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UPDATING OF A CLINICAL PROTOCOL FOR THE PREVENTION AND MANAGEMENT OF POSTPARTUM HAEMORRHAGE AT KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA
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ABSTRACT

Background: **Postpartum haemorrhage (PPH) affects 6% of births and accounts for almost 30% of maternal deaths. The use of clinical protocols for preventing and treating PPH is recommended by WHO. Protocols should be evidence-based, regularly updated, widely available and routinely adhered to.**

Broad Objective: **To update the Kenyatta National Hospital (KNH) PPH prevention and management protocol based on latest recommendations, and ensure its dissemination and use by providers.**

Materials and Methods: **A literature search identified selected PPH-related guidelines which were assessed using the AGREE-II tool for guideline quality. A matrix was created to compare recommendations across guidelines. Recommendations included in the KNH protocol were based on agreement across guidelines, guideline quality, publication year, and contextual factors in our setting. To aid implementation, an**

updated KNH protocol document, a clinical algorithm and a PPH management checklist were developed. These were reviewed and accepted as best practice by KNH and University of Nairobi.

Results: **Six PPH-related guidelines were used (WHO, FIGO, RCOG, ACOG, FOGSI, and the Kenya National Guidelines for Quality Obstetrics and Perinatal care). The KNH protocol covers PPH prevention, including: active management of third stage, oxytocin after vaginal or caesarean delivery, other drugs for prevention (when oxytocin is not available), controlled cord traction and delayed cord clamping. It also covers PPH management (supportive and definitive measures).**

Conclusion: **An updated PPH prevention and management protocol for KNH was developed. Implementation and adherence will help standardize PPH-related care and improve health outcomes for women.**

INTRODUCTION

Over the past two decades, maternal mortality has reduced worldwide (1) However, developing countries continue to be the largest contributor to maternal deaths globally. Sub-Saharan African countries alone accounted for an estimated 66% of global maternal deaths in 2015, with an estimated MMR (2015) of 546 (uncertainty interval (UI) 511 to 652) (1). Haemorrhage is the largest contributor to maternal deaths, accounting for 27.1%, the majority of which are due to postpartum haemorrhage (PPH) (1). PPH is defined as blood loss of 500mls or more within 24 hours after birth, while severe PPH is defined as a blood loss of 1000mls or more within 24 hours (2). Obstetric haemorrhage is a life-threatening emergency that requires urgent intervention in an appropriately equipped obstetric care setting.

The use of evidence-based, up-to-date clinical guidelines can help ensure a uniform standard of clinical care for all patients (2). All health facilities providing obstetric care should be equipped with relevant local guidelines to ensure a high quality of care for women, particularly for prevention and management of PPH. When used correctly, these guidelines can help reduce PPH-associated morbidity and mortality (2). Adherence to PPH guidelines has been demonstrated to significantly reduce the incidence of PPH and PPH-associated morbidity (3). A number of different strategies and implementation tools can be used to encourage healthcare providers to use and adhere to guidelines, such as professional education interventions, communication tools (such as checklists and job aids) and reminders.

Kenyatta National Hospital (KNH) is the largest teaching and referral hospital in Nairobi, Kenya, with a bed capacity of 1800. Approximately15,000 births occur at KNH each year. Clinical protocols for obstetric care are developed by senior clinicians in consultation with labour ward staff and ratified by the Department of Obstetrics and Gynaecology of the University of Nairobi. The KNH protocol on PPH prevention and management was last updated in 2013, and was therefore prioritized for updating in light of new evidence. There was also an identified

need to broaden the scope of the PPH protocol to include all interventions and cadres working in the KNH labour ward. This protocol is targeted at midwives, medical and clinical officers, residents and consultants providing obstetric care at KNH. This article describes the methods used in this process and summarizes the contents of the updated KNH PPH protocol.

