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Initial management of primary postpartum hemorrhage: a survey

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ABSTRACT

Objective: The objective of this study is to evaluate the actions taken by obstetricians when faced with postpartum hemorrhage (PPH).

Materials and methods: A standardized open-ended survey was applied to 235 physicians at five hospitals and at an obstetrics and gynecology conference, inquiring about which actions are recommended in the initial stages of PPH. We calculated the frequency and confidence intervals of the actions mentioned and correlated the number of actions with the number of clinicians mentioning them using Spearman's rho test.

Results: Asking for help was mentioned by 45% of the respondents and 38% asked for vital signs. Only one-fifth of those surveyed asked for blood count, coagulation testing, arterial blood gas, or urinary catheter. Very few mentioned hypothermia prevention, oxygen administration, or blood transfusion. A total of 80% of those interviewed only mentioned 3 of the 16 recommended actions.

Conclusion: Postpartum hemorrhage training should include instructions on initial steps in order to improve treatment comprehension and outcomes.

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Introduction

Primary postpartum hemorrhage (PPH) is a leading direct cause of maternal mortality in low-income countries, representing 27.1% of maternal deaths [1,2]. Approximately 54–93% of maternal deaths related to obstetric hemorrhage are preventable [3,4] with the implementation of standardized and multidisciplinary programs [5–7]. For example, the consensus bundle on obstetric hemorrhage is organized into four domains: Readiness, Recognition and Prevention, Response, and Reporting and Systems Learning. These four domains focus on everything from preparation, management, and feedback on the actions taken in the case of PPH. The timely identification of PPH in each case and the activation of emergency management plans are crucial components of this safety bundle [8].

Multiple guidelines agree about the establishment of primary measures to decrease maternal morbidity and mortality related to PPH. The practitioner who identifies the developing complication takes the role of the first responder, implementing immediate life support actions and preparing the environment for the arrival of a multidisciplinary team [1,9,10]. This first

responder has four objectives: communication, monitoring, initial resuscitation, and hemorrhage control [11]. For each of these objectives, the following are required.

Communication

The first step is to ask for help: all PPH management protocols include a multidisciplinary team that responds to a call for help [9].

Monitoring

Patient monitoring allows for adequate decision making and justified medical interventions. It is important to know the patient's vital signs and solicit hemoglobin, hematocrit, platelet levels, coagulation state, and evaluate perfusion through acid–base balance and lactic acid levels [12].

Initial resuscitation

This step consists of five actions: fluid augmentation through a peripheral venous catheter; blood type

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testing; second intravenous line placement in case a blood transfusion is necessary [9,12]; supplementary oxygen at 10–12 liters per minute via face mask and; avoidance of hypothermia. Hypothermia can be avoided by warming fluids and blood products, covering the patient's head and body, and increasing room temperature [8,13].

Hemorrhage control

Control of an ongoing hemorrhage includes: administration of uterotonic drugs as oxytocin or 800 µg sublingual misoprostol can be used to treat women with higher-than-average bleeding (e.g. approximately 350 ml or more) [14], or carbetocin [15], as well as bimanual uterine compression and massage (since compression of vessels can slow or stop the flow of blood) [8]. This technique should be maintained until the patient is in a condition where the "4 Ts" evaluation can be completed [8]. The "4 Ts" approach stands for the most common causes of PPH, these being uterine atony (tone), lacerations (trauma), retained placenta (tissue), and coagulation defects (thrombosis) [16]. Research on uterine massage suggests that once an oxytocic drug has been given, there is limited use for this maneuver for further reduction in postpartum blood loss [17]; uterine massage should, therefore, be considered where uterotonics are not available, prior to their administration, or while waiting for them to take effect. Also, the utilization of the Bakri balloon is associated with a decreased rate of postpartum hysterectomy [18].

While the chain of actions to be implemented in PPH is very well established, management variability is high, depending on who acts as a first responder. There are no published reports that evaluate the performance of these immediate responses in obstetric practice and the performance of the first responder when he/she is an obstetrician. The aim of this study was, thus, to evaluate the actions undertaken by obstetricians as first responders when they identify a PPH.

Materials and methods

A descriptive cross-sectional study was conducted with the elaboration of a standardized open-ended survey. The study population included obstetricians with current clinical practices and OB-GYN residents attending deliveries. The survey was conducted at two venues: in the first, an interviewer visited five public healthcare hospitals in Mexico to question

respondents at their workplace; in the second, three researchers interviewed respondents attending an obstetrics and gynecology conference.

The surveys were conducted by interviewers with no clinical practice in order to limit interviewer bias and avoid influencing the outcome. The information was standardized, and interviewers were continuously evaluated in their performance. Respondents received no positive or negative feedback to their comments or questions, and the interviewer did not intervene in any way during their responses. There were no audio or video recordings, and the interviewer assured respondents of complete anonymity.

