Simulation Based Post-Partum Hemorrhage Training in Nigeria: A Pilot Project

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Simulation Based Post-Partum Hemorrhage Training in Nigeria: A Pilot Project

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ACKNOWLEDGEMENT

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I would like to thank my wonderful parents for their love, prayers, and support. Above all, I thank my amazing children Amarachi, Chibuzo, Ebere, and Uche for their inspiration, patience, and understanding within the past 4 years.

Lastly, I am especially thankful to all who supported my project through GoFundMe and other donations. Your contributions made the implementation of my project in Nigeria a success.
Abstract

Postpartum hemorrhage (PPH) is one of the leading causes of mortality and morbidity among child bearing women globally (Ononge, Mirembe, Wandabwa, & Campbell, 2016). Although this outcome is preventable, it remains a significant cause of death among women especially in underdeveloped countries. This paper examines an educational project that was aimed to increase the knowledge of student midwives and registered midwives in a rural academic setting in Nigeria.

Methods: A one-day educational pilot training which consisted of a didactic component and a case-based simulation training focused on identifying risk factors, assessment techniques, and management protocols for the PPH patient. There were 35 participants in this pilot

Results: Participants showed an overall increase in their level of knowledge of PPH following this training. A mean score of 13.21 for post-assessment was noted compared to 9.74 pre-assessment with a variance of 9.0 for pre-assessment and 13.2 for post assessment.

Conclusion: Conclusion: Low levels of awareness about PPH and lack of standardized training or competency evaluation for practicing midwives enlightens a significant depth about the problem of PPH in Nigeria. This pilot project demonstrated the ability to increase knowledge and awareness of PPH prevention and, assist this Nigerian community of practitioners in enhancing their skills.

Key words: postpartum hemorrhage, maternal mortality, simulation, high-risk patients.
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INTRODUCTION

Problem description

Obstetric Hemorrhage: Obstetric hemorrhage otherwise known as postpartum hemorrhage (PPH), is defined as a quantified blood loss of more than 500 milliliters in a vaginal delivery, or greater than 1000 milliliters blood loss during a cesarean section (C-section) (Smith & Brennan, 2017). Obstetric hemorrhage can be classified as primary hemorrhage if it occurs within 24 hours after delivery, and secondary hemorrhage when it occurs after 24 hours and within 12 weeks following a delivery (Belfort, Lockwood, & Barss, 2017). Understanding this classification is pivotal in the training of providers, especially in Nigeria, where there is no standardized method of data collection or documentation. This is a constraining factor in capturing cases of secondary hemorrhage and its’ outcomes. Postpartum hemorrhage is one of the complications experienced by mothers post-delivery and is one of the leading, but mostly preventable causes of maternal mortality globally (Ngwenya, 2016).

PPH in Africa: The American Congress of Obstetrics and Gynecology (ACOG) (2016) reveals that about 303,000 women died during childbirth worldwide in 2015, and two-thirds of those deaths occurred in Sub Saharan Africa. Furthermore, ACOG established that there are an estimated 140,000 maternal deaths annually worldwide, which, implies that one woman dies every four minutes due to PPH. The risk of maternal death is over 200 times greater for women living in developing nations compared to women who live in developed countries (Piane, 2008). Nigeria, along with the Democratic Republic of Congo, Ethiopia, Pakistan, Kenya, Indonesia, Uganda, Bangladesh, Tanzania, and India make up about 60% of all maternal deaths worldwide (Filippi, Chou, Ronsmans, Graham, & Say, 2016). In the United States, maternal mortality from pregnancy related complications, is estimated at 17.3 deaths per 100,000 live births and in
developing countries, the rate is 1,000 deaths per 100,000 live births (Smith & Brennan, 2017). “The tragedy of a woman dying in childbirth extends beyond her own death, devastating her infant, her other children, her family and the community” (Piane, 2008, P. 26). According to the World Health Organization (WHO) (2015), about one million children are left motherless annually and in most cases these children also die within 1-2 years after the death of their mothers.

**International Goals:** In September 2000, world leaders came together at the United Nations Summit to adopt the United Nations Millennium Declaration; committing the world nations to a global partnership towards reducing extreme poverty, decreasing the spread of Human Immunodeficiency Virus (HIV)/Acquired Immunodeficiency Syndrome (AIDS), addressing universal primary education, promoting gender equality, empowering women, and decreasing maternal and child mortality. This declaration of improving health around the globe was initialized into one global action plan in 2010, with the target dates for improvements in the year 2015. This project became known as the Millennium Development Goals (MDG) (Lomazzi, Borisch, & Laaser, 2014). The maternal mortality rate in 2000 was estimated at 529,000 deaths globally and the maternal mortality ratio (MMR) was 400 deaths per 100,000 live births (WHO, 2004). The fifth domain (MDG-5) which acts on maternal health is centered on reducing the maternal mortality ratio (MMR) by 75%, and this goal was to be met by the year 2015 (Kyei-Nimakoh, Carolan-Olah, & McCann, 2016). Key problems recognized by the MDG-5, are lack of skilled birthing attendants, lack of antepartum visits, insufficient data on cause of maternal mortality producing the highest rates of maternal mortality in Sub Saharan Africa (UN, 2015). In addition to this global initiative, there are several other national and global programs which focus on the prevention of maternal mortality caused by postpartum hemorrhage (Table 1).
Table 1: National and Global Programs Addressing PPH

<table>
<thead>
<tr>
<th>Program/Agency</th>
<th>Website</th>
<th>Information Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>The California Maternal Quality Care Collaborative (CMQCC)</td>
<td><a href="https://www.cmqcc.org/qi-initiatives/obstetric-hemorrhage">https://www.cmqcc.org/qi-initiatives/obstetric-hemorrhage</a>.</td>
<td>Postpartum hemorrhage toolkit that centers on readiness, recognition, response, and reporting</td>
</tr>
<tr>
<td>Postpartum Hemorrhage Project by the Association of Women’s Health Obstetric and Neonatal Nurses (AWHONN) was supported by grant from MERCK for mothers.</td>
<td><a href="http://www.pphproject.org/">http://www.pphproject.org/</a></td>
<td>This website was designed to educate providers on the recognition of at risk patients, decrease providers’ errors, enhance readiness and response to obstetric hemorrhage. (AWHONN, 2014)</td>
</tr>
<tr>
<td>Postpartum Hemorrhage Initiative by International Federation of Gynecology and Obstetrics (FIGO).</td>
<td><a href="https://www.figo.org/pph">https://www.figo.org/pph</a>.</td>
<td>They function as advocates among medical communities in low resource nations to implement policies that focus on management of PPH (FIGO, 2010).</td>
</tr>
</tbody>
</table>

Despite having these initiatives in place, maternal mortality continues to pose a critical challenge. In Nigeria, data around maternal death is not readily available (Oladapo et. al, 2015). This may be attributed to lack of access to computers and electronic documentation programs. Given the lack of accessible data regarding maternal death outcomes in Nigeria, the true value of addressing any health indicators and outcomes as well as the ability to measure progress towards achieving MDG-5 is adversely affected.
Description of setting

The DNP site was Holy Rosary Hospital (HRH) which is located in a rural part of Eastern Nigeria. It was founded in 1965 and is affiliated with a rural community hospital which was built in 1932. The structures and amenities in both the school and the hospital have not been upgraded since the time of construction. HRH provides services including maternal care to about 10 other local communities, with an estimated 800 births annually. Transportation to and from this rural setting is a challenge and a restraining factor in the referral of high risk or unstable patients to a higher level of care. The closest medical center where patients can be referred is at least 20 miles away with an inaccessible road network.

Assessment and evaluation of this school of midwifery through data received from the school and interviews with school officials revealed that current students face challenges in standard academic preparedness. A lack of access to textbooks, library resources, computer technology, and the poor quality of basic infrastructure necessary for successful learning such as sufficient lighting, training equipment, media, and supplies poses threat to the learning environment and capabilities of these students. HRH is one of the only two midwifery schools in the state.

AVAILABLE KNOWLEDGE

A review of literature was conducted to evaluate the causes of high maternal mortality due to postpartum hemorrhage in Nigeria. Databases searched include: Cochrane, CINAHL, PubMed, Google scholar, and UpToDate. Articles published in English language, articles on PPH, and publications between 2000 and 2017 met the inclusion criteria. Keys words searched were: postpartum hemorrhage, maternal mortality, simulation-based training, Millennium
Development Goals (MDG), maternal mortality ratio (MMR). The initial search yielded 300 results. A total of 52 articles met the inclusion criteria and were reviewed.

**Nigerian Healthcare System:** Nigeria’s healthcare system is underperforming in providing basic healthcare especially in rural communities, which results in an increased mortality rate (Oyibocho, Irinoye, Sagua, & Ogungide – Essien, 2014). The Nigerian healthcare system is managed by three tiers of government: local, state, and federal. Primary healthcare is managed by the local government at the rural level. Secondary care and specialty services are provided by the state. Tertiary care, which is the highest level of care is provided by private providers in teaching hospitals in partnership with the federal government and other nongovernmental organizations (Welcome, 2011). This system of healthcare promotes unequal opportunities to access care consistent with the socioeconomic status (Obiyan & Kumar, 2015). Those at the rural level are likely to receive more substandard care because of poverty. It is estimated that about 55% of the Nigerian population lives in rural communities and cannot afford the cost of healthcare when compared to the rest of the population (Welcome, 2011).

In addition to the exorbitant cost of healthcare services, primary healthcare systems in Nigeria lack the ability to provide adequate human resources for the provision of 24-hour urgent and emergency coverage (Abimbola, et al., 2012). Tertiary hospitals in Nigeria perform below standard in terms of providing care expeditiously to women who require urgent care (Oladapo et al., 2015). This leads to delays in prompt diagnosis, referral, and initiation of treatment which in turn increases the risk of mortality and morbidity. The three most common types of delay include the decision when to solicit care, delay in access to hospitals, and delay in the provision of emergency treatment (Tort, Rozenberg, Traore, Fournier, & Dumont, 2015). All three types of delay were found to be applicable to the Nigerian healthcare system. Hussein et al., (2016)
reported that a lack of an organized method of transportation to a higher level of care was one of the barriers in initiating prompt management of postpartum hemorrhage which also leads to delay in providing needed care.

**Cultural Influences:** Religion, level of education, and cultural practices in Nigeria influence the number of pregnancies, methods of delivery, and overall health practices related to birth. About 25% of women in Northern Nigeria start childbearing as teens, which increases their chances of having multiple pregnancies over time, resulting in a higher risk of postpartum hemorrhage (Prata, Ejembi, Farser, Shittu, & Minkler, 2012). Close to 40% of expectant mothers in Nigeria do not receive prenatal care and only one out of three births is attended by skilled personnel (Abimbola, Okoli, Olubanjo, Abdullahi, & Pate, 2012).

Ninety two percent of all deliveries in Northern Nigeria take place in the home and are attended by traditional birth attendants who are not adequately trained for such roles (Prata, et al., 2012). This leads to poor maternal outcomes resulting from the inability to manage common complications of pregnancy. Although the MMR has reduced significantly in developed countries, it continues to pose a major risk in third world countries. Smith and Ramus (2016), report that lack of experience of providers is one of the contributory causes of poor maternal outcomes. Ajenifuja, Adepiti, and Ogunniyi (2010), advocate that all birth attendants should possess adequate knowledge and skills required to manage the third stage of labor effectively. World Health Organization (2011) found that “there is compelling historical and limited epidemiological evidence that there is a significant relationship between increased coverage of maternity care by skilled personnel and a reduction in maternal mortality ratios” (p.5). The WHO concludes that providing a skilled birth attendant for all deliveries is a key strategy towards reduction of maternal mortality. Tunçalp, Souza, and Gülmezoglu (2017) report that the World
Health Organization now recommends the adoption of simulation-based training for management of PPH.

