UTERINE MODEL-BASED SIMULATION TRAINING ON UTERINE COMPRESSION SUTURES PLACEMENT FOR MANAGEMENT OF POSTPARTUM HEMORRHAGE AT MUHIMBILI NATIONAL HOSPITAL DAR ES SALAAM

Francisco M Baraka, MD

MMed Obstetrics and Gynecology Dissertation
The Muhimbili University of Health and Allied Sciences
October, 2021

Muhimbili University of Health and Allied Sciences

Department of Obstetrics and Gynaecology

Uterine Model-Based Simulation Training on Uterine Compression Sutures Placement for Management of Postpartum Hemorrhage at Muhimbili National Hospital Dar es Salaam

By

Francisco M. Baraka

A Dissertation Submitted in Partial Fulfilment of the Requirements for the

Degree of Master of Medicine in Obstetrics and Gynaecology of

The Muhimbili University of Health and Allied Sciences

October, 2021

CERTIFICATION

The undersigned certifies that she has read and hereby recommends for examination of the dissertation entitled "***Uterine model-based simulation training on uterine compression sutures placement for management of postpartum hemorrhage at Muhimbili national hospital Dar es salaam"*** in partial fulfillment of the requirements for the degree of Master of Medicine in Obstetrics and Gynaecology of Muhimbili University of Health and Allied Sciences.

_____

Dr Belinda S. Balandya

(Supervisor)

_____

Date

DECLARATION AND COPYRIGHT

I, **Francisco M. Baraka,** declare that this **dissertation** is my original work and that has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature _____ Date _____

ACKNOWLEDGEMENT

I thank the Almighty God who gave me the ideas and the ability to develop and accomplish this dissertation.

I thank my supervisor Dr. Belinda Balandya for her support and guidance in correcting and providing positive contributions in the making of this document. I thank my beloved wife Dr. Eveta S Masawe and all members of my family for everyday encouragement and support

I am grateful to all members of the academic staff in the Department of Obstetrics and Gynaecology at Muhimbili University of Health and Allied Sciences (MUHAS) for their valuable inputs that greatly improved my dissertation. I thank all my classmates for their support ideally and financially: Dr. Mubina Suleiman, Dr. Ikrah Abdallah, Dr. Fatemazahra Amij, and Dr. Rehema Omari just to mention a few.

I would like to thank all obstetricians, registrars, and nurses at Muhimbili National Hospital (MNH), for their guidance, encouragement, and positive input while developing this dissertation. To mention a few: consultants Dr. Nathanael Mtinangi-;Head of the department(HOD), Dr. Vincent Tarimo (former HOD), and Dr. Angela Thomas. Others are Dr. Abidan Mganga, Mrs. Ducresia Bagenda(former nurse in charge of labor ward), and Mrs. Nelva Mrema (nurse in charge in Obstetrics and Gynecology theatre). May Almighty God bless you all - Amen.

DEDICATION

I would like to dedicate this dissertation to my lovely wife Dr. Eveta Sabas Masawe; - my children; - Francisca Francisco Baraka, Agatha Francisco Baraka, and Juan Francisco Baraka; - my mother Catherine Mdiga Mpanda, and Mother in law Juliana Leon Masawe. You are so important and special to me, God bless you all. Amen

ABSTRACT

Background: In Postpartum hemorrhage, uterine compression sutures (UCS) are applied when pharmacological method fails to control bleeding due to uterine atony. UCS techniques were seldom used at Muhimbili National Hospital despite uterine atony being the second cause of peripartum hysterectomy, one of the causes being lack of practical training on UCS in the department. Thus, to impart knowledge and positive attitude on UCS, simulation training using mattress uterine model was done.

Objective: To determine the effect of simulation training on self-perceived knowledge, skills, and attitude on uterine compression sutures placement for management of PPH at MNH

Materials and method: An interventional cross-sectional study was done at MNH Upanga to all medical doctors working in the department. Mattress uterine models were used in the training. The training had a theory (PowerPoint presentation) and practical parts on B-Lynch, Hayman, and Cho compression suture placement techniques. Pre-tested pre and post-training self-administered structured questionnaires were used before and after training respectively. The participants reported self-perceived knowledge, skills and attitude (feel) to apply UCS through Yes/No and Likert-scale type questions. Wilcoxon matched-pairs signed-rank test was used to compare the median score before and after training. A p-value of < 0.05 was considered statistically significant.

Results: Sixty-nine doctors participated in this training. Five (7.2%) were registrars, 49 (71.1%) residents and 15 (21.7%) were obstetricians. Nine (13.0%) reported they had UCS training with practical sessions and 33 (47.8 %) had applied UCSs in their practice. Statistically, there was a significant improvement in self-perceived knowledge, skills, and attitude on UCS after training to all participants ($P < 0.001$), whereas 69 (98.6%) agreed that such training was useful.

Conclusion: Simulation training on uterine compression suture techniques using mattress uterine model showed improvement on self-perceived knowledge, skills and, attitude in applying UCS in management of PPH.UCS placement simulation training should be done regularly in the department to updates skill for newly recruited staffs and postgraduate students.