The interview was standardized, interviewers introduced themselves, explained the objective of the survey, and invited respondents to participate. Those who accepted were presented a PPH clinical scenario and asked which actions should be taken. Data was recorded on a checklist (Google Forms, 2018) identifying the respondent's age, years of clinical practice, year of residency, and workplace (public hospital, or private practice). The actions mentioned were quantified and their frequency and confidence intervals were calculated. The number of actions and the proportion of obstetricians that mentioned them were correlated with Spearman's rho test, using SPSS version 20 (SPSS Inc., Chicago, IL, USA).

Because this study only involved the application of a survey, no Institutional Review Board or ethics committee approval was needed.

Results

A total of 235 physicians identified as first responders in cases of PPH agreed to participate, with an average age of 38 years (SD 29), of whom 126 (54%) were registered obstetricians and 109 (46%) were OB-GYN residents. Affiliations included 66 (28%) from private institutions and 169 (72%) from the public sector. We included 235 surveys from obstetricians at four different hospitals. Since the surveys were carried out in person, all of them were completed and used in the study. The results of the survey were separated according to the four objectives established for the first responder.

Communication

The recommended actions in the initial stages of PPH were reported low to very low in our study (Table 1). Fewer than half of the respondents (45, 95% CI:

Table 1. Immediate reaction protocol: the 16 actions evaluated.

Evaluated action	% Mentions (95% CI)
Communication	
• Ask for help	45 (38–51)
Monitoring	
• Central nervous system/mental status evaluation	38 (32–44)
• Vital signs and O ₂ saturation	38 (32–44)
• Urinary catheter	14 (10–19)
• Hematologic studies	
◦ Biometry	21 (16–26)
◦ Coagulation tests	18 (13–23)
• Arterial gasometry	14 (10–18)
Initial resuscitation	
• Fluid augmentation	
• Intravenous access (2 × 14 G cannula)	44 (37–50)
• High-flow oxygen	13 (9–18)
• Keep blood and plasma available	14 (10–18)
• Prevent hypothermia	
◦ Warm solutions	4 (1–6)
◦ Cover the patient	1 (0.3–2)
Hemorrhage control	
• Bimanual uterine compression	37 (31–43)
• Strong uterine massage	63 (56–69)
• Therapeutic uterotonics	94 (92–97)
• Ask for uterine tamponade resource	29 (24–35)
• Ask for instrumental hemostatic devices	60 (54–66)

38–51) mentioned asking for help or calling the multidisciplinary team when identifying a PPH.

Monitoring

Mention of the five surveillance actions was also low to very low: 38% (95% CI: 32–44) of respondents referred to asking for vital signs, 21% (95% CI: 16–26) to requesting a complete blood count, 18% (95% CI: 13–23) to coagulation testing, 14% (95% CI: 10–18) to arterial gas values, and 14% (95% CI: 10–19) to a urinary catheter.

Initial resuscitation

Only 44% (95% CI: 37–50) of respondents referred to the necessity for immediate crystalloid fluid augmentation, and one-third (38, 95% CI: 32–45) included placement of at least one wide-bore intravenous cannula to achieve rapid fluid therapy. It is especially important to highlight the very low attention paid to patient temperature. As little as 4% (95% CI: 1–6) of participants mentioned warming solutions and 1% (95% CI: 1–2) referred to covering the patient or using a warming mattress. Just 14% (95% CI: 10–18) asked for cross-matching or preparation for a blood transfusion. Another recommendation for PPH is to consider oxygen administration, but this measure was cited by only 13% (95% CI: 9–18) of respondents.

Hemorrhage control

One-third (37, 95% CI: 31–43) of respondents considered bimanual uterine compression as part of the hemostatic maneuvers in the initial phase of management, and two-thirds (63, 95% CI: 56–69) included strong uterine massage. Not surprisingly, almost all respondents referred to the use of uterotonics (94, 95% CI: 92–97); this was often the first action mentioned and one in which respondents took time to explain the use of different drugs and a sequential plan for their use. Uterine tamponade resources, mainly the Bakri balloon, was mentioned by 29% of those surveyed (95% CI: 24–35), and 60% (95% CI: 54–66) referred to instruments for exploration and hemostatic clamping.

Reaction protocol penetration

The relationship between the number of actions and the number of clinicians that mentioned them was also analyzed. An inverse relationship was found, showing that 80% of those interviewed mentioned only 3 of the 16 recommended actions. A mere 8% of respondents mentioned 10 of the 16 actions, and none mentioned 14 or more. The inverse relationship between the number of actions and the number of respondents mentioning them was very strong ($r = -0.94, p < .001$; see [Figure 1](#)).