**Midwifery Training:** Most deliveries in Nigeria are typically managed by one of two types of midwives. One group is made up of midwives who undergo three years of midwifery training, and the second group consist of registered nurse midwives who receive 18-months of training after completion of a nursing degree (Oyetunde & Nkwonta, 2014). Current midwifery education in Nigeria appears inadequate when measured by the standards set by the International Confederation of Midwives (ICM) (Oyetunde & Nkwonta, 2014). These standards include; “Set quality indicators based on global expectations, align with regulatory bodies the scope of midwifery practice and provide framework for design, the implementation, and evaluation of the ongoing quality of the program” (ICM, 2010, p.1). Midwifery schools in Nigeria lack teaching tools, books, and equipment that support learning. Oyetunde and Nkwonta (2014) revealed that midwifery training in Nigeria is predominantly theoretical even when the students are on clinical rotation. This may be attributed to lack of resources in the clinical setting which limits the students’ ability to practice and experience hands on learning. Also, lack of mentorship or preceptorship programs is a constraining factor in providing adequate training during clinical rotations. The registered midwives do not have sufficient knowledge to train students during clinical rotations. This type of approach contradicts the recommendations of ICM which suggests that midwifery education should consist of at least 50% clinical practice (Oyetunde & Nkwonta, 2014). The result is a production of midwives and registered nurse midwives who are not competently prepared to provide safe maternal care due to lack of evidence-based knowledge. Compared to other developed countries like the United States who offer midwifery education at the Masters and Doctoral level, midwifery education in Nigeria is still at the diploma level.
Incompetent skill levels and the low knowledge level of providers in providing emergency obstetric care, has been shown to contribute to the risks of maternal mortality (Moran, Naidoo, & Moodley, 2015).

Clinical rotations for student midwives take place in the rural community hospital which lacks basic equipment required to provide safe patient care. This is a constraining factor to the students’ ability to experience hands-on learning and obtain necessary clinical practice. The reality of this low resource setting gaining access to enhanced clinical experiences galvanizes the concept of using simulation-based training in rural areas. The lack of clinical knowledge impacts the providers’ ability to make critical decisions to diagnose, treat, or refer patients to a higher level of care. In Nigeria, establishing training programs and professional development courses to improve the obstetric emergency management skills of midwives is pivotal in decreasing maternal mortality outcomes (Moran, Naidoo, & Moodley, 2015).

Given this key information and concern around PPH in Nigeria, a Doctor of Nursing Practice (DNP) project was founded to pilot an intervention directed at improving midwife educational practice. Global concerns aimed at the reduction of preventable maternal death from postpartum hemorrhage, especially in Nigeria, influenced the decision to conduct an assessment of the participating hospital and implement this project.

**Simulation in Education:** Simulation is a training approach which replaces actual patient experiences in a controlled environment (Lateef, 2010). Although the scenarios are acted, they are designed to evoke real feelings and allow the learners to make mistakes and learn from them thereby preventing harm to the patients. Bilotta, Werner, Bergese, and Rosa (2013), found that Simulation Based Training “exceeds traditional didactic and apprenticeship models in terms of speed of learning, amount of information retained, and capability for deliberate practice”
Simulation-based training (SBT) is an evidence-based teaching model which has been adopted by the healthcare industry for education and training purposes. This type of training aims to accelerate the development of expertise in the hands-on skills of teams and individuals as well as bridge the gap in classroom training and real-world clinical experiences while ensuring the safety of the patients (Agency for Healthcare Research and Quality (AHRQ), 2017).

Postpartum hemorrhage simulation-based training can significantly enhance the theoretical understanding and technical proficiency of participants as well as increase confidence (Kerbage, Debarge, Clouqueur, & Rubod, 2016). Different types of simulation-based learning exist. The AHRQ (2017) identifies five different methods of simulation; part-task trainers, full scale simulators, virtual reality, in-situ simulation, and standardized patients. High fidelity simulation can involve the use of full scale computerized human patient simulators (Doolen et al, 2016). High fidelity mannequin-based simulation training is efficient in enhancing knowledge proficiency of providers and acquisition of new skills (Aebersold, Tschannen, & Bathish, 2012). However, using standardized patients (SP) can also be effective in producing high fidelity learning scenarios. In resource limited environments such as Nigeria, adopting SP will make the scenarios more realistic and give the participants a more lived experience. Ryall, Judd, and Gordon, (2016) reports that “the reliability and validity of assessment using high-fidelity human patient simulators was found to be good” (p.73, para.2) Implementation of a simulation-based training in low resource settings has been shown to improve the knowledge and skills of providers. Nelissen, et al. (2017) report a 38% decrease in the frequency of PPH following a simulation-based educational training. This training was intended to enhance the knowledge of student midwives and registered nurse midwives in a rural academic setting in the Eastern part of Nigeria using high fidelity simulation for the management of postpartum hemorrhage.
Deficiency in knowledge and skills of providers especially in cases of obstetric emergency is one of the causes of maternal mortality (Naidoo & Moodley, 2015).

PROJECT AIM AND PICOT

**PICOT question:** In a rural academic setting, how does implementation of a simulation based postpartum hemorrhage training compared to current practice enhance skills and knowledge of providers and improve outcomes post training?

**Aim statement:** By July 2, 2017, student midwives and registered midwives in this rural academic setting will complete a didactic and a simulation-based training on the management of PPH presented by a DNP student and pass the post assessment test by 80%.

**Goal:** To enhance the knowledge and skills of student and registered midwives on recognition, assessment, and management of postpartum hemorrhage in a rural academic setting in Eastern Nigeria by applying theory and simulation to enhance clinical performance.

**Conceptual framework**

Patricia Benner’s *From Novice to Expert* and Jerome Bruner’s theory of constructivism formed the conceptual framework for this project. Benner (1984) identified 5 stages of clinical competency which a clinician passes through to become an expert in his or her field. They are; novice, advanced beginner, competent, proficient, expert. In conformity with Benner’s definition of a novice and given the lack of knowledge of the participants about this crucial topic, they were identified as novices prior to training. The goal of the project would be to increase their level of knowledge to at least the proficient level.

Bruner’s theory (1973) of constructivism focuses on three theories which include: readiness (content must focus on experience and contexts that ensure students are ready and able to learn), spiral organization (concept must be easily understood), and going above the
information provided (fill missing holes or gaps). This theory was applicable to the participants for this DNP project intervention in Nigeria who showed a high level of enthusiastic and were ready to learn. The content of this training was easily understood by the participants.

This DNP project utilized the Evidence-based Practice (EBP) model which embraces planning, implementation, evaluation, definition, and assessment as key directives for achieving clinical excellence through evidence-based practice.

**METHODS**

**Context**

Several stakeholders were identified in this project (Appendix A). They include:

The University of San Francisco: USF is one of the stakeholders because this project was implemented by the DNP student as a school project. HRH school of midwifery: HRH is the implementation site and a stakeholder because this training was designed for the students and staff. Additionally, Patients in this community hospital (family members, newborn, other children of patient, both current and potential) are stakeholders because they are beneficiaries of the training. Enhancing the knowledge and skills of providers through this training, will improve maternal outcomes in this community. Student midwives and registered nurse midwives are stakeholders because they were the recipients of this educational training. Similarly, Nigeria as a stakeholder can decrease maternal mortality rate by adopting and implementing this simulation-based training across the country. Furthermore, global organizations such as WHO can provide funding for implementation of this type of training in Nigeria and other countries where maternal death from postpartum hemorrhage is high.

The global concerns aimed at reducing this preventable cause of maternal death especially in Nigeria influenced the decision to conduct an assessment of this organization’s
clinical practices and implement this project. Implementing simulation-based training programs on management of postpartum hemorrhage in these types of setting is pivotal in achieving the 5th MDG. Global organizations can organize and implement this type of training for providers in resource limited areas. Nigeria as a nation can certainly benefit from implementing this level of project at the national level to decrease MMR.

**Authorization for project**

The DNP student received approval to develop this project from the DNP committee at USF (University of San Francisco). An Affiliation agreement was obtained between the school and the Nigerian hospital University. Furthermore, authorization and support to implement this project was received from the principal of the school of midwifery as well as the hospital administrator. (Appendices B, C, & D)

**PROJECT MILESTONES**

**GANTT chart and Work Breakdown Structure**

A Gantt chart was developed to prevent scope creep and served as an indication of the timeline for completion of this project. It was used to organize the project from start to completion into stages and showed when each aspect was expected to be completed. The elements of the work breakdown structure formed the milestone of this project. (Appendix E).

**SWOT analysis**

To ensure the success of this project as well as discover opportunities and establish processes to mitigate weaknesses, a Strength, Weakness, Opportunities and Threat (SWOT) analysis was created (Appendix F).

Some of the strengths of this project included HRH’s affiliation with the community hospital and are in the same area, providers are dedicated and thrive to provide good care to the patients
despite limitations in knowledge and resources. The students’ quest for knowledge was remarkable. Several weaknesses were identified. They include: lack of infrastructures and equipment, lack of ongoing education and training, lack of simulation supplies, lack of critical care personnel, lack of modern technology and data collection process, absence of policies and guidelines, and Poverty in the community. This training provided the participants the opportunity to learn how to provide high quality care using available resources. **Opportunities:** some of the opportunities that were identified are: networking with renowned international organizations, improvement in population health and maternal outcomes, improve readiness for management of obstetric emergency, and academic partnership with a college in the United States. **Threats:** limited resources, inability to sustain process, lack of monetary support by the government (school is owned by the church) are some of the threats that were identified.

**Budget and Funding**

The estimated budget for this project was $10,000. Due to the financial demand of this project, it was essential to solicit for grants and scholarship to help offset the cost. A personal GoFundMe was set up and a total of $2,700 was raised. Additional funds received from donors (family and friends) who did not want to make contributions through GoFundMe came up to $1040 for a total of $3,740. Also, half of the hotel accommodation was paid for by a friend and the cost of transportation in Nigeria was paid for by a friend as well. Remaining expenditure was paid out of pocket **Table 2.**

**Table 2 Budget for project**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ticket</td>
<td>$1534.76</td>
</tr>
<tr>
<td>Visa</td>
<td>$338</td>
</tr>
<tr>
<td>Transportation</td>
<td>$200</td>
</tr>
</tbody>
</table>
Simulation based training

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulation supplies</td>
<td>$335</td>
</tr>
<tr>
<td>Handouts, reference binder, and supplies</td>
<td>$800</td>
</tr>
<tr>
<td>Transportation in Nigeria</td>
<td>$1500</td>
</tr>
<tr>
<td>Meals</td>
<td>$1000</td>
</tr>
<tr>
<td>Hotel accommodation for 2</td>
<td>$2000</td>
</tr>
<tr>
<td>Meals for the participants</td>
<td>$800</td>
</tr>
<tr>
<td>Meetings</td>
<td>$700</td>
</tr>
<tr>
<td>Gasoline for generator</td>
<td>$200</td>
</tr>
<tr>
<td>Miscellaneous expenses including gifts</td>
<td>$500</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9,907.76</strong></td>
</tr>
</tbody>
</table>


**Project Implementation**

This educational pilot project took place in Nigeria, in July of 2017, and consisted of a one-day training using a didactic component and simulation exercises. The day was divided into two parts, 3 hours of didactic training, a break, and then simulation for 4 hours. There were a total of 35 participants, comprised of currently practicing registered nurse midwives and student midwives. A baseline knowledge assessment was acquired through a multiple-choice test of 20 questions to determine the participants’ ability to recognize and manage PPH prior to beginning the didactic session (Appendix G).

The didactic training was held in the morning for three hours and included background on PPH, key findings, assessment techniques, and management protocols for PPH. The content of this training was presented in a slideshow at the 8th grade level standard. While the native language in this rural area is Ibo, classes are taught in English and the learners are adept. A
toolkit utilizing the four domains established by the California Maternal Quality Care Collaborative (CMQCC) was used in the didactic training. The four domains include:

1) readiness, 2) recognition and prevention, 3) response, and 4) reporting/systems and organizations (Main et al, 2015). The second half of the training was composed of a simulation-based teaching approaches, which took place in the labor and delivery unit of the hospital.

Simulation equipment was brought in for this session and included: a mannequin with a placenta, a mannequin baby, chux, a weight scale, intravenous fluid bags, intravenous line tubing, and a blood powder mix.