METHODS

In updating this PPH protocol, the working group was guided by the ADAPTE process, which provides a "systematic approach to adapting guidelines produced in one setting for use in a different cultural and organizational context" (4). The adaptation process consists of three phases: the set-up phase, which includes outlining of tasks before starting the process; the adaptation phase, which involves several steps from the selection of a topic to preparing a draft of the adapted guideline; and the final phase, which consists of consultation and feedback before creating a final document (4).

Firstly, a literature search was conducted to identify relevant current national and international guidelines on PPH prevention and management, as well as any systematic reviews of PPH prevention and management clinical guidelines. The matrix was informed by the approach of Bohlmann and colleagues in their comparison of different PPH guidelines (5). For efficiency, the working group focused on a selected group of guidelines from relevant reputable organizations, namely the World Health Organization (2), the Royal College of Obstetrics and Gynaecology (6), the American College of Obstetrics and Gynecology (7), the International Federation of Gynaecology and Obstetrics (8), Federation of Obstetric and Gynaecological Societies of India (FOGSI, 2014) (9), and the current Kenyan National Guidelines for Quality Obstetrics and Perinatal Care(10). All guidelines were assessed using the AGREE-II tool. AGREE II is a validated tool for assessing the quality and reporting of clinical practice guidelines. (11). Two authors did an AGREE-II assessment for each guideline independently, with results compared by a third author. This produced a single aggregated AGREE-II score (maximum possible score of 161) for each guideline.

A matrix was created for comparison of recommendations across the selected guidelines, in order to identify any agreement or disagreement between guidelines regarding specific recommendations. Each row on the matrix related to a specific intervention within PPH prevention and management. A template of the matrix was developed by the working group (based on known PPH prevention and management interventions) and pilot tested on one guideline. Using this template, each included guideline was reviewed and data extracted into the matrix. To ensure accuracy, each guideline was extracted independently by two authors, and compared for consistency by a third author. The final matrix is available in Appendix 1. We then assessed agreement of recommendations across all guidelines. Where there was consensus, the recommendation was adopted for the KNH PPH protocol. Where there was disagreement, the working group

reviewed the underlying evidence (such as the relevant systematic reviews), the guideline quality (AGREE II score), year of publication and any relevant contextual factors to reach consensus on what recommendation should be used in the KNH PPH protocol. These recommendations were also specifically discussed in a Departmental meeting to review the PPH protocol.

In a few instances where available guidelines did not have a recommendation, or lacked clinical detail (such as massive blood transfusion and fluid management), an additional focused literature review for relevant systematic reviews and/or recent clinical guidance was conducted (Cochrane Database of Systematic Reviews and PubMed).

A draft KNH PPH protocol document was synthesized based on this process. It was circulated to relevant KNH stakeholders for comment and discussed in a Departmental meeting at KNH for feedback and consensus. Obstetrics and Gynaecology (including the nursing staff), Haematology and Microbiology Departments participated in the meeting. This group reached consensus, and the PPH protocol was formally accepted as best practice at KNH.

RESULTS

Six guidelines were used to create the matrix from which the guideline was derived. These included guidelines from: WHO 2012, FIGO 2012, RCOG 2016, ACOG 2006, FOGSI 2014, and the Kenya National Guidelines for Quality Obstetrics and Perinatal care (Table 1).

Prevention of PPH

Active management of third stage of labour: Active management of third stage of labour (AMSTL) is recommended by all the guidelines that were used to update this protocol. It comprises routine use of uterotonics after vaginal or caesarean delivery, controlled cord traction (CCT) and delayed cord clamping. AMSTL has become a central component for the PPH reduction strategies globally (2), and it was consistently recommended across all included guidelines

Choice and dose of uterotonics: The first drug of choice for PPH prevention is intramuscular (IM) oxytocin 10IU after delivery of the baby for vaginal delivery, or 5IU intravenously for caesarean deliveries, recommended across most guidelines. Oxytocin is the drug of choice as a uterotonic for the prevention of PPH due to its efficacy as a uterotonic and fewer side effects in comparison to other drugs (2). Administration of oxytocin immediately after delivery, or after delivery of the anterior shoulder, is associated with a significant reduction of PPH.