Discussion

Postpartum hemorrhage (PPH) is the leading cause of maternal mortality in the world, mainly in middle-income and low-income countries. The worldwide trend has been toward a reduction in maternal mortality related to PPH, however, in low-income countries, a significant reduction has not been seen and in some cases, an increase is even reported. The absence of such a reduction in recent years could be partially explained by an inadequate course of actions by the first responder [9,19].

Multiple publications identify areas of opportunity in health care associated with morbidity and mortality. Applying human error research to obstetric hemorrhage provides insights into why teams and individual clinicians have consistently failed to recognize, be ready for, and respond in order to reduce preventable maternal morbidity and mortality. Specific errors have been identified in risk factor screening, diagnosis, volume administration, blood transfusion, surgical training, and deficiencies in hospital infrastructure [20].

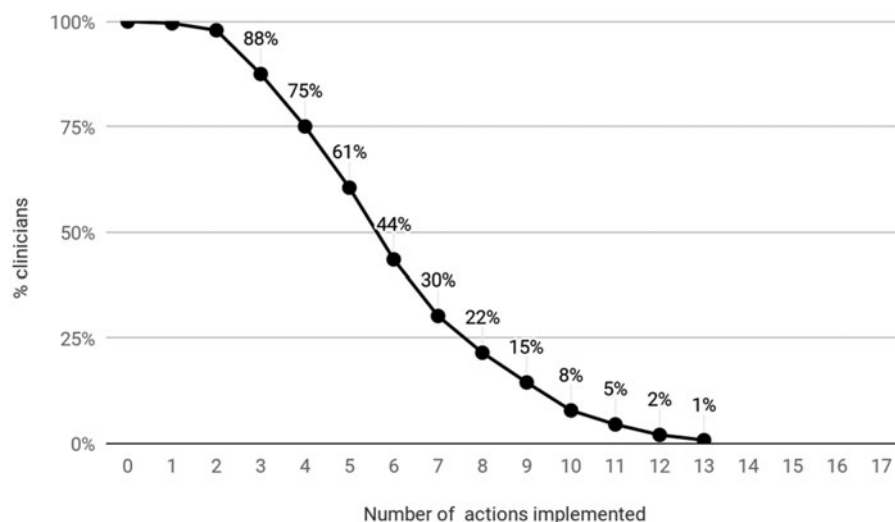


Figure 1. Relationship between the number of actions implemented and the percentage of clinicians who mentioned them ($\rho = -0.94$, $p < .001$).

Although multiple guides propose a standardized approach, there are no published studies that analyze the actions of first responders to PPH. This article is the first to evaluate what obstetricians have in mind when they face a case of PPH.

Adequate communication is one of the most important aspects of dealing with PPH, and one of the most studied. Resuscitation Council Guidelines highlight the critical importance of interactions in the emergency medical team [21]. Asking for help is the second link in the CPR survival chain; its effectiveness in emergency scenarios has been demonstrated [8] and the importance of team activation is such that today's rapid response teams seem to be one of the most promising strategies for reducing death in emergency scenarios.

After identifying patients at risk for or in early stages of PPH, the immediate notification of an identified set of responders and rapid intervention by the response team provides specialized professional care with a division of responsibilities among members of the team [22]. Rapid response teams are the key component in rapid response systems. There are currently at least 16 rapid response systems used in obstetrics, of these MEOWS being the most important.

Death can occur quickly in PPH, which justifies immediate assembly of a response team as a priority for the first responder. Since less than half of the respondents mentioned asking for help, it is necessary to emphasize the importance of this step in hemorrhage drills. Effective care requires that the first responder should be in communication with specialized clinicians.

Poor clinical monitoring, inadequate interpretation of changes in physiological parameters, and failure to

undertake appropriate action are preventable factors associated with serious adverse events [23]. A recent systematic review found positive clinical outcomes after the introduction of NEWS! one of the early warning scoring systems, which includes for respiration rate, oxygen saturation, systolic blood pressure, maternal pulse, level of consciousness or new confusion, and temperature [24]. Multiple guides have been proposed for PPH that include monitoring of vital signs, hemoglobin concentration, coagulation status, urine output, arterial blood gas, and other values as therapeutic targets to be maintained with resuscitation maneuvers [25]. Calculation of the shock index also requires systolic arterial pressure and heart rate. Laboratory and clinical markers of clinical instability have high sensitivity (88%) in identifying patients who need to be transferred to intensive care. However, these markers lacked specificity (13%) and had very low (8%) positive predictive value [26].

The very low degree of attention paid to monitoring actions revealed by our survey is a cause for concern, which could be explained because the obstetrician is not directly involved in hypovolemic shock decision making.