Three different simulation scenarios were covered, and each scenario lasted for about 15 to 20 minutes followed by a debriefing. The primary objectives of the simulation scenarios were:

a) to exhibit prompt and critical communication skills using SBAR (Situation, Background, Assessment, and Recommendation) technique

b) To identify early risk factors for PPH and prepare for management of such patients in the postpartum phase

c) To identify uterotonic drugs used in the management of PPH

d) To understand nonmedical management of PPH

e) To apply knowledge from the didactic session to the simulation scenarios.

Simulation Scenarios

The simulation scenarios were designed as group experiences, in which various roles of midwife provider, nurse, technician, etc. were assigned to the participants and the primary goal was to utilize the simulation of post-partum cases to implement effective care. The first scenario involved a 39-year-old, G5, P4 with a previous history of PPH and a blood transfusion. The students were expected to identify pertinent risk factors obtained through the history and
presenting symptoms of the patient. The desired competency was to set up the room in readiness for management of PPH.

The second scenario was a 43-year-old female, G6, P4, at 37 weeks, with a prior intrauterine fetal demise, 2 prior C-sections and known placenta previa, presenting for a repeat C-section due to worsening hypertension. The desired competency was to complete a thorough assessment of a postpartum patient after surgery and promptly report exam findings to the attending physician using SBAR.

The third case scenario focused on nonmedical management of PPH. This patient had a spontaneous vaginal delivery with a 3rd degree perineal laceration which, was repaired. Quantified blood loss (QBL) was 350ml. The patient was unable to void two hours after delivery and QBL was 600ml. The desired competency for this scenario was to quantify the blood loss and identify possible causes as well as nonmedical management of the patient.

At the end of the simulation-based training, each participant completed a self-administered questionnaire which was used to assess the effectiveness of the simulation experience. This questionnaire was designed using Likert scale and contained eight questions which include:

i. The instructor showed in-depth knowledge of content
ii. This training is relevant to my studies and practice
iii. This training will improve patient outcomes
iv. This training should be added to the curriculum
v. This training has prepared me to provide safer care to my patients
vi. What did you find most useful about this training?

vii. What would you change?
Measures

The Institute for Healthcare Improvement (IHI) model for improvement was adopted for studying process and outcomes.

Outcomes measure: Levels one, two, and four of Kirkpatrick model of evaluation were adopted to evaluate this project. Level I measured the engagement of the participants. The results of the questionnaire indicated that all the participants agreed that the training was favorable and relevant to their jobs. Level II focused on the intended outcomes. The pre and post assessment tests were used to measure level of knowledge of participants after implementation of training. Level IV of this model was used to review the extent to which the intended results occur because of the training. This was evident in the performance of the participants during simulation as well as their positive verbal responses.

Process measure: this will focus on the number of cases of postpartum hemorrhage documented by the midwives after training. It will also reassess the curriculum of the school of midwifery to determine if this simulation-based training as been adopted as a method of training.
Analysis: Both quantitative and qualitative data were collected and analyzed for this project. The self-administered questionnaires completed by the participants formed the qualitative. This was collected using the Likert scale in which the participants were asked the percentage to which they agree or disagree with a question. Analysis was done by calculating the responses to each question. The number was multiplied by 100 to obtain the percentage (Appendix H). The pre-and post-assessment test results made up the quantitative data. A cumulative score of the participants test scores was obtained. Using a T-Test of Two-Samples Assuming Unequal Variances with confidence intervals of both 95% and 99%, a change in scores between the pre and post education quizzes was tested.

RESULTS

Quantitative Features: This firsthand educational experience denuded some of the challenges for midwives and student midwives in this academic and healthcare setting that are likely contributory factors to poor maternal outcomes. Midwifery training in this school was deemed inadequate as evidenced by the result of the pre-assessment test which confirmed that there was a significant lack of foundational knowledge regarding PPH (Table 3).

Test scores (N =35)

<table>
<thead>
<tr>
<th>Question</th>
<th>Pre-assessment score (percentage of correct answers)</th>
<th>Post-assessment score (percentage of correct answers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition of PPH</td>
<td>28.5%</td>
<td>71%</td>
</tr>
<tr>
<td>Signs of compensation</td>
<td>48.5%</td>
<td>57%</td>
</tr>
<tr>
<td>Risk factors for postpartum hemorrhage</td>
<td>6%</td>
<td>57%</td>
</tr>
<tr>
<td>potentially avoidable factors of PPH</td>
<td>40%</td>
<td>57%</td>
</tr>
<tr>
<td>Uterotonic drugs for management of PPH</td>
<td>58%</td>
<td>97%</td>
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A striking finding was that 70% of participants did not answer the question regarding the definition of postpartum hemorrhage correctly. About 60% of the participants were unable to answer the question on the initial signs of compensation in a patient experiencing PPH. Fifty one percent of participants did not answer the question about possible cause of PPH with a contracted uterus during the third stage of labor correctly. More dramatically, it was noted that 94% of participants were unable to answer the question on risk factors for PPH correctly. About 60% of the participants were unable to identify potentially avoidable factors that lead to poor maternal outcomes during PPH and 42% of the participants did not understand the uterotonic medications used for management of PPH. Overall, participants showed significant improvement in knowledge following implementation of this simulation-based training. Analysis of the pre-assessment test showed an average score of 48.31% compared to average post assessment score which, was 66.1%.

**Other Findings:** Simulation based learning did not exist to any degree in this institution. A high level of enthusiasm among the learners was noted. The first group who role played during the simulation case were quite anxious and the initial simulation scenario was repeated a couple of times to help the learners understand the focus and goals of a simulation. The learners struggled with connecting the rationale behind each step during the scenarios. They identified the lack of readily available resources as a constraining factor in their ability to manage patients during PPH. Participants learned how to manage PPH using available resources which they expressed increased confidence after the training.

**Qualitative Surveys:** Through the surveys administered to the students, it was demonstrated that there is significant lack of awareness on the severity of PPH complications on pregnant women, although it is the leading causes of maternal mortality in Nigeria. A self-
administered feedback questionnaire was handed out to the 35 participants at the end of the training with a return rate of 100%. All the participants agreed that this training is relevant to their practice and will help them to provide safe care to their patients. Participants concurred that this training will improve patient outcomes. The participants favored adding such a training to their curriculum. They all agreed that this training has prepared them to provide safe care to their patients.

**Ethical consideration**

Informed consent was obtained prior to implementation of this project. Confidentiality of the participants was ensured as well as anonymity of their responses. Participation in this project was voluntary and no one was harmed in the process. The ethical consideration is to improve maternal outcomes in a resource challenged environment. This project aligns with the code of ethics of the American Nurses Association (ANA) which beckons nurses to work collaboratively with “other health professionals and the public to protect human rights, promote health diplomacy, and reduce health disparities” (Lachman, Swanson, & Winland-Brown, 2015, p. 365). Also, implementation of this project aligns with the Jesuit values which views “learning as a humanizing, social activity rather than a competitive exercise” and calls on students and alumni to change the world (USF, n.d.).

**Gaps in Practice**

Internal data received from the hospital suggested that there were no cases of postpartum hemorrhage or maternal death from PPH in 2015 and 2016. (Table 4)

**Table 4 Report from HRH**

<table>
<thead>
<tr>
<th>Cases of PPH in 2015 from January to December</th>
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</table>
### Cases of PPH in 2016 from January to December

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<tr>
<th>Description</th>
<th>Count</th>
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</thead>
<tbody>
<tr>
<td>Cases of PPH in 2016 from January to December</td>
<td>0</td>
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<tr>
<td>Mortality from PPH in 2015 and 2016</td>
<td>0</td>
</tr>
<tr>
<td>Number of hysterectomies as a result of complications of PPH in 2015 and 2016</td>
<td>0</td>
</tr>
</tbody>
</table>

This was quite contradictory to stories shared by the participants during debriefing about their experiences of maternal death from postpartum hemorrhage which they attributed to lack of resources. Some of the participants reported their patients died from PPH because they lacked the right level of knowledge to manage those outcomes. Given the lack of ongoing training or certification requirements for the registered midwives, there are no methods currently available to help them update their knowledge or skills and stay current in practice. This is inconsistent with midwifery practice in the United States, where midwives are required to recertify every five years and obtain specialty specific continuous education (Walker, Lannen, & Rossie, 2014).

**Gap analysis**

Gap analysis was developed based on findings from the needs assessment at HRH and communication with the Dean (Appendix I). In the Current state, there is high MMR, provision of substandard care, providers lack in depth knowledge of management of postpartum hemorrhage, lack of resources, and lack of dedicated PPH content. In the future state, Providers will be able to identify early signs of postpartum hemorrhage and manage them timely and efficiently. Or make early referrals. They will be able to utilize available resources within their environment to effectively manage postpartum hemorrhage. Also, an academic partnership between the University of San Francisco and HRH will be established. MMR will decrease.
Proposals: HRH needs to enhance the syllabus of school curriculum to address PPH in depth and incorporate simulation to the current midwifery training program. Additionally, ongoing training programs and continuing education for recertification for registered nurse midwives should be implemented. Furthermore, there is a need to organize an annual ongoing postpartum hemorrhage simulation for providers.

Discussion

This project revealed a significant gap in knowledge and practice in PPH, for both students enrolled in the midwifery program and currently practicing registered midwives who serve as primary providers in this rural hospital. Indicators from the survey analysis demonstrate a lack of baseline knowledge, inadequate preparation for the care of PPH, and poor confidence level of these providers. Suplee, Bingham, and Kleppel (2017) also show that 88% of their study participants did not know that 61% of maternal deaths happened in the postpartum phase. The overall value of implementing this project was a heightened awareness of some of the factors leading to poor maternal outcomes that can be controlled by addressing the educational model, rather than just looking at rates. With or without simulation training, advancing the didactic curriculum to meet the needs of adequate knowledge in PPH, will be a critical step for the institution.

Given the lack of resources and inferior teaching facilities, challenges remain in making standards of education and care equal around the world. In this setting, conditions including: lack of ongoing electricity to operate the projector for long periods, poor lighting intervals, and lack of simulation to implementation of this project were; lack of electricity to operate the projector, lack simulation equipment were just some of the physical barriers. In the clinical setting, the lack of adequate facilities for a delivery and substandard care regimens, including a lack of policies,
procedures, and ongoing training protocols were evident. Rural facilities around the world, can achieve high fidelity using human standardized patient simulation for the purpose of training their students and providers to enhance skill level and confidence. While significant consideration is given to the lack of available resources, educational projects that provide the knowledge and ability to utilize low cost resources just as effectively in the management of PPH need to be considered for sustainability. Meeting global goals and reducing the burden of maternal mortality around the world, can be supported by developed nations.

**SUMMARY**

This project revealed a significant gap in knowledge and practice modalities for PPH, for both students enrolled in the midwifery program and currently practicing registered midwives who serve as primary providers in this rural hospital. Indicators from the survey analysis demonstrate a lack of baseline knowledge, inadequate preparation for the care of PPH, and poor confidence level of these providers. Suplee, Bingham, and Kleppel (2017) show that 88% of their study participants did not know that 61% of maternal deaths happened in the postpartum phase. The overall value of implementing this project was a heightened awareness of some of the factors leading to poor maternal outcomes that can be controlled by addressing the educational model, rather than just looking at rates. With or without simulation training, advancing the didactic curriculum to meet the needs of adequate knowledge in PPH, will be a critical step for the institution.

Given the lack of resources and inferior teaching facilities, challenges remain in making standards of education and care equal around the world. In this setting, conditions including: lack of ongoing electricity to operate the projector for long periods, poor lighting intervals, and lack
of simulation to implementation of this project were; lack of electricity to operate the projector, lack simulation equipment were just some of the physical barriers.