When oxytocin is not available, other uterotonics are recommended, including ergometrine, syntometrine or carboprost (Table 1). While other guidelines recommend 0.2mg ergometrine, the KNH PPH protocol advises use of 0.5mg, as this is the formulation available at our institution. Acceptable dose ranges of ergometrine are 0.2mg to 0.5mg intramuscularly. Oral uterotonics such as misoprostol can be considered for community prevention of PPH since this drug can be given orally, as well as when the storage requirements for oxytocin are not available (2). Misoprostol was recommended as a second-line uterotonic

by FIGO (2012), WHO (2012), FOGSI (2015), as well as the Kenyan national guideline (2012). It is however recognized as being inferior to oxytocin for PPH prevention and should only be given when oxytocin is not available. At the KNH, oxytocin is readily and widely available, hence misoprostol was not included in the KNH protocol.

Delayed cord clamping: The WHO (2012) guideline recommends delaying cord clamping to 1 to 3 minutes after birth. Other guidelines were within this range except FOGSI (2014), which recommended clamping after at least 30-40 seconds. Delayed cord clamping, defined as more than 60 seconds, has been shown to improve outcomes for both preterm and term neonates(2). Delayed cord clamping for 1 minute was thus adopted for the KNH protocol (Table 1).

Controlled cord traction: WHO (2012), FIGO (2012), Kenyan National guidelines (2012) and FOGSI (2014) recommended the use of CCT specifically by a skilled birth attendant. None of the guidelines specified a CCT technique. The new KNH protocol is specific on performance of CCT.

Table 1

Recommendations for Prevention of Postpartum Haemorrhage

Intervention	**RCOG 2016**	**WHO 2012**	**FIGO 2012**	**KENYA 2012**	**ACOG 2006**	**FOGSI 2014**	**KNH 2017**
Active Management of Third Stage of Labour	✓	✓	✓	✓	✓	✓	✓
Controlled cord traction	Not specified	✓	✓	✓	Not specified	✓	✓
Cord clamping	>1min	1-3mins	>2mins	1-3mins	Not addressed	30-40secs	1-3mins
Oxytocin use in vaginal delivery	5IU IV slow or 10IU IM	10IU IV slow or 10IU IM	5IU IV slow or 10IU IM	10IU IM	Not addressed	Recommended. 10IU IM OR 5IU IV over 1-2 min OR 10-20IU in 500mls N/S.	10IU IM

Oxytocin use for caesarean section	5IU IV slow	Recommended. 10 IU slow IV.	Not addressed.	Not addressed.	Not addressed.	10IU IM OR 5IU IV over 1-2 min OR 10-20IU in 500mls Normal Saline.	5IU by slow IV injection. 20-40IU In 500mls Normal Saline.
Misoprostol	Recommended. Dose not specified.	Recommended.600mcg PO	Recommended.600 mcg PO	Recommended. 600mcg PO/SL.	Not addressed.	600mcg PO/SL/PR	In the event of unavailability of oxytocin, use of misoprostol is recommended. Dose: 600mcg PO/SL/PR.
Other drugs when oxytocin not available	Syntometrine. Dose not specified	Ergometrine or Syntometrine. Dose not specified.	Ergometrine/ Methylergometrine/ Syntometrine. Misoprostol. Doses not specified.	Ergometrine 0.2mg IM. Syntometrine 1ml IM	Not addressed.	Methyl-Ergometrine 0.2 IM Carboprost 250mcg IM	Ergometrine 0.5mg IM (0.5mg is the available formulation in KNH

Management of Post-Partum Hemorrhage: In the event of PPH occurring, a majority of guidelines recommended calling for help and early involvement of various disciplines including anesthesia, blood transfusion unit, theatre team, and laboratory staff (7, 6, 12). Immediate resuscitation procedures such as primary maternal survey, checking airway and breathing, use of oxygen (if indicated), large bore IV access, obtaining blood samples for complete blood count, grouping and cross matching, and coagulation studies were recommended.