Several guidelines include actions to preserve body temperature [12,27,28] as part of a strategy-oriented to treat PPH but others do not [29,30] Because of the proven influence of body temperature on coagulation cascade, efforts to maintain adequate temperature are essential. As hypothermia impairs coagulation, fluids should be warmed, and the patient kept warm with active warming devices or warmed blankets [25]. Actions oriented to prevent hypothermia were the least mentioned in our survey.

It is important to send a blood sample for cross-matching and to verify the availability of compatible blood types even if the necessity of a transfusion is still uncertain. The first responder's taking of blood samples and verifying the availability of compatible blood types shortens the waiting time for blood products if transfusion is indicated.

Almost all practice guidelines include transfusion strategies, although they do not include the optimal moment for requesting cross-matching and verification of compatible blood types. We believe that nearly all patients should have a blood sample in the blood bank on admission, given that early transfusion improves the prognosis for women with massive hemorrhage. The American College of Obstetricians and Gynecologists recommends blood transfusion once a patient passes to stage two according to their four stages of obstetric hemorrhage checklist [31].

The primary goal of the first responder is not to treat the cause of bleeding but to control it. As continuous bleeding worsens the patient's prognosis, it has to be controlled as soon as it has been identified. There are immediate actions proposed to accomplish this goal and include bimanual compression, energetic fundal massage, therapeutic uterotonics, and use of tamponade and hemostatic instruments.

Our survey found an excellent awareness of uterotonics use (more than 90%) but low to very low mention of the other options. Our findings are consistent with those of other studies. A cross-sectional study that analyzed 360 medical records of women with PPH in three hospitals found low adherence to recommended actions (uterine massage, 67%; urinary catheter, 76%; hemodynamic monitoring, 67%), but increased adherence in cases of severe hemorrhage [32]. It is important to mention the potential bias in medical record analysis, as an action could be performed but not recorded, or recorded but not performed. Our survey found lower rates of adherence to these recommended actions in a clinical scenario.

Even when there is a universal consensus about the importance of establishing management protocols for PPH, there are no universal practice guidelines. Frequently, hospitals adapt or adopt existing guidelines or develop them *ad hoc*. The quality of the protocols for postpartum hemorrhage varies widely both in form and content between hospitals [33].

There is also a great heterogeneity in the steps contained in response protocols in different hospitals. A study of Dutch hospitals found an average of less than half of the recommended actions (46%, range: 20–68%) are in hospital protocols [33].

All practice guidelines should have strategies for their adoption because the real importance of a protocol is its applicability in the clinical setting. If they are not used, they will not have a significant impact on maternal morbidity and mortality. A web-based survey was developed and sent out by email to 130 FIGO Member Associations, the most common challenge mentioned for implementing guidelines was the lack of supportive policy and programs [34]. Improving data surveillance and implementing national guidelines for the prevention and management of major complications of pregnancy, childbirth, and puerperium is necessary to reduce maternal mortality [35].

Clinicians who identify a postpartum hemorrhage face an emergency in which they must implement a series of actions that include assembling a multidisciplinary response team and quickly put into practice knowledge, procedural skills, and competencies. Educational strategies must include simulation drills where participants face clinical challenges, in order to improve confidence in decision making [29], in establishing effective and efficient workgroups, and in order to comply with accepted courses of action. The drills must be dynamic, adaptable to the environment, and specific to the resources of individual health care centers. Likewise, a systematic review found that clinicians' use of checklists improved communication, reduced adverse events, promoted better adherence to standard operating procedures, and reduced morbidity and mortality [36].

There is significant evidence for the benefits of such interventions in improving the quality of care in obstetric settings, where the incorporation of specific competencies for primary responders will have a beneficial impact on maternal morbidity and mortality [36,37]. This can be summarized in the following:

1. The only way to diminish human error in an emergency setting is to obtain more tools and education on how to use these tools.
2. Some of these tools include checklists, information cards (online and in print), mobile apps and even live chats.
3. Educational strategies include known courses, although the most important strategies now lie in the use of simulation training and implementing checklists and debriefing in these simulations.
4. The most crucial aptitudes to be taught to first responders are those based on communication, leadership, and teamwork.
5. All PPH should be reviewed in hindsight in order to identify weak points and opportunities to improve.

When looking into the future the real challenge lies in correlating the results of our survey with the attention and quality of care provided to our patients.

Author contributions

SES contributed to the conception and design of the study, analysis, and interpretation of data, and writing and revising the manuscript. FZP contributed to data collection and revising the manuscript. JAHP contributed to writing and revising the manuscript. MAOR contributed to data collection and revising the manuscript. AGM contributed to the analysis and interpretation of data. GEG contributed to writing and revising the manuscript. ABSR contributed with writing and style correction.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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