**Lessons learned**: Funds for the DNP project were limited especially because of the lack of resources in the school and hospital. This implied that the student had to supply what should have been common resources at the school. The GoFundMe should have been set up earlier. The distance from the United States to HRH and the difference in time (Nigeria is 8-9 hours ahead of the US) was challenging for the student. This type of training may be more beneficial if conducted in two days instead of one. Lack of access to the computer often delayed response from the school. This magnitude of training may be more effective if there are multiple trainers. Overall, the aim of this project was achieved. Involving the stakeholders in the planning and implementation of this project attributed to its success. There is a possibility of developing an academic partnership with this organization. There is also a possibility of other students developing similar projects in future to address health concerns in resource challenged areas. There is a plan to return to implementation site to continue this training as well as implement a train the trainer program.

**CONCLUSION**

In the clinical setting, the lack of adequate facilities for a delivery and substandard care regimens, including a lack of policies, procedures, and ongoing training protocols were evident. While significant consideration is given to the lack of available resources, educational projects that provide the knowledge and ability to utilize low cost resources just as effectively in the management of PPH need to be considered for sustainability. There is an ethical need to address this preventable cause of maternal mortality globally.
Moucheraud et al. (2015) establishes that 81% of children whose mothers died during childbirth also die. Meeting global goals and reducing the burden of maternal mortality around the world, can be supported by developed nations. In order to achieve and sustain the MDGs globally, there is need for developed countries to communicate with low resource areas such as Nigeria through outreach programs and training. Healthcare providers in countries around the world need to possess the appropriate level of education and training to perform their duties effectively. Implementation of simulation-based training can be pivotal in enhancing the knowledge and clinical skills of providers especially in low resource settings and subsequently help in preventing maternal deaths.

Additionally, there is an urgent need to standardize midwifery training programs in Nigeria according to the recommendations of the International Confederation of Midwives to eliminate the educational gaps. Simulation based training should be incorporated into all midwifery curricular. Schools in developed countries like the United States can also institute academic partnership programs with local schools in Nigeria and other high-risk countries to provide training and education to providers. The total cost of implementing this type of high fidelity high impact simulation cannot be equated to the value of life. Given some of the highest rates of maternal mortality, the Nigerian government can be held responsible for legislation that would standardize maternal care through established guidelines, increased surveillance, and robust reporting. “Childbirth should be the start- not the end – of life” (PATH, n.d.).

Limitations

Given a significant overall value of this project, there were notable limitations. The small number of participants (N=35) is a limitation. A larger group is needed to adequately evaluate outcomes of this type of training. Lack of accurate data from the organization makes it
challenging to effectively evaluate the outcome of this training on maternal outcomes. Other limitations include: time constraint, distance to implementation site, insufficient resources, cultural practices at the site, and lack of simulation tools at the site. Outcomes may not be adequately measured due to limited time. DNP student’s limited knowledge of simulation was also a limitation.

**Benefit analysis**

According to the World Health Organization (WHO) (2015), about one million children are left motherless annually and in most cases these children also die within 1-2 years after the death of their mothers. The amount of money spent on implementing this project which was shown to enhance the knowledge of participants cannot be equated to the value of life. The cost of a funeral in Nigeria is at least $1,500 which excludes the cost of hospitalization and other financial burden on the family and the community. This is further complicated by the lack of insurance coverage which implies that individuals in this community pay out of pocket for services received. Kes et. al, (2015) in a four-country study conducted in Africa report an estimated productivity loss of $850 in Uganda and $1838 in Senegal as a result of maternal death.

By implementing this project, this organization can: decrease maternal mortality as well as mortality among children, decrease hospital length of stay, enhance the knowledge of providers and increase their confidence level, reduce additional medical intervention, and improve patient experience.
References


Competency-based training “Helping Mothers Survive: Bleeding after Birth” for


DOI: http://dx.doi.org/10.1016/j.ejogr.2016.03.013.
http://doi.org/10.1186/1742-4755-12-S1-S3


prevention and management of postpartum haemorrhage: an educational intervention study in a low-resource setting. Biomed Central pregnancy and childbirth 17:301


http://apps.who.int/iris/bitstream/10665/42930/1/9241562706.pdf

Appendices

Appendix: A Stakeholders

- University of San Francisco
- Global organizations
- Nigeria
- School of midwifery
- Patients in this community hospital
- Student and registered midwives
Appendix B

DNP Statement of Non-Research Determination Form

Student Name: Nneka Chukwu

Title of Project: Simulation Based Post-Partum Hemorrhage Training in Nigeria: A Pilot Project

Brief Description of Project: Postpartum hemorrhage is one of the leading causes of maternal morbidity and mortality across the globe although it is preventable. It has been estimated that the maternal mortality ratio in Nigeria is 560 per 100,000 live births (Adeyemo & Enuku, 2014). This project aims to provide evidence-based education and hands-on training to student nurse midwives and registered nurse midwives on early identification and management of postpartum hemorrhage. The participants will receive a pre-assessment using Skills Confidence Questionnaires to determine their baseline knowledge prior to introduction of curriculum. Participants will be divided into two groups to ensure active participation. Both groups will receive the same materials. Initial training will be the didactics which will incorporate the core concepts of PPH. Second part be the actual simulation using a volunteer postpartum mother. Training sessions will be recorded for review during debriefing. Participants will also receive training on the use of postpartum toolkit prior to implementation.

A) Aim Statement: By July 2, 2017, student midwives and registered midwives at Holy Rosary hospital will complete training and hands-on simulation on early identification and management of postpartum hemorrhage after completing the educational training and show 5% increase in knowledge based on results of posttest.
B) **Description of Intervention:** Intervention will be divided into 2 parts which, will include a didactic component and an in situ simulation based training (SBT) using available resources in the setting. Participants will receive a pre-assessment to determine baseline knowledge prior to introduction of the module. A post assessment will also be administered to assess the effectiveness of training. Additionally, participants will complete a self-administered questionnaire which, will be used to assess effectiveness of teaching and methodology. There will also be a 30-minute post simulation debrief upon completion of the SBT.

C) **How will this intervention change practice?** Oladapo et al (2015), found that there is a significant deficiency in the ability of providers to identify signs of deterioration and complications early in mothers who are at risk. Creating an educational curriculum that is simulation based, easy to adopt, and enhances learning for student midwives and registered midwives using current evidence will provide the skills required to change the current practices in this macro system. It will also help them improve their clinical judgement, critical thinking, team communication, and competence on early recognition, readiness, response, and management of postpartum hemorrhage using available resources. Studies have shown that creating evidence-based training and simulation for providers improves the skills of obstetrics providers which, will subsequently result in a decrease in maternal morbidity and mortality. For example, Salas, Paige & Rosen (2013) found that “strong evidence now supports the efficacy of simulation as a learning strategy for individuals and teams in healthcare” (P.1).

Also, Evans et al. (2014) in their study on competency-based training for providers demonstrated that simulation training on management and prevention of postpartum
hemorrhage enhanced the knowledge of providers as well as increased their confidence. Similarly, Nelissen et al. (2015) demonstrated that SBT resulted in an immediate improvement in the knowledge and skills of providers following an obstetric simulation-based training. Furthermore, simulation-based training promotes a culture of safety and ensures preparedness for management of emergency situations. It also “allows systems to test readiness or assess threats to patient safety” (AWHONN, 2016). Improving providers’ knowledge, skills, and performance using evidence-based practices will lead to change in practice.

D) Outcome measurements: Outcome will be measured using the following methods:

1. Post Assessment responses on gained knowledge after simulation.
2. Simulation based exercise and debrief analysis.
3. Self-administered questionnaires to assess participants opinion about the usefulness of the training to their learning
4. Adaptation by the school of the proposed simulation curriculum

However, to ensure sustainability, annual simulation will be recommended. Additionally, the school and hospital will identify super users who will champion this process and train future staff and students. Overall goal is for the institution to adopt this training and make it a part of the students’ curriculum as well as an ongoing training for registered midwives in the hospital.

To qualify as an Evidence-based Change in Practice Project, rather than a Research Project, the criteria outlined in federal guidelines will be used: (http://answers.hhs.gov/ohrp/categories/1569)

X This project meets the guidelines for an Evidence-based Change in Practice Project as
outlined in the Project Checklist (attached). Student may proceed with implementation.

☐ This project involves research with human subjects and must be submitted for IRB approval before project activity can commence.

Comments:

EVIDENCE-BASED CHANGE OF PRACTICE PROJECT CHECKLIST *

Instructions: Answer YES or NO to each of the following statements:

<table>
<thead>
<tr>
<th>Project Title:</th>
<th>YES</th>
<th>NO</th>
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<tbody>
<tr>
<td>The aim of the project is to improve the process or delivery of care with established/accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes.</td>
<td>X</td>
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<td>The specific aim is to improve performance on a specific service or program and is a part of usual care. ALL participants will receive standard of care.</td>
<td>X</td>
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<tr>
<td>The project is NOT designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does NOT follow a protocol that overrides clinical decision-making.</td>
<td>X</td>
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<td>The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does NOT develop paradigms or untested methods or new untested standards.</td>
<td>X</td>
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<td>The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does NOT seek to test an intervention that is beyond current science and experience.</td>
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<td>The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USF SONHP.</td>
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<td>The project has NO funding from federal agencies or research-focused organizations and is not receiving funding for implementation research.</td>
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<tr>
<td>The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., not a personal research project that is dependent upon the voluntary participation of colleagues, students and/or patients.</td>
<td>X</td>
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<td>If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: “This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board.”</td>
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ANSWER KEY: If the answer to ALL of these items is yes, the project can be considered an Evidence-based activity that does NOT meet the definition of research. IRB review is not required. Keep a copy of this checklist in your files. If the answer to ANY of these questions is NO, you must submit for IRB approval.
*Adapted with permission of Elizabeth L. Hohmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

STUDENT NAME (Please print): Nneka Chukwu  
Signature of Student: ______________________________DATE_8/3/17__________

SUPERVISING FACULTY MEMBER (CHAIR) NAME (Please print): Jodie Sandhu  
Signature of Supervising Faculty Member (Chair): ______________________________DATE________________
Appendix C: Letter from the school of midwifery

Dear Chukwu,

I lost my phone and your phone number was lost. Thank God I have your e-mail address. Reference your request. I will try my best to see if I can meet up with your demands.

I understand you want to use my school as the area of study and you requested for the following.

- Academic year is 18 months
- Students population is 90
- Sample of yearly program is hereby attached, including the syllabus, clinical posting and community posting.

I hope this will satisfy your yearnings.

Thanks.

(MRS) Egeruoh C.A.
Principal.
Appendix D: MOU

VI. Relationship

It is expressly understood that this Agreement is not intended, and shall not be construed, to create the relationship of agent, servant, employee, partnership, joint venture, or association between University and Agency, but is rather an Agreement by and between independent contractors, these being University and Agency.

VII. Entire Agreement

This Agreement is the entire understanding between the parties as to the subject matter contained herein and supersedes all other agreements, oral or written.

VIII. Governing Law

The validity, interpretation, and performance of this Agreement shall be governed by and construed in accordance with the laws of the State of California.

IX. Term

This Agreement becomes effective on ____________ and terminates on ____________. Either party may terminate this Agreement by giving 60 days written notice of termination to the other party; provided, however, that at the election of University, any termination by Agency shall not become effective as to any student(s) assigned to the Agency on the date of the notice of termination until the end of the academic term in which the students are participating in the practicum/internship.

X. Notices

Notices required under this agreement shall be sent to the parties by certified or registered mail, return receipt requested, postage prepaid, at the addresses set forth below:

To University:

Name: University of San Francisco
School of Nursing and Health Professions
2130 Fulton Street
San Francisco, CA 94117

To Agency:

Name: Mrs. Egeruo I. C. A.
School of Post Basic Midwifery
Emukwu, Enugu State, Nigeria.

IN WITNESS WHEREOF, this Agreement has been executed by and on behalf of the parties hereto on the date and year first above written.