Fluid resuscitation: The WHO, RCOG, FIGO, FOGSI and the Kenyan national guidelines did not provide details for dosing and type of fluid. RCOG (2016) recommends administering a maximum of

3.5 litres, (to avoid dilutional coagulopathy) the first 2 litres being crystalloids and the next 1.5L being colloids if blood is still not available. Use of warm crystalloids (rather than room temperature) is preferred (6). The revised KNH protocol advises administration of two liters of normal saline (NS) as rapidly as possible (within 30 minutes), targeting a mean arterial pressure (MAP) of >65mm Hg or systolic blood pressure (SBP) of >90mmHg. Nonetheless, giving large amount of fluids should not be withheld in patients who have renal injury as a result of hemorrhagic shock and resultant renal hypoperfusion. In such rare situations where more than 10 liters of fluids may be required, a switch to Ringer's lactate (if NS was being used) is advised. This is because large volumes of NS could cause metabolic acidosis, while large volumes of Ringer's lactate can cause metabolic alkalosis (13). Colloids are to be used with caution and to a maximum of 1.5 litres since they have been associated with prolonged need for ventilatory support for critical patients and do not eliminate the risk of pulmonary edema (14). They should not be withheld if they are the only fluid available. Colloids versus crystalloids still remains controversial since the recent CRISTAL trial, a 9 year multicenter study, whose findings support the use of colloids for patients with hypovolemic shock from different causes. The findings of this study require validations before colloids are recommended as first line over crystalloids (15).

Blood and blood products for transfusion: Only RCOG (2016) gave specific guidance regarding blood transfusion in PPH. Additional information was sought from two United Kingdom based guidelines, the National Blood Users Group guideline on management of massive hemorrhage (15) and a guideline on clinical management of major perioperative blood loss in adults (16). Blood and blood products are recommended if blood loss is ongoing and thought to be in excess of 2000 mL, or if the patient's clinical status reflects developing shock despite aggressive resuscitation. It is acceptable to start at 4 units of packed red cells, aiming for hemoglobin levels above 8mg/dl. A transfusion rate of 2-4mls/kg/hr is appropriate (15), although in clinically severe situations the rate may be increased. In the event that blood is urgently required, but cross matching would delay administration, the use of O rhesus negative blood is recommended (6). RCOG also recommends use of fresh frozen plasma for every 4 units of red cells, at a dose of 12-15ml/kg or to keep Prothrombin Time (PT) and Activated Partial Thromboplastin Time (APTT) greater than 1.5 times normal (6, 17). RCOG recommends administration of cryoprecipitate to keep fibrinogen levels greater than 2g/L, and platelet concentrate when the platelet levels drop to less than 75×10^9 (6).

None of the guidelines gave a detailed description of a massive transfusion protocol. Massive blood transfusion is variably defined as: loss of blood at a rate of 150ml/min, loss of 100% of blood volume in 24 hours or 50% of blood volume in 2 hours or when a patient receives more than 10 units of red cells in 24 hours (16). When such a large blood loss is anticipated, FFP at a dose of 12-15ml/kg (3 units in an adult) should be administered for every 6 units of red cells.

Cryoprecipitate - at a standard dose of two 5-unit pools – can be used to keep fibrinogen levels above 1g/L. Patients should be monitored for the possibility of hyperthermia, thrombocytopenia and hyperkalaemia, as well as frequent monitoring of the coagulation profile. Coagulation monitoring should be at least 4 hourly, or after every 5 units of blood are given (16).

