 | 100% | 0 | 0% |
| Newfoundland and Labrador[2] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | - | - | - | - | - |
| Yukon, NWT, and Nunavut[1,3] | 0 | 2 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 6 | 4 | 67% | 2 | 33% |
| Total | 75 | 17 | 43 | 91 | 25 | 38 | 38 | 26 | 7 | 89 | **350** | **125** | **35.7%** | **225** | **64.3%** |

*Note.* [1]Management of non-life-threatening maternal hemorrhage is specified at 2A, [2]Non-standard reporting did not specify levels of service criteria, [3]PPH threshold was not specified, but is assumed to be 2A, [4]Obstetric care is set at 2A and used as a surrogate for PPH management capacity.

## Discussion

We used the History, Identify Red Flags, Assessment, Interventions, & Diagnostics Framework for this section, as well, and will now compare our findings to the rest of the literature base. We will compare each of the guidelines to each other, and then highlight existing literature for each of the HIRAID interventions. Finally, we will highlight relevant topics for emergency nurses based on which interventions are most applicable to emergency nursing practice.

### Guidelines comparison

The FIGO and SOGC guidelines similarly emphasize a stepwise approach to PPH management with constant re-evaluation (Escobar et al., 2022; Robinson et al., 2022). An initial resuscitative approach consists of monitoring oxygen saturation, blood pressure, and continuous ECG while obtaining intravenous (IV) access with two large bore (16g or 18g) IVs. In the setting of ongoing heavy bleeding, the application of high-flow oxygen is recommended by both guidelines, regardless of saturation levels. Insertion of an indwelling catheter for urinary bladder emptying is an additional resuscitative measure recommended (Escobar et al., 2022; Robinson et al., 2022).

The consensus is clear that the first-line treatment is uterotonic drug administration (Escobar et al., 2022; Post et al., 2023; Robinson et al., 2022; World Health Organization, 2015). Oxytocin is the drug of choice in both guidelines, with ergometrine, carboprost, and misoprostol as second-line approaches (Escobar et al., 2022; Robinson et al., 2022). Tranexamic acid (TXA), listed in both SOGC and FIGO guidelines, can be used to stabilize clot formation in all patients, as an adjunct to uterotonics (Escobar et al., 2022; Robinson et al., 2022). In addition, fundal massage and bimanual uterine compression should be performed as first-line measures while waiting for pharmacologic agents to take effect (Escobar et al., 2022; Robinson et al., 2022). When pharmacological interventions are inadequately controlling the bleeding, proximal external aortic compression and uterine tamponade should be considered as temporizing measures while patients are prepared for surgical intervention.

### History

The primary indication would be vaginal bleeding and a history of recent delivery. The ED nurse should ensure to ask about the woman's gravida, term, preterm, abortion, and living (GTPAL) history, timing of delivery and route. Inquire about complications with pregnancy or delivery, size, and duration of passing clots or soaking pads, and review of symptoms of anemia or blood loss. NENA guidance lacks specificity and triage skills for the obstetric situation. NENA, ED nurses, and perinatal patients could all benefit from specific competencies such as obstetric history taking and risk identification for PPH.

### Identify red flags

Red flags in a patient's history include postpartum hemorrhage at the time of delivery, the presence of a low-baseline hemoglobin, and symptoms of anemia. In terms of bleeding, an anecdote suggests soaking more than two vaginal pads per hour for more than two hours is a red flag. Signs of shock include hypotension with associated organ dysfunction (altered level of consciousness, cardiac/respiratory depression, decreased/absent urine

output).

**Assessments**

Uterine tone assessment, initiate vitals monitoring to watch for signs of hemodynamic compromise (ECG, O2, BP, HR, RR), as well as intake/output. With uterine palpation, the uterus should feel like a firm mass in the midline lower abdomen. With poor tone you might feel a boggy/soft mass, it may be deviated to the side or easily able to be deviated to the side, or unable to feel the uterus at all. It may also be enlarged (above the umbilicus). Underestimation of blood loss and reliance on vitals alone has led providers to underestimate the severity of PPH and delay treatment (Hancock et al., 2015; Robinson et al., 2022; Turkoglu et al., 2023).