University:

Margaret Baker, PhD, RN, FAAN, FGSNA
Dean, School of Nursing and Health Professions

Agency:

Mrs. Egeruo I. C. A.
PhD, RN, RM, FNGN, ME, FPGC
HOD, School of Post Basic Midwifery

Date 29/11/2016

Date 29/11/2016

Please submit completed MOU directly to Graduate Placement Coordinator or Placement Team.
### Appendix E: Gantt chart

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<td>Create post-assessment questions and questionnaires</td>
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<td>Present proposed budget with brief narrative to chair and stakeholders</td>
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## Appendix F

### SWOT analysis

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<tr>
<th><strong>STRENGTHS</strong></th>
<th><strong>WEAKNESSES</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>School is affiliated with the hospital</td>
<td>Lack of infrastructures and equipment</td>
</tr>
<tr>
<td>Dedicated providers who to thrive to provide care despite lack of resources</td>
<td>Lack of ongoing education and training</td>
</tr>
<tr>
<td>Students quest for more knowledge</td>
<td>Lack of simulation supplies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>OPPORTUNITIES</strong></th>
<th><strong>THREATS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Networking with renowned international organizations</td>
<td>Limited resources</td>
</tr>
<tr>
<td>Improvement in population health and maternal outcomes</td>
<td>Inability to sustain process</td>
</tr>
<tr>
<td>Improve readiness for management of obstetric emergency</td>
<td>Lack of monetary support by the Government (school is owned by the church)</td>
</tr>
<tr>
<td>Academic partnership with a college in the United States.</td>
<td></td>
</tr>
</tbody>
</table>
Appendix G: Pre-and Post-Assessment Questions

**Pre-and Post-assessment**

1. A nurse is monitoring a new mother in the Postpartum period for signs of hemorrhage. Which of the following signs, if noted in the mother, is an indication that the body is compensating?
   a. A temperature of 100.4°F
   b. An increase in the pulse from 88 to 120 BPM
   c. An increase in the respiratory rate from 18 to 22 breaths per minute
   d. A blood pressure change from 130/88 to 124/80 mm Hg

2. A nurse is preparing to assess the uterine fundus of a client in the immediate postpartum period. When the nurse locates the fundus, she notes that the uterus feels soft and boggy. Which of the following nursing interventions would be most appropriate initially?
   a. Massage the fundus until it is firm
   b. Elevate the mother’s legs
   c. Push on the uterus to assist in expressing clots
   d. Encourage the mother to void

3. To be considered a PPH, what would the quantified blood loss have to be for a C-section?
   a. <500 ml
   b. >1000 ml
   c. 800 ml
   d. 900 ml

4. If continued bleeding occurs during the third stage with a contracted uterus, the cause is most likely to be:
   a. Cervical or perineal Lacerations
   b. Placental abruption
   c. Uterine atony
   d. Cervical polyp

5. The following are potentially avoidable factors except;
   a. Delayed or wrong diagnosis
   b. Underestimation of blood loss
   c. Delayed or inadequate treatment
   d. Miscommunication among team members
   e. Administration of blood

6. Risk factors for postpartum hemorrhage include; (please select all that applies)
   a. History of postpartum hemorrhage
   b. Prolonged use of oxytocin for induction
   c. Placenta accrete/previa
   d. Primiparity
   e. Advanced maternal age
   f. Multiparity
   g. Prolonged labor
   h. chorioamnionitis

7. True or false prolonged used of magnesium sulfate during the antepartum period can increase the risk of postpartum hemorrhage.

8. What is the minimum rate of urine output required to avoid necrosis of the kidneys
   a. 10ml/hr.
   b. 50ml/hr.
   c. 100ml/hr.
   d. 30ml/hr.

9. Active management of 3rd stage of labor includes all except
   a. Controlled cord traction
   b. Administration of uterotonic drugs
   c. Administration of blood
d. Uterine massage

10. True or false communication is not an important factor in management of communication

11. What does SBAR stand for?

12. True or false EBL is more accurate than QBL

13. A standard 18in x 18in lap that is 75% saturated with blood represents a blood loss of:
   a. 25 ml
   b. 50 ml
   c. 75 ml
   d. 100 ml

14. The first sign of compensation in a patient with hypovolemia is;
   a. Hypertension
   b. Hypotension
   c. Pallor
   d. Tachycardia

15. The most important lab to monitor during postpartum hemorrhage is
   a. Blood culture
   b. WBC
   c. Hemoglobin with hematocrit
   d. AFB

16. The following are risk factors for postpartum hemorrhage except
   a) Previous history of postpartum hemorrhage
   b) History of 2 previous C-Sections and placenta previa
   c) Grand multiparity
   d) Primigravida

17. True or false the most common cause of postpartum hemorrhage is uterine atony

18. Signs of postpartum hemorrhage include all except;
   a) Tachycardia
   b) Tachypnea
   c) Hypotension
   d) Increased urinary output

19. The following factors can lead to poor outcomes in cases of postpartum hemorrhage;
   Select all that applies
   a) Delayed diagnosis
   b) Underestimation of blood loss
   c) Poor communication
   d) Uterine massage
   e) Administration of uterotonic drugs

20. The following are uterotonic medications except;
   a. Oxytocin
   b. Hemabate
   c. Misoprostol
   d. Clindamycin
Appendix H

Teaching effectiveness survey

Please complete this survey to evaluate effectiveness of this training. Your response is confidential. Thank you.

<table>
<thead>
<tr>
<th>Teaching approaches</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>The instructor showed in-depth knowledge of content</td>
<td>32</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>91.4%</td>
<td>8.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This training is relevant to my studies and practice</td>
<td>35</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>This training will improve patient outcomes</td>
<td>31</td>
<td>4</td>
<td>0</td>
<td>0</td>
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<tr>
<td></td>
<td>88.6%</td>
<td>11.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This training should be added to the curriculum</td>
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<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>83%</td>
<td>17%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>This training has prepared me to provide safer care to my patients</td>
<td>34</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>97.1%</td>
<td>2.9%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What did you find most useful about this training?

What would you change?
What would you add?
## Appendix I Gap analysis

<table>
<thead>
<tr>
<th>Current situation</th>
<th>Future state</th>
<th>Proposal</th>
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</thead>
<tbody>
<tr>
<td>• High MMR</td>
<td>• Providers will be able to identify early signs of postpartum hemorrhage and manage them timely and efficiently. Or make early referrals.</td>
<td>• Enhance syllabus to address PPH in depth</td>
</tr>
<tr>
<td>• Provision of substandard care.</td>
<td>• Providers will be able to utilize resources within their environment to manage postpartum hemorrhage.</td>
<td>• Incorporate simulation to the current midwifery training program</td>
</tr>
<tr>
<td>• Providers’ lack of knowledge of management postpartum hemorrhage.</td>
<td>• Establish academic partnership with the University of San Francisco.</td>
<td>• Implement ongoing training programs and continuing education for recertification for registered nurse midwives</td>
</tr>
<tr>
<td>• Lack of resources</td>
<td>• Decrease maternal mortality</td>
<td>• Organize annual simulation on early identification and management of postpartum hemorrhage for providers.</td>
</tr>
<tr>
<td>• Lack of dedicated PPH content in the current syllabus</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Work Breakdown Structure

- propose project
  - approval by stakeholders at implementation site
    - implement and evaluate project
  - develop project after approval by chair
    - Write final product paper
    - present project to chair and co-chair
Appendix J

Scenarios for simulation

Estimated scenario time: 15-20 minutes  
Debriefing time: 40 minutes

Target group: student midwives and registered midwives at Holy Rosary hospital Emekuku

Learning objectives for scenario #1

➢ Identify risks of postpartum hemorrhage upon admission
➢ Exhibit critical communication skills using SBAR
➢ Place the appropriate equipment at the bedside
➢ Anticipate uterotonic drugs that may be administered

1. Ngozi Okoro, 39-year-old G5 P4 at 40 weeks gestation was admitted for spontaneous labor 1500. Last vaginal exam was 3/2/80. She has a previous OB history of postpartum hemorrhage and blood transfusion. VS on admission was BP 165/85, HR 85, temp 99.8. She had a spontaneous vaginal delivery at 2300 after 8 hours of labor and was transferred to the postpartum unit. Last vital signs after delivery was 110/60, HR 100, Temp 100.1. 2 hours postpartum, she notified the nurse that she felt a gush of fluid between her legs. On examination, the nurse found “a pool” of blood. BP now is 95/48 HR 110. Ngozi started complaining of dizziness and continues to hemorrhage despite adequate uterine massage.

Learners’ actions

i. Position patient
ii. Perform fundal check/ massage the uterus which is firm
iii. Check vital signs
iv. Quantify blood loss and weigh chux and peripads
v. Call for help and notifies provider using SBAR
vi. Insert a second IV
vii. Initiate IV fluid and start oxytocin bolus
viii. Administer other uterotonics as ordered
ix. Call the lab for blood
x. Prepare for insertion of Foley bulb
xi. Transfer patient to OR and prepares for suturing of cervical laceration
Learning objectives for scenario #2

➢ Identify risk factors for this patient

➢ Anticipate needs of this patient and ensure readiness for possible hemorrhage

➢ Complete initial assessment following hemorrhage

➢ Initiate hemorrhage protocol

➢ Communicate with the interdisciplinary team using SBAR

2 A 43-year-old G6 P4 at 37 weeks, with a prior Intrauterine fetal demise, 2 prior C-sections and known placenta previa, presents for repeat C-section due to worsening hypertension at 1630. Reported Spontaneous Rupture of Membrane (SROM) at 1430 Pressure range on admission: 185/93-198/98, HR 84, Temp 101.5. Magnesium sulfate was initiated as well as Cefoxitin (IV antibiotic). She also received IV Tylenol for fever. Initial labs: Hemoglobin 13.2, Hematocrit 43.8, Platelets 180. Findings during surgery included complete placenta previa. Viable female infant delivered @1800. Intraoperative QBL was 700 ml. Intraoperative BP was 140/88. One hour after recovery, the nurse notices several clots of blood on the chux. Post-operative hemoglobin is 6.5 and she is complaining of dizziness. BP 100/50, HR 120. Patient continued to bleed despite adequate fundal massage. Urine output was 20 ml per hour. QBL is now 3500 ML.

Learners’ actions

i. Perform fundal check and uterine massage

ii. Check the perineal pad

iii. Check vital signs

iv. Weigh chux and peri pads

v. Call for help and notify the provider using SBAR
vi. Start oxytocin bolus and crystalloid (Lactated Ringers) bolus
vii. Administer other uterotonics as ordered
viii. Contact blood bank and initiate massive transfusion protocol
ix. Take patient back to the operating room for surgical intervention

Learning objectives for scenario #3
- Identify initial assessment for hemorrhage
- State major causes of hemorrhage in pregnancy
- Identify non-medical management of PPH

Oby Amadi, a 32-year-old G2 P1, at 38 weeks gestation was admitted for spontaneous labor 0900. OB history is remarkable for previous postpartum hemorrhage requiring transfusion. Vital signs on admission; BP 130/70, HR 90, Temp 98.8. Vaginal exam was 3/80/-2. She delivered at 1730 with a 3rd degree perineal laceration which was repaired. QBL was 350 ML. Upon assessment 2 hours postpartum, the midwife noted that the fundus was deviated to the right and patient had not voided since delivery. Oby stated that she was not able to void because of pain and tenderness. Severe edema to the labia was noted. QBL is now 600 ML.

Learners actions
i. Check peri pad
ii. Quantify blood loss
iii. Monitor vital signs
iv. Communicate to the provider using SBAR
v. Insert a Foley catheter to empty the bladder
vi. Continue maintenance IV fluid
Appendix K: PowerPoint for didactic training

Simulation Based Post-Partum Hemorrhage Training in Nigeria: A Pilot Project

NNEKA CHUKWU, DNPc, MSN, RN, CNL

OBJECTIVES

At end of this presentation, participants will be able to:
1. Define postpartum hemorrhage.
2. Describe risk factors for postpartum hemorrhage.
3. Identify early signs and symptoms of postpartum hemorrhage.
5. Describe the concept of simulation and its importance.
6. Describe quantification of blood loss.
Melissa’s story

Melissa Price, the patient representative on the hemorrhage task force, had a late postpartum hemorrhage. Melissa ended up with a hysterectomy and about 12 units of blood transfused. While in the Emergency Department, Melissa recalls asking the nurses how they could tell how much blood she was losing – the nurses never weighed the blood, and dumped it from a bed pan into a portable toilet. After Melissa’s OB got the bleeding to stop, she was left alone behind a curtain and checked on infrequently. Melissa tells of feeling sheer panic when the bleeding started up again with “enormous clots… I screamed and I will never forget the look on the nurse’s face when she lifted up that blanket. After that, ER staff was running around everywhere.