Management of uterine atony: Uterine atony is a leading cause of PPH, and all guidelines described a number of supportive, medical and surgical measures for its management. This includes bladder emptying, uterine massage, clot expulsion, bimanual uterine compression, balloon tamponade and aortic compression (7, 6, 2, 12, 9, 8) (Table 2). Medical management includes uterotonics (oxytocin as first line), with ergometrine, carboprost, carbetocin, tranexamic acid and recombinant factor VII as secondary options (Table 2). The recent World Maternal Antifibrinolytic (WOMAN) Trial has provided evidence for use of tranexamic acid in PPH management (18). In this study, 1 gram of tranexamic acid was administered intravenously as soon as the diagnosis of PPH was made followed by 1g should bleeding continue. Tranexamic acid was noted to significantly reduce haemorrhage with no notable adverse effects. For this reason, the updated KNH protocol recommends its use as soon as a diagnosis of PPH is made. Surgical options include haemostatic sutures (such as the B-Lynch); vessel ligation, embolization and, if all other measures fail, a subtotal hysterectomy. Although external compression of the abdominal aorta was not addressed by the above guidelines, it was included as one of the first steps in the KNH protocol, especially when help was not immediately available. This procedure is a recognized life-saving manoeuvre, especially in low-resource settings (2).

Management of secondary Post-Partum Haemorrhage: Secondary PPH is defined as excessive vaginal bleeding from 24 hours after delivery up to 6 weeks postpartum. Only the ACOG (2006), RCOG (2016) and Kenya national guidelines (2012) addressed secondary PPH specifically. These guidelines recommend performing an ultrasound to know whether there are retained products of conception (RPOC) and performing high vaginal and endocervical swabs. The Kenya guideline also recommends examination under anaesthesia as a strategy to assess the cause of secondary PPH. When endometritis is suspected, appropriate antimicrobial therapy should be initiated while evacuation is done for RPOC. RCOG also recommends use of uterotonics such as misoprostol and ergometrine as well as balloon tamponade or arterial embolization for uterine sub-involution. The guidelines also acknowledge postpartum hysterectomy as a final option for management of secondary PPH.

Table 2

Recommendations for Treatment of Postpartum Haemorrhage

Intervention	**RCOG (2009)**	**WHO (2012)**	**FIGO (2015)**	**KENYA (2012)**	**ACOG (2006)**	**FOGSI (2015)**	**KNH (2016)**
COMM-UNICATION	Well defined, have cited a Complete List of members to be called. Multi-disciplinary. Role allocation.	Not addressed.	Not addressed.	Call for help, more than one person needed. No clear task allocated	Call for help.	Shout for help, inform theatre.	SHOUT FOR HELP! Multidisciplinary team approach, anaesthesia, lab, nursing, haematology, blood bank. Place operating theatre on standby.
FLUID THERAPY	Use 3.5 litres of warmed crystalloid Hartmann's (2 litres) Followed up by additional crystalloid orcolloid (1–2 litres) if blood still not available.	Isotonic crystalloids -dose not specified	Not addressed.	Set up IV fluids mentioned, Amount and type not indicated	Set up crystalloids	Crystalloids, colloids and blood and components. CRYSTALLOIDS PREFERRED TO COLLOIDS. Dose not indicated	In the initial phase, administer 2L of normal saline as rapidly as possible (within 30mins). Mean arterial pressure of >65mmhg or systolic blood pressure>90mmhg is a reasonable target. Hartman's can be used instead of normal saline. Order blood if blood loss is ongoing and thought to be >2L. If not available, continue with boluses of 500mls to keep mean arterial pressure as indicated.