**Interventions**

Initiating two large-bore IVs is necessary because fluid resuscitation, as well as medication administration, is the priority. Although most guidelines suggest that patients require large-bore access (Escobar et al., 2022; Robinson et al., 2022), there is surprising heterogeneity in what constitutes a "large-bore" IV. A 2021 scoping review focused on massive transfusion protocols identified numerous studies that identified the ability to give multiple (often incompatible products) promptly and repeat blood draws for lab testing to be the preferred quality metrics for massive transfusion (Greer et al., 2021). Given the lack of consensus definition on what constitutes "large-bore" access, nominal differences in flow rates between peripheral IVs (Greer et al., 2021), and the need for multiple IV access points to facilitate medication administration, we suggest that PPH can typically be achieved with two to three peripheral Ivs, which can handle the flow rates of most rapid transfusers and advanced imaging (i.e., 18–20g; Jayanthi & Dabke, 2006), and that more access points should be prioritized over establishing larger (14–16g) IVs. Bladder catheterization should be part of the initial intervention, as the uterus is unable to contract efficiently with a full bladder (Robinson et al., 2022). Bimanual or uterine balloon compression (Robinson et al., 2022) and proximal external aortic compression (O'Dochartaigh et al., 2020) can help temporize patients while transitioning them to definitive care. Bimanual compression entails inserting two fingers are inserted into the vagina to elevate the uterus from the posterior fornix and compress the uterus between your fingers and the fundal hand. Proximal external aortic compression can be easily taught and consists of placing one fist covered by the other hand between the sternum and umbilicus, which are used to apply firm sustained downward pressure (Douma et al., 2019). While specialized, these skills could be valuable for emergency nurses working independently or in areas without dedicated obstetrical support.

**Diagnosis**

There were specific diagnostic criteria listed in the SOGC and FIGO guidelines, but not in the CAPWHN or NENA guidelines. The absence of diagnostic criteria being discussed in these documents is likely driven by the fact that nurses do not make diagnoses. There is, however, a need for nurses to be able to frame interventions around working diagnoses or clinical impressions and, at present, there is insufficient language in the NENA documents to guide this practice. The paucity of diagnostic criteria in the NENA standards document is reasonable given the high-level guidance it provides and suggests that recommendations as specific as these may need to be addressed in more granular practice documents.

## Limitations

Our study did not expand beyond Canadian nursing practice and there may be clear guidance from other organizations. This is a reasonable trade-off given that there are regional variations in the scope of practice for nurses. We did not use a structured approach to screening all the guidelines from all organizations and, as a result, we may have missed some details. This is a reasonable limitation given that the average nurse would not be able to do a full search of clinical guidelines by systematically searching websites while simultaneously providing clinical care.

## Conclusion

There is a critical need for PPH guidelines in emergency nursing practice. Emergency nurses, often the most experienced clinicians in under-resourced areas of Canada, must be competent in crucial skills required for effective PPH management. As the frontline access to care, emergency nurses play a pivotal role in managing the care of any patient, including those with obstetrical emergencies.

Clear articulation of obstetric and maternal emergency nursing skills could help guide specialty emergency nursing education programs and local skill training. NENA is in a unique position to collaborate with healthcare institutions, nursing associations, and government bodies to help address some of the gaps in maternal and obstetric care. We would encourage NENA to develop specific maternal and obstetric guidelines and to support targeted obstetrical emergency education for its members. The goal of education programs should be to give emergency nurses the skills they need to effectively handle PPH situations, so that all postpartum patients, no matter where they live, receive the best treatment possible.

## Implications for emergency nursing practice

**Comprehensive guideline adoption**: There is a critical need for emergency nurses to advocate for the adoption of comprehensive PPH management protocols into their practice. By integrating evidence-based guidelines from various organizations, nurses can ensure standardized, high-quality care for patients experiencing PPH, regardless of geographic location or resource constraints.

**Enhanced training in obstetric emergencies**: The manuscript highlights the critical need for emergency nurses to receive specialized training in obstetric emergencies, particularly in managing PPH. Given the potential for rural and remote EDs to be the first point of care for patients experiencing acute PPH, nurses in these settings must possess the necessary skills and knowledge to recognize and manage this condition effectively. This suggests a need for targeted education programs that address the unique challenges of managing PPH in diverse healthcare settings.

**Improving diagnostic competency**: The manuscript highlights a gap in the discussion of diagnostic criteria within emergency nursing guidelines. While nurses do not make formal diagnoses, they play a crucial role in recognizing signs and symptoms suggestive of PPH and initiating appropriate interventions. Therefore, there is a need to enhance diagnostic competency among emergency nurses to enable timely recognition and response to obstetric emergencies, including PPH.

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## Contributions of the authorship team and CRediT author statement

*Imbrogno, Luigi: Conceptualization, Methodology, Investigation, Writing – Original Draft & Revising and Editing, Validation, Visualization.*

*Heard, Jack: Writing – Reviewing and Editing, Visualization, Supervision, Resources.*

*Picard, Christopher: Supervision, Visualization, Writing – Original Draft & Revising and Editing, Validation.*

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