Melissa’s story (contd)

Rushing to call my OB, rushing to get an OR suite, rushing to figure out how to get my insulin pump turned off. I just kept thinking, ‘God give them more time. They need more time to save me.’ When I was going down the hallway to the OR suite, my OB was right next to me – running next to me. I grabbed his hand and said to him, ‘Get me to the other side of this.’ And he said, ‘Melissa, I will do everything I can to get you there.’ It haunts me to this day that had I passed out and not been able to scream and advocate for myself, things would likely have turned out very, very differently.” (Story and name used with permission of Melissa Price and courtesy of CMQCC).
Definition of Postpartum hemorrhage (PPH)

- Defined as blood loss >500ML in a vaginal delivery and >1000ML in Cesarean delivery.
Postpartum period

Termed the “4th stage of labor” (Romano, Cacciator, Giordano, & La Rosa, 2010, P.22)
Divided into 3 phases;
1. The acute phase which is the period between 6 to 12 hours of delivery. Higher risk of PPH

2. Second phase: 2 to 6 weeks. Hemodynamic instability may occur. The woman is still at risk of postpartum hemorrhage

3. Third phase: may last up to six months.

Background

- Post Partum Hemorrhage is one of the leading causes of mortality and morbidity among child bearing women

- More than 500,000 women die every year globally from pregnancy related complications (Nwagha, Nwachukwu, Dim, Ibekwe, & Onyebuchi, 2010)

- The risk of a woman dying from complications of pregnancy and delivery is more than 200 times higher in third world countries such as Nigeria in comparison to industrialized nations (Plane, 2008)
Background

- Nigeria is one of the countries in West Africa with an estimated population of 167 million

- Nigeria with nine other countries make up about 60% of all maternal deaths worldwide (Adeyemo & Enuku, 2014)

- Maternal mortality ratio in Nigeria is about 560 per 100,000 live births (Adeyemo & Enuku, 2014)
Risk factors

- Prior C/S or uterine surgery
- Multiple gestation
- >4 previous vaginal births
- History of previous PPH
- Large uterine fibroids
- Placenta previa, low lying placenta
Risk factors

**Suspected Placenta accreta or percreta**

**Administration of magnesium sulfate**

**Platelets <100,000**

**Prolonged 2nd stage of labor**

**Prolonged induction and use of oxytocin**

**Chorioamnionitis**

---

**Potentially Avoidable Factors in Care**

- No or inadequate identification of risk factors
- Delayed or wrong diagnosis
  - Unrecognized abnormal vital signs (i.e. hypovolemia)
- Underestimation of blood loss
- Delayed and/or inadequate treatment
  - Under resuscitation
- Inadequate/inappropriate referral, consultation, transfer of care
- Inadequate documentation
- Chain of communication issues
Causes of Post Partum Hemorrhage (PPH)

This can be divided into 4 subgroups;

1. Uterine atony which, is the primary cause of PPH
2. Placental: abruption, accrete, percreta, or previa
3. Injury to the cervix for example cervical laceration
4. Coagulation disorders

Signs and Symptoms of Hemorrhage

Look for trends in vital signs and patient status

- Pulse ↑
- Respirations ↑
- Pallor ↑
- Change in Mental Status
- Urinary Output ↓
- Capillary Refill ↓
- Blood Pressure ↓
Initiatives

There are several initiatives which aim at decreasing maternal mortality and morbidity. For example:

California Maternal Quality Care Collaborative (CMQCC) postpartum hemorrhage toolkit. This has been adopted by most hospitals within the United States as well as internationally.

Illinois Department of Public Health (IDPH) obstetric hemorrhage program.

Initiatives

Association of Women’s Health Obstetrics and Neonatal Nurses postpartum hemorrhage project

AWHONN
PROMOTING THE HEALTH OF WOMEN AND NEWBORNS
Initiatives

International Federation of Gynecology and Obstetrics (FIGO)

CURRENT GUIDELINES AND GOALS

- A local organization, California Maternal Quality Care Collaborative (CMQCC) aim to eliminate preventable maternal death and injury in the US. An evidence based postpartum hemorrhage toolkit created by this organization has been adopted by most hospitals within the United States as well as internationally.

- This quality improvement initiative aims to improve readiness, recognition, response, and reporting of maternal hemorrhage at birth.
Quantification of Blood Loss (QBL)

Quantification of blood loss has been shown to decrease the incidence of errors in blood loss estimation.

- Blood loss estimation can lead to:
  - Overestimation
    - leads to unnecessary treatments
  - Underestimation
    - leads to delays in treatment
- Methods such as a calibrated drapes had an error rate of less than 15%

<table>
<thead>
<tr>
<th>Hospital Item</th>
<th>Approximate dry weight (grams)</th>
<th>&quot;Wet&quot; Weight (grams)</th>
<th>Wet - Dry = Total fluid/blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Chux Bed Pad</td>
<td>115g</td>
<td>205g</td>
<td>205g - 115g = 90g = 90ml</td>
</tr>
<tr>
<td>Large Peripad</td>
<td>45g</td>
<td>75g</td>
<td>75g - 45g = 30g = 30ml</td>
</tr>
<tr>
<td>Small Peripad</td>
<td>17g</td>
<td>35g</td>
<td>35g - 17g = 18g = 18ml</td>
</tr>
<tr>
<td>Mesh Underwear</td>
<td>17g</td>
<td>35g</td>
<td>35g - 17g = 18g = 18ml</td>
</tr>
<tr>
<td>Wash/Face Cloth</td>
<td>25g</td>
<td>40g</td>
<td>40g - 25g = 15g = 15ml</td>
</tr>
<tr>
<td>Longer Hand/Body Towel</td>
<td>185g</td>
<td>225g</td>
<td>225g - 185g = 40g = 40ml</td>
</tr>
<tr>
<td>Fitted Bottom Sheet</td>
<td>500g</td>
<td>550g</td>
<td>550g - 500g = 50g = 50ml</td>
</tr>
</tbody>
</table>
QBL for vaginal delivery

Total amount of fluid in under buttocks drape - amniotic fluid = Under buttocks QBL
Weight of saturated laps – weight of dry laps = Lap blood QBL
Under buttocks QBL + Lap blood weight = Vaginal delivery QBL
QBL for C-Section

To calculate QBL for C-Section,
- subtract amniotic fluid and irrigation fluid to get the total canister QBL
- Total weight of Laps – weight of dry laps = Lap blood weight
- Canister QBL + Lap blood QBL = Total Cesarean Section QBL
The blood loss at a vaginal delivery is given as 350mL. To quantify this amount correctly, the blood volume in the collection drape would fill a:

A. Standard soda can  
B. Half gallon of milk  
C. Pint of milk  
D. Quart of milk

---

**Familiar Objects**

<table>
<thead>
<tr>
<th>1 cup = 250mL</th>
<th>2 cups = ~ 500 mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>= 5 cm clot (orange)</td>
<td>= 10 cm clot (softball)</td>
</tr>
<tr>
<td>= 1 unit PRBCs</td>
<td>= 2 unit PRBCs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>12 oz. soda can = 355 mL</th>
</tr>
</thead>
</table>

**Floor Spills**
- 23 inches (50 cm): 500 mL
- 34 inches (75 cm): 1000 mL
- 45 inches (100 cm): 1500 mL

1 gm of blood = 1 mL

**Ideal Method = Weighing**

**Estimating Blood Loss**
OB Hemorrhage: Recognition

- Scant: Less than 2.5 cm (1 inch/hour)
- Light: Less than 10 cm (4 inches/hour)
- Moderate: Less than 15 cm (6 inches/hour)
- Heavy: 1 pad saturated within 2 hours

Visual EBL: Inaccurate

Weighing: Most accurate

---

EBL Recognition

A standard 18in x 18in lap that is 75% saturated with blood represents a blood loss of:

A. 25 ml
B. 50 ml
C. 75 ml
D. 100 ml
## EBL Recognition

![EBL Recognition Diagram]

---

### Quantification Examples

(1 mL or 1 cc = 1 gram)

<table>
<thead>
<tr>
<th>Hospital Item</th>
<th>Approximate Dry Weight (grams)</th>
<th>“Wet” Weight (grams)</th>
<th>Wet - Dry = Total fluid/blood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Chux Bed Pad</td>
<td>115 g</td>
<td>205 g</td>
<td>205 g - 115 g = 90 g = 90 ml</td>
</tr>
<tr>
<td>Large Peripad</td>
<td>45 g</td>
<td>75 g</td>
<td>75 g - 45 g = 30 g = 30 ml</td>
</tr>
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<td>Small Peripad</td>
<td>17 g</td>
<td>35 g</td>
<td>35 g - 17 g = 18 g = 18 ml</td>
</tr>
<tr>
<td>Mesh Underwear</td>
<td>17 g</td>
<td>35 g</td>
<td>35 g - 17 g = 18 g = 18 ml</td>
</tr>
<tr>
<td>Wash/Face Cloth</td>
<td>26 g</td>
<td>40 g</td>
<td>40 g - 26 g = 12 g = 12 ml</td>
</tr>
<tr>
<td>Longer Hand/Body Towel</td>
<td>185 g</td>
<td>225 g</td>
<td>225 g - 185 g = 40 g = 40 ml</td>
</tr>
<tr>
<td>Fitted Bottom Sheet</td>
<td>500 g</td>
<td>550 g</td>
<td>550 g - 500 g = 50 g = 50 ml</td>
</tr>
</tbody>
</table>
Blood Loss Quantification and Replacement

<table>
<thead>
<tr>
<th>Est. Blood Loss (EBL)</th>
<th>~900 ml</th>
<th>~1200-1500 ml</th>
<th>~1800-2100 ml</th>
<th>&gt;2400 ml</th>
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<tbody>
<tr>
<td>Pulse</td>
<td>&lt;100 bpm</td>
<td>&gt;100 bpm</td>
<td>&gt;120 bpm</td>
<td>≥140 bpm</td>
</tr>
<tr>
<td>Respiration</td>
<td>14-20 bpm</td>
<td>20-30 bpm</td>
<td>30-40 bpm</td>
<td>&gt;35 bpm</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>Normal</td>
<td>Overt Hypotension</td>
<td>Orthostatic changes</td>
<td>Overt Hypotension</td>
</tr>
<tr>
<td>Mental Status</td>
<td>Alert, mild thirst</td>
<td>±Anxious and Restless</td>
<td>Agitated or confused</td>
<td>Drowsy, confused and lethargic</td>
</tr>
<tr>
<td>Urine Output</td>
<td>≥30 cc/hr</td>
<td>20-30 cc/hr</td>
<td>5-15 cc/hr</td>
<td>Anuria</td>
</tr>
<tr>
<td>Cap Refill</td>
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<td>≥2 seconds</td>
<td>≥2 seconds</td>
<td>≥2 seconds</td>
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<tr>
<td></td>
<td></td>
<td>Cold &amp; clammy</td>
<td>Cold &amp; clammy</td>
<td></td>
</tr>
<tr>
<td>Fluid Replacement</td>
<td>Crystalloids</td>
<td>Crystalloids</td>
<td>Crystalloids &amp; blood</td>
<td>Crystalloids &amp; blood</td>
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<tr>
<td>(3:1 Rule)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CMQCC Postpartum hemorrhage toolkit
Hemorrhage Guidelines: Staged Responses

Pre-Admission: All patients-Assess Risk

- Stage 0: All birth- Routine Measures
- Stage 1: QBL > 500 mL vag or 1000 mL CS or VS unstable with continued bleeding
- Stage 2: QBL 1000-1500 mL with continued bleeding
- Stage 3: QBL exceeds 1500 mL