							When more than 10litres of normal saline have been administered, switch to Hartmann's solution. Use colloids ONLY when crystalloids are not available. Colloids maximum of 1.5L. Colloids are associated with more adverse effects.
MEASURES TAKEN FOR UTERINE ATONY							
SUPPORTIVE	Bimanual uterine compression (rubbing up the fundus) to stimulate contractions. Ensure bladder is empty (Foley catheter, leave in place).	IV fluids, Use Temporary measures for non-responsive - Bimanual compression, external aortic compression, non-	Uterine massage, bimanual compression, aortic compression, hydrostatic intrauterine balloon tamponade, Use of anti-shock garment while	Uterine massage Bimanual compression, Aortic compression, Intrauterine balloon tamponade Anti-shock garment use not reinforced Uterine packing not recommended after vaginal	1.Empty bladder 2.Uterine massage 3.Uterine compression 4.Expel clots 5.Uterine tamponade -Uterine packing, use 4 inch gauze, can soak with 5000IU of thrombin.	Massage uterus. uterine compressions Aortic compression Pneumatic anti shock garment.	1.Empty bladder 2.Uterine massage 3. Expel clots 4.Uterine bimanual compression 5.aotic compression 6.Uterine tamponade Foley catheter Sengastaken-blackmore tube SOS Bakri tamponade balloon, insert one put 300-500mls of Normal saline.

		pneumatic anti-shock garments, uterine packing.	awaiting C/S or transfer to facility Uterine packing not recommend ed	delivery	-Foley catheter, insert one or more, instil 60-80mls of normal saline -Sengastaken-blackmore tube -SOS Bakri tamponade balloon, insert one put 300-500mls of Normal saline.		
MEDICAL (DRUGS AND DOSAGES)	1. syntocinon 5IU by slow intravenous injection(may have repeat dose) 2. Ergometrine 0.5 mg slow IV/IM 3. Syntocinon infusion (40 IU/500ml Hartman's solution at 125ml/hr 4.Carboprost 0.25 mg IM at intervals of not < 15 min (max 8 doses),	1. Oxytocin - dose not specified. 2. Misoprost ol - 800mcg. 3. Ergometri ne- dose not specified. 4. Tranexami c acid-	1.Oxytocin 10 IU IM or 5 IU IV slow push or 20-40 IU in 1 litre normal saline at 60 drops/min then continue oxytocin 20 IU/litre of infusion fluid at 40 drops/min.	1.Oxytocin-rpt 10IU/5IU slow IV, 20-40IU in IV fluid infusion 2.Misoprostol 800 mcg SL or rectal, Do not repeat if used for prophylaxis 3.Ergometrine/ Methylergometr ine 0.2mg IM repeat 2-4 hourly, Max 5 doses (1mg) in 24 hours	1.Oxytocin 10-40 units in 1 litre of normal saline or lactate, continuous 2. Methylergonovi ne maleate- 0.2mg IM, every 2 hours. (Avoid in hypertension) 3.Carboprost- 0.25mg IM (avoid in Asthma, hepatic, renal	Oxytocin (no dosage) Misopros tol- 800mcg orally, sublingu al or rectal. Tranexa mic acid- no dosage indicated .	1. Oxytocin-rpt 10IU/5IU slow IV, 20-40IU in IV fluid infusion 2. Misoprostol 800 mcg SL or rectal, Do not repeat if used for prophylaxis 3. Ergometrine/Methylergom etrine 0.5mg IM repeats 2-4 hourly, Max 2 doses (1mg) in 24 hours. 4. Syntometrine 1 ampoule IM 5. Carbetocin 100mcg IM or IV over 1-2 minutes