California OB Hemorrhage Guidelines

- **Stage 0** (BE PREPARED)
  - Risk assessment on admission
  - Active management 3rd stage of labor
  - Antepartum care and counseling
    - Previa, accreta, Jehovah’s witness, iron deficiency anemia
  - Appropriate blood bank specimens on admission
  - Quantify blood loss for all births
Obstetric Hemorrhage Safety Bundle

Readiness
- Hemorrhage Cart / with procedural instructions (balloons, compression stitches)
- Rapid access to hemorrhage medications (kit or equivalent)
- Establish a response team: multiple partnerships / unit education, drills, debriefs
- Establish MTP and 0-neg/uncrossmatched transfusion protocols

Recognition: (every patient)
- Assessment of hemorrhage risk (prenatal, on admission, ongoing in labor & PP)
- Measurement of cumulative blood loss
- Active management of 3rd stage (oxytocin after birth)

Response: (every hemorrhage)
- Unit-standard, stage-based OB hemorrhage emergency management plan w/ checklist
- Support program for patients, families, and staff

Reporting / Systems Learning: (every unit)
- Establish a culture of huddles for high-risk patients and post-event debriefings
- Review all stage 3 hemorrhages for systems issues
- Monitor outcome and process metrics in perinatal QI Committee
California OB Hemorrhage Guidelines

**Stage 1:** EBL > 500 mL (vaginal) or > 1000 mL (C/S) or HR > 110, BP < 85/45, O2 sat < 95%; AND STILL BLEEDING
- Activate hemorrhage protocol and check list
- Find cause
  - Use a standard second line medication for atony
- Initiate preparations
  - Get help: BUT primary RN STAY AT BEDSIDE
  - IV 16 gauge and baseline labs
  - Foley with urimeter
  - Blood bank: T and C 2 units
  - Quantify blood loss

**Stage 2: OB Hemorrhage**

**MOBILIZE**
- Primary nurse (or charge nurse)
- Call obstetric or initiate
to labor and delivery
- Call Anesthesiologist
- Activate Response Team
- PHONE BIB
- Notify about bank of hemorrhagic order products in stock
- Change senior:
  - Notify Neonatologist or 7th OB
  - Bring hemorrhage cart to the bedside
  - Order 2 units PRBCs and bring to the bedside
  - Order labs: STAT (ESCPs), Chem 12 panel, Coag Panel II, Hgb
  - Transfer PRBCs based on clinical signs and response, do not wait for lab results, consider emergency/urgent transfusion
- Notify nurse
- Assign single person to communicate with blood bank
- Assign second attending or clinical nurse specialist as family support person or call medical social worker

**ACT**
- Team leader (OB physician or nurse)
- Additional uterine medication: Methotrexate 250 mg IV if not contraindicated OR Mifepristone 600 mg IV
- Can repeat Methotrexate up to 3 times every 24 min.
- Check Hgb repeated in 1 hr after
- Continue IV fluids and provide additional IV crystalloid solution
- Do not delay other interventions (see right column) while waiting for responses to medications
  - Move to OR (if in outpatient unit, move to LED or CR)
  - Order 2 units PRBCs and bring to the bedside
  - Order labs: STAT (ESCPs), Chem 12 panel, Coag Panel II, Hgb
  - Transfer PRBCs based on clinical signs and response, do not wait for lab results, consider emergency/urgent transfusion
- Primary nurse (or designee)
  - Estimate 7th large transf IV at 16-18 mL
  - Assess and document vital signs and cumulative blood loss at 5-10 min.
  - Set up blood donation set and blood warmer for transfusion
  - Administer meds, blood products and electrodes, as ordered
  - Keep patient warm
  - Second senior (or charge nurse)
  - Place Foley with urimeter (if not already done)
  - Order pseuds, light and OB procedure tray or hemorrhage cart
  - Order blood products from the blood bank (or take designee)
  - Assist with move to OR if indicated

**THINK**
- Blood bank:
  - Hemostatic activity of transfusion products: fresh frozen plasma and platelets, initiate delivery of platelets if not present on-site
  - Ovulate ferring 2-4 FFP takes 30 mins, see if transfusing + 2 units PRBCs
  - Prepare for possibility of massive hemorrhage

Sequentially advanced through procedures and other interventions based on stability:
- Vaginal birth
- If necessary immediate cesarean or other procedures:
  - Visualize and repair if retained placenta
  - D&C
  - If severe uterine or lower uterine segment bleeding:
    - Intubation balloon
  - If above measures unresponsive:
    - Ovarian/uterine artery embolization
  - If response inadequate:
    - Uterine artery ligation
  - If response inadequate:
    - Intubation balloon
  - If response unresponsive:
    - Anaesthetic or sedation relaxation drugs for manual reduction
  - If failure:
    - Uterine artery or hypogastric artery embolization

If vital signs are worse than estimated or increased blood loss, possible uterine evacuation or labor augmentation with internal bleeding, move to laparotomy

Ovulate stimulated modified Pergorium management with increased surveillance
STAGE 3: OB Hemorrhage

Mobilize

- Name/Role of Physician: California Medical Hemorrhage Program
- Phone:
  - Charge Nurse or designee:
  - Notify advanced (anesthesia support, gynecologist):<br>
  - Notify/Notify anesthesiologist:
  - Call in OR staff:
  - Ensure hemorrhage cart available at the patient’s location
  - Low-dose stat as needed:
  - Call in CNS, OR/ICU, manager:
  - Continue OB Hemorrhage Report in OR, essential player:
  - Call in house, report to House staff:
  - If transfer considered, notify ICU:

- Blood Bank:
  - Prepare to issue additional blood products as needed – stay ahead.

- ACT

- THINK

- For Renal Care:
  - Aggressive Transfusion
  - Based on Vital Signs, Blood Loss

- After the first 2 units of PRBCs use
  - New rapid FFP and RBC: 1 large massive hemorrhage
  - 4 PRBCs: 4 FFP: 1 apheresis Platelet

- Unreparable Cerebral Injury:
  - Stop of fluid resuscitation, very important.
  - +/- DVTs, PRBCs and coagulation tests:
  - Maintain/monitor bleeding with ongoing hemorrhage, may consider transfusion of FFR plus IV in conjunction with hematology or trauma surgeon.

Once Stabilized:
- Modified Postpartum Management with increased surveillance;
- Consider ICU

California OB Hemorrhage Guidelines

- Stage 3: STILL BLEEDING and EBL > 1500 mL or
  - > 2 u PRBCs given or VS unstable or suspect coagulopathy

- Massive transfusion protocol
  - Transfuse aggressively
  - Near 1:1 ratio PRBC: FFP
  - Rapid use of FFP may be as important as ratio
  - 1 PLT pheresis pack per 4-6 units PRBC

- Invasive surgical techniques

- Mobilize help: Advanced surgeon (gyn, gyn onc, trauma, MFM)
CMQCC Transfusion Guidelines

- For massive ongoing hemorrhage
- Resuscitation transfusion not based on labs but clinical
- Seeks to AVOID coagulopathy
- Transfuse with uncrossed PRBCs until crossed blood available
- Goal near equal ratio of PRBC:FFP after first 2U
- One unit platelets (single plateletpheresis pack) given for every 4-6 units PRBCs
- Guidelines consistent with practice guidelines of the American Society of Anesthesiologists

Management Algorithm

<table>
<thead>
<tr>
<th>Est. Blood Loss (EBL)</th>
<th>~500 ml (Stage 1)</th>
<th>~1200-1500 ml (Stage 2)</th>
<th>~1800-2100 ml (Stage 3)</th>
<th>&gt;2400 ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse</td>
<td>&lt;100 bpm</td>
<td>&gt; 100 bpm</td>
<td>&gt; 120 bpm</td>
<td>&gt;140 bpm</td>
</tr>
<tr>
<td>Respiration</td>
<td>14-20 bpm</td>
<td>20-30 bpm</td>
<td>30-40 bpm</td>
<td>&gt; 35 bpm</td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>Normal</td>
<td>Orthostatic changes</td>
<td>Overt hypotension</td>
<td>Overt hypotension</td>
</tr>
<tr>
<td>Mental Status</td>
<td>+Anxious</td>
<td>+Anxious</td>
<td>Anxious and Confused</td>
<td>Confused and Lethargic</td>
</tr>
<tr>
<td>Urine Output</td>
<td>&gt;30 cc/hr.</td>
<td>20-30 cc/hr.</td>
<td>5-15 cc/hr.</td>
<td>Anuria</td>
</tr>
<tr>
<td>Fluid Replacement</td>
<td>Crystalloids</td>
<td>Crystalloids</td>
<td>Crystalloids + blood</td>
<td>Crystalloids + blood</td>
</tr>
<tr>
<td>Labs</td>
<td>CBC; PT/PP; Fibrinogen; T&amp;S versus T&amp;C; FDP; Pts; D-dimer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product Replacement</td>
<td>Crystalloids → Transfuse PRBCs → Transfuse other (FFP, Cryo, Pts)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bleeding Abatement</td>
<td>Massage → Littorotics → Packing/Tamponade/Embolization → Surgery</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Lethal Coagulopathy Triad: Dilution, Hypothermia & Acidosis

- **Dilution**
  - Transfusion of crystalloid and packed cells devoid of clotting factors
  - A problem once 1 – 1 ½ total blood volume replaced

- **Hypothermia**
  - Significantly decreases platelet function; even if counts are adequate
  - Keep patient warm (Bair Hugger®, fluid warmer)

- **Acidemia**
  - Occurs with massive hemorrhage due to hypovolemia, peripheral tissue hypoxia
  - As hydrogen ion concentration increases, enzyme functions involved in coagulation pathway stop functioning
  - VERY DIFFICULT TO REVERSE!
  - Work to prevent metabolic acidosis
Active Management of the Third Stage of Labor (AMTSL)

- Is the period from birth to expulsion of the placenta
- Has been shown to reduce the risk of maternal primary hemorrhage
- Is associated with significant reduction in primary blood loss greater than 500 ML
- Putting the baby to breast right after delivery increases production of oxytocin which increases uterine contractions

1. Administration of uterotonic drugs
2. Controlled cord traction
3. Uterine massage
**Medical management of PPH**

<table>
<thead>
<tr>
<th>Oxytocin (Pitocin)</th>
<th>Hemabate (PGF2α; Carbetrop tromethamine)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-40 units/liter NS/LR IV rapid infusion</td>
<td>250 mcg IM q 15-90 minutes (max 5 doses)</td>
</tr>
<tr>
<td>Other rapid infusion routes: IM &amp; IU</td>
<td>Other rapid infusion routes: IU</td>
</tr>
<tr>
<td>Methergine (Methylergonovine Maleate; Ergonovine Maleate)</td>
<td>Misoprostol (Cytotec)</td>
</tr>
<tr>
<td>0.2 mg IM q 2-4 hrs (max 5 doses)</td>
<td>400-1000 mcg PR</td>
</tr>
</tbody>
</table>

### Uterotonics

**Medication Recommendations 2.0**

<table>
<thead>
<tr>
<th>Prevention</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxytocin or 10-40 International units/500-1000 mL IV infusion titrated to uterine tone</td>
<td>Rapid infusion of IV oxytocin 10-40 IU/500-1000 mL at ≥ 500 mL/hour, titrated to response</td>
</tr>
<tr>
<td>OR Oxytocin 10 units IM when no IV access</td>
<td></td>
</tr>
</tbody>
</table>

Choose a standard second line agent:

- Methergine 0.2 mg IM
- Misoprostol 600 mcg orally or 800 mcg sublingually
- Hemabate 250 mcg IM or intramyometrially
Oxytocin for the Active Management of the Third Stage of Labor Protocol

- First Hour
  - Rate 300 mL/hr = 18 U
- Second Hour
  - Rate 60 mL/hr = 3.6 U
  - Uterine Atony Rate 600 mL/ hr = 36 U for an hour
  - Until fundus is firm or patient is transferred to postpartum
- No IV
  - 10 U IM
  - Establish IV access

Interventions for the Third Stage of Labor

- Hemorrhage risk factors
- Utilized uterotonics sequentially
- Use of computerized infusion pumps
- Document dosages (units) of oxytocin administered rather than a rate
- Empty bladder to maintain uterine tone
- Uterine massage
- Maintain IV site for at-risk or actual hemorrhage patients
- Assess for signs of hypervolemia and shock
  - Quantify blood loss
  - Strict intake and output

Burke, 2010
Non-Surgical Techniques for Acute Blood Loss

<table>
<thead>
<tr>
<th>fundal massage</th>
<th>bimanual compression</th>
<th>uterotonics</th>
<th>tamponade devices</th>
<th>uterine packing</th>
</tr>
</thead>
</table>

Recombinant Activated Factor VII

Cook “Bakri” Intrauterine Balloon

- There are now several balloons, but the most available in the US is the Cook “Bakri” Balloon
  - Specifically designed for this purpose
  - Double lumen (for drainage from above)
  - Silicone (non-latex)
  - Uterine contour shape
  - Good filling capacity (saline)
  - Inexpensive
  - Easy to use

Copyright permission granted by Clark Illustration
Foley catheter used as uterine tamponade

Has been shown to be effective in treating postpartum hemorrhage
Less expensive than the Bakri balloon.
Easy to insert and readily available in most settings
**Remember “ORDER” for Action**

<table>
<thead>
<tr>
<th>Oxygenate</th>
</tr>
</thead>
</table>
| • Assist with airway protection  
| • Apply pulse oximeter  
| • Start Oxygen by mask 10L/min (O₂ stats >95%)  
|  
| Restore circulation |  
| • Ensure IV access with two (2) large bore catheters (LR/NS infusing)  
| • Consider arterial line  
| • Accurately assess blood loss  
| • Draw Labs: CBC, Coagulation Panel, Chemistry Panel  
| • Give volume expanders (crystalloid [2-3 L] & blood as indicated)  
|  
| Drug therapy       |  
| • Oxytocin (Pitocin)  
| • Methylergonovine (Methergine)  
| • Carbutoprol Tromethamine (Hemabate) Prostaglandin F2 Alpha  
| • Misoprostol (Cytotec)  
|  
| Evaluate Status    |  
| • Trend Vital Signs  
| • Monitor lab results, urine output, bleeding and IV fluids  
| • Observe Mental Status  
| • Avoid hypovolemia  
|  
| Remedy             |  
| • Identify and treat the underlying cause and/or prepare for intraoperative management  

---

**Preparedness - Need to know**

**Availability of & time to get**
- Type and Cross
- Lab results – CBC, coags
- Blood products – PRBCs, plts, FFP, cryo etc.
- Medications – Pitocin, Methergine, Hemabate, Misoprostol, etc.
- Availability of Cell Saver

**Specialist availability**
- Anesthesia, Gen surgeon, Gyn-Onc, radiology, MFM, etc.

**Are these processes in place?**
- Rapid Response Team
- ICU/Critical Care Team
- Critical Data Manager
  - Labs
  - Vital signs
  - I & O
  - Medications
- Massive transfusion policy
- Chain of Communication
- Consult/Transport
Rapid Response Protocols

Facility resources:

- Optimal medical skills
- Optimal surgical skills
- Optimal administrative skills
- Blood bank stores
- Lab response times
- Ancillary resources
- Knowledge of these resources etc.

Who's going to do what?

---

Project Team Communication

And that's how we went on three...

Communication

---
Practice team communication

Ada a 28 year old G2P2 had a vaginal delivery 2 hours ago and had not voided. On assessment, the midwife noted that the uterus was deviated to the right. Ada stated that she was unable to void due to severe edema to the labia from prolonged pushing. She needs to notify the physician of this situation and obtain an order to place a Foley catheter. Practice reporting using SBAR.
STEP 5: Quality Reporting & Systems Learning

- Establish a culture of huddles for high-risk patients and post-event debriefs
- Conduct a multidisciplinary review of serious hemorrhages for systems issues
- Monitor outcomes and processes metrics

OB Hemorrhage: We Can Do Better

- Most maternal mortalities and near misses due to hemorrhage are preventable
- 1/3 of patients will have no risk factors prior to labor
  - Must be prepared for every patient
  - QBL every delivery so can respond early
- Requires reliance not on individuals but on team approach
Simulation Based Training (SBT)

SBT

- Simulation based training is an evidence-based practice.

- “It is a technique (not a technology) to replace and amplify real experiences with guided ones, often “immersive” in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion” (Lateef, 2010, p.1)

- It has been shown to improve communication between teams
In Situ Simulation

- This is defined as a “team-based simulation strategy that occurs on the actual patient care units involving healthcare team members and organization process....” (Miller, Riley, Davis, & Hansen, 2008, P. 106)

- It helps to reestablish emergency situations using realistic scenarios. Participants are allowed to make mistakes and learn from them during debriefing instead making an error during actual patient care.

Elements of In Situ Simulation

1. Briefing: involves review of the process as well as the importance. It is important for participants to understand that the simulation is not intended to evaluate their technical skills but aims to enhance their critical thinking skills.

2. The simulation: takes place in the actual patient care setting (labor and delivery room, postpartum room, and operating room). Interactions between team members are recorded during simulation for review later.
Elements of In Situ Simulation

3. Debriefing: this is the most important element. The simulation director reviews the video of scenarios with participants to discuss what went well and what could have been done differently. Debriefing closes the gap between the experience and making sense of it” (Miller, Riley, Davis, & Hansen, 2008, P.108). It is usually a time for reflection.

4. Follow up: one of the goals of a simulation is to change practice/process. It is important for teams to make changes to practice based on lessons learned.

Learning objectives for Case study #1

1. Identify risks of postpartum hemorrhage upon admission

2. Communicate with the provider

3. Provide the appropriate equipment at the bedside
Case study #1

Ngozi Okoro, 39 year old G6 P5, 40 weeks gestation and admitted for spontaneous labor 3/-2/80.
Previous OB history of postpartum hemorrhage and blood transfusion
VS BP 165/85, HR 85, T 99.9.
Oxytocin drip was initiated for augmentation of labor. She also received magnesium sulfate drip. Ngozi had a spontaneous vaginal delivery after 8 hours of labor.

Questions for case study #1

1. What are the risk factors?
2. What should the midwife anticipate upon admission?
3. What equipment should the midwife have at the bedside?
4. How should the midwife communicate to the provider?
Case study #2

A 42 year old G7 P5 at 37 weeks, with a prior IUFD, 3 prior C-sections and known placenta previa, presents for repeat C-section due to worsening hypertension
Pressure range on admission: 186/92-198/98, HR 80
Initial labs: Hgb 14.6,
Hct 43.8, Plts 190
Findings on delivery include;
a) Adhesions- omentum to anterior abdominal wall
   & bladder to lower uterine segment
b) Complete placenta previa

Questions for case study #2

1. What are the risk factors for this patient?

2. Which interdisciplinary teams should the midwife also notify about this patient?

3. What labs should the nurse anticipate the MD will order?

4. What medications should the midwife have ready at the bedside?
Key steps for reducing maternal mortality and morbidity due to hemorrhage

- Training of all healthcare providers in early diagnosis, prevention and treatment options

- Promote and reinforce the value and effectiveness of *Active Management of the Third Stage of Labor* as standard

- Develop and use treatment protocols

- Monitor the incidence of hemorrhage and ensure quality assurance

Recognition and Management of Hemorrhage

**ANTEPARTUM**  **INTRAPARTUM**  **POSTPARTUM**

**Concealed**
- signs and symptoms of hypovolemia

**Overt**
- objective measurement of blood loss

Blood Loss Recognized
Let's Recap

1. Remember; be ready at all times

2. Recognize early warning signs

3. Respond in a timely manner. Delay is dangerous

4. Reporting: communicate with members of the immediately and document appropriately

5. Patient safety is everyone's responsibility
Questions

Thank you
### Appendix L: Evaluation table

<table>
<thead>
<tr>
<th>Article #</th>
<th>Title, Authors and date of publication</th>
<th>Type of evidence</th>
<th>Sample size</th>
<th>Study findings</th>
<th>Limitations</th>
<th>Evidence level and quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nelissen et al. (2013). Helping mothers survive bleeding after birth: an evaluation of simulation-based training in a low-resource setting.</td>
<td>An educational intervention study</td>
<td>(n = 89)</td>
<td>Mean scores increased from 74% to 80% and pass rates increased from 63% to 75%.</td>
<td>Small study group n = 89. Facilitators did not have prior knowledge of simulation.</td>
<td>Level III Quality: B</td>
</tr>
<tr>
<td>2</td>
<td>Ezugwu, E.C., Agu, P.U., Nwoke, M.O., and Ezugwu, F.O. (2014). Reducing maternal deaths in a low resource setting in Nigeria.</td>
<td>A retrospective review</td>
<td>Retrospective review of maternal deaths (59) and live births (9150) within 6 years</td>
<td>Confidence interval = 95% ( P ) value = &lt; 0.05. MMR was 10 times higher among women who did not receive prenatal care. A 43.5% decrease in MMR was noted following adoption of interventions.</td>
<td>Quality of data used. Insufficient data</td>
<td>Level II Quality: B</td>
</tr>
<tr>
<td>3</td>
<td>Oladapo et al. (2015). When getting there is not enough: a nationwide cross-sectional study of 998 maternal deaths and 1451 near misses in public</td>
<td>Cross-sectional study</td>
<td>Maternal death n = 998 ( \text{Near misses n = 1451 Total = 2,449} )</td>
<td>Deficiencies in clinical management among providers was noted (n = 1,215) which constitutes 49.9%</td>
<td>Quality of data</td>
<td>Level I Quality: B</td>
</tr>
<tr>
<td></td>
<td>Study Description</td>
<td>Methodology</td>
<td>Sample Size</td>
<td>Results</td>
<td>Quality Level</td>
<td></td>
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<td>------------------------------------------------------------------------</td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>Evans et al. (2014). Competency-based training “helping mothers survive: bleeding after birth” for providers from central and remote facilities in three countries</td>
<td>A competency-based training on bleeding after birth with a pre- and post-assessment of participants</td>
<td>n = 155</td>
<td>Ninety percent of participants passed post-assessment test after training. 16 of the post-assessment or pre-assessment tests were missing</td>
<td>Level III Quality B</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Prata, N., Ejembi, C., Fraser, A., Shittu, O., &amp; Minkler, M. (2012). Community mobilization to reduce postpartum hemorrhage in home births in Northern Nigeria</td>
<td>Retrospective study</td>
<td>N = 1875</td>
<td>Community-based distribution of misoprostol was successful in creating awareness in the target community about postpartum hemorrhage. The researchers were unable to locate 75 of the participant and were unable to determine effectiveness of the misoprostol</td>
<td>Level III Quality B</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Bilotta, F.F, Werner, S.M., Bergese, S.G., &amp; Rosa, G. (2013). Impact and Implementation of Simulation-Based Training for Safety</td>
<td>Review of evidence</td>
<td></td>
<td>Increasing medical efficiency and skills of providers through SBT will be beneficiary to any community</td>
<td>III Quality B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Authors</td>
<td>Research Design</td>
<td>Study Methods</td>
<td>Findings</td>
<td>Quality Level</td>
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<td>------------------------------------------------------------------------------------------------------------------------------</td>
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<td></td>
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<tr>
<td>8</td>
<td>Kerbage, Y, Debarge, V, Lucot, J.P, Clouquer E, &amp; Rubod, C. (2016). Simulation training to teach postpartum hemorrhage surgery to residents</td>
<td>Simulation training workshop</td>
<td>Participant showed improvement in level of theoretical knowledge and skills after the implementation of simulation based training.</td>
<td>Level III Quality B</td>
<td></td>
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</tr>
<tr>
<td>9</td>
<td>Lateef, F. (2010). Simulation-based learning: Just like the real thing</td>
<td>A review</td>
<td>Simulation training needs to be integrated into traditional educational programs in order to be successful</td>
<td>Level III Quality B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Rathore, A.M, Gupta, S., Manaktala, U., Gupta, S.,</td>
<td>Prospective study</td>
<td>(n=18)</td>
<td>“The success rate of condom</td>
<td>Level III Quality B</td>
<td></td>
</tr>
</tbody>
</table>