	Carboprost 0.5 mg (intramyometrially) 5. Misoprostol 800 mcg SL.	dose not specified.	2.Ergometrine/Methylergometrine 0.2 mg IV/IM every 2-4 hrs to a max of 1 mg in 24 hrs 3..Misoprostol 800μg sublingual 3.Carbetocin 100μg IM/IV over 1 minute 4. Carboprost 0.25mg IM every 15 minutes to a max of 2mg as third line.	4.Syntometrine 1 ampoule IM 5.Carbetocin 100mcg IM or IV over 1-2 minutes 6.Carboprost 0.25mg IM every 15 min, maximum 8 doses 7.Tranexamic if second line options have failed or if bleeding partly due to trauma- no dosage 8. Recombinant factor VIIa.	and cardiac disease) 4.Misoprostol-800-1000mcg rectally 5. Dinoprostone-vaginal or rectal 20 mg (Avoid in hypotensive patient, stored frozen thawed to room temp.) 6.Human Recombinant factor VIIa-50-100mcg/kg every 2 hours until haemostasis is achieved	Recombinant factor v11a- no dosage indicated.	6 .Carboprost 0.25mg IM every 15 min, maximum 8 doses 7. Tranexamic if second line options have failed or if bleeding partly due to trauma- no dosage 8. Recombinant factor VIIa.
RECOMMENDED SURGICAL TECHNIQUES	1.Balloon tamponade 2.Haemostatic brace suturing (B-Lynch)	1. Balloon tamponade. 2. B-lynch. 3. Uterine	1.Compression sutures (B Lynch or Cho techniques);	1.Compression sutures 2.Uterine-ovarian, hypogastric artery	1.Compression sutures 2.Uterine-ovarian vessel ligation	Vessel ligation (uterine, ovarian, internal	1.Vessel ligation(uterine, ovarian, internal iliac) 2.B-LYNCH 3. Hysterectomy.

	3. Ligation of uterine arteries, ligation of internal iliac artery. 4. Selective arterial embolisation. 5. Hysterectomy.	artery ligation, internal iliac artery ligation. 4. Hysterectomy.	2.uterine, utero-ovarian and hypo gastric vessels ligation 3. If life threatening subtotal or total hysterectomy.	ligation 3.Hysterectomy 4. Uterine artery embolisation if other measures have failed.	3.Hysterectomy Embolization	iliac). U-Suturing technique B-LYNCH Hysterectomy.	

DISCUSSION

Postpartum hemorrhage has several recognized risk factors (such as anemia, multiple gestation, fetal macrosomia and previous PPH), however it can occur in any woman. For this reason, clinicians must anticipate its occurrence and institute universal best practices to help prevent it, and manage it quickly and effectively if it occurs. Updated clinical practice guidelines are required to ensure prompt and effective management for all women. The clinical protocol presented here aims to improve PPH prevention and management at our institution, and ensure patient care is aligned with current evidence.

Management of PPH begins with ensuring safety and calling for help, basic life support measures, obtaining specific laboratory samples and measures tailored to the cause of PPH. Procedures for uterine atony management may need to reflect local resources and skilled personnel (2). For example, the use of uterine artery embolization for primary PPH treatment is not available in all hospitals. In Kenya, use of balloon tamponade is a cost effective and easy to use temporizing measure in managing PPH (19). In low and middle-income countries where delays in reaching emergency care facilities contribute to the burden of PPH, use of anti-shock garments and aortic artery compression have also been found to be useful (20).

A number of tools are being developed to support the implementation of this revised protocol. These include: a structured checklist, an algorithm and a PPH management handbook. A PPH box with medical supplies and equipment required for PPH management has a specified location in the ward, known to all providers, to help ensure timely care and therefore improve preparedness and efficiency. Flow charts (algorithms) and blood sample bottles will also be included in the 'PPH box'.

The PPH checklist is aligned with this revised protocol, and requires a health provider document information consistently, including key demographic details of the patients, time of management, and the sequence in which management procedures were carried out. This checklist will be placed in the patients' records when PPH occurs and can be reviewed retrospectively for clinical auditing purposes. A clinical algorithm (i.e. a practical flow chart on management and prevention of PPH) is being derived from the updated protocol. The updated KNH-PPH protocol will be periodically reviewed by the KNH clinical guidelines committee to ensure it is up to date. Clinical drills will be carried out regularly to ensure that health providers adhere to this protocol. While this protocol was developed with the KNH setting in mind, other hospitals should consider how their PPH prevention and management protocols can be optimized.

CONCLUSION

International recommendations were reviewed and used to develop an up to date, evidence-based clinical protocol for PPH prevention and management at Kenyatta National Hospital. Implementation and adherence to the PPH protocol will standardize prevention and treatment of PPH at this institution and improve health outcomes for women.

Use of tools such as checklists, education and algorithms are being implemented to improve the adherence to this guideline.

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