TABLE OF CONTENTS

CERTIFICATION i

DECLARATION AND COPYRIGHT ii

ACKNOWLEDGEMENT iii

DEDICATION iv

ABSTRACT v

ABBREVIATIONS vii

DEFINITIONS OF TERMS viii

1.0 INTRODUCTION 1

1.1 BACKGROUND 1

1.2 LITERATURE REVIEW 5

1.3 CONCEPTUAL FRAMEWORK 8

1.4 PROBLEM STATEMENT 9

1.5 RATIONALE 9

1.6 Research question 10

1.7 OBJECTIVES 10

1.7.1 Broad objective 10

1.7.2 Specific objectives 10

2.0 METHODOLOGY 11

2.1 Study design 11

2.2 Study population 11

2.3 Study area 11

2.4 Sample size and Sampling method 12

2.5 Study variables 13

2.5.1 The independent variable 13
2.5.2 The dependent variables 13
2.6 Data collection 13
2.6.1The uterine model construction 13
2.6.2 The PowerPoint presentation preparation 16
2.6.3 Data collection tool 17
2.6.4 The Research assistant 17
2.6.5Pretesting the questionnaires and uterine model 17
2.6.6 The training method 17
2.6.7 Data collection procedure 18
2.7 Data analysis 18
2.8 Ethical clearance 19
2.9 Dissemination Plan 19
3.0 RESULTS 20
4.0 DISCUSSION 26
STUDY LIMITATIONS 27
STUDY STRENGTH 27
5.0 CONCLUSION AND RECOMMENDATIONS 28
5.1 Conclusion 28
5.2 Recommendations 28
REFERENCES 29
APPENDICES 33
Appendix I. Questionnaire 33
Appendix II: Consent Form 39

LIST OF TABLES

Table 1: Participants demographic and general characteristics 21
Table 2: All participants' pre and post-training scores on knowledge, skills, and attitude on UCS 23
Table 3: Median score across doctors' sub groups 24

LIST OF FIGURES

Figure 1: B-Lynch suture procedure 3
Figure 2: Hayman suture placement technique 4
Figure 3: Cho suture placement technique 4
Figure 4: Conceptual framework showing the impact of UCS simulation training 8
Figure 5: Cut sections of a sketch map and pieces of mattress and cloth 14
Figure 6: Adhering and folding the pieces of mattress and cloth 15
Figure 7: The uterine model is ready 16
Figure 8: Pie chart showing Participants previous UCS training status 22

ABBREVIATIONS

ACOG	American College of Obstetricians and Gynecologists
AR	Assistant researcher
BLS	B Lynch sutures
CS	Caesarian section
CSS	Cho square suture
FIGO	International Federation of Gynecology and Obstetrics
HS	Hayman suture
MNH	Muhimbili National Hospital
OBGY	Obstetrics and Gynecology
MUHAS	Muhimbili University of Health and Allied Sciences
PH	Peripartum hysterectomy
PI	Principle investigator
PPH	Postpartum hemorrhage
RCOG	Royal College of Obstetricians and Gynecologists
SPSS	Statistical Package for the Social Science
STAH	Subtotal Abdominal Hysterectomy
TAH	Total Abdominal Hysterectomy
UBT	Uterine Balloon Tamponade
WHO	World Health Organization

DEFINITIONS OF TERMS

Simulation training: Training by an imitation of a real-life process

Postpartum hemorrhage: Bleeding of more than 500ml or 1000mls after the birth of the baby for vaginal delivery and caesarian section respectively

Uterine compression sutures: Sutures used to compress the non-contracting uterus mechanically during severe postpartum hemorrhage

Self- perception: The idea that a person has about the kind of person he/she is

1.0INTRODUCTION

1.1 BACKGROUND

Postpartum hemorrhage (PPH) has traditionally been defined as blood loss of 500mls or more after vaginal delivery and more than 1000mls after caesarian section (CS)(1). A blood loss of more than 1L is classified as severe PPH. Currently, PPH is defined as cumulative blood loss of equal or more than 1L or any blood loss after giving birth with signs of hypovolemia regardless of the mode of delivery (1–3). The latter definition is important as it helps health workers to make the diagnosis of PPH early without waiting for the actual volume mentioned as in the case of mothers with pre-existing anemia. If such bleeding occurs within 24 hours after birth it is called primary PPH while the one occurring after 24hour is called secondary PPH.

Postpartum hemorrhage causes about 25% of maternal deaths worldwide(4). Uterine atony is the leading cause of PPH by 75-90 %(4). Other causes of PPH are uterine rupture and tear of the cervix, retained products of conception and bleeding disorders (5). In Sub-Saharan African, PPH causes not less than 33% (6),while in Tanzania it is 25% (7). At Muhimbili National Hospital (MNH) PPH causes 14.9% of maternal deaths(8) and from a recent yet unpublished review at MNH, uterine atony is the second most cause of peripartum hysterectomy(18.4%).

In this study, three uterine compression sutures (UCS) placement techniques were trained. These are: - B-Lynch sutures (BLS), Cho-square sutures (CSS) and Hayman sutures (HS). The three techniques are the most practiced and reported among the known UCS techniques. These techniques are simple, safe, quick to apply, and can preserve life and fertility (5,9). All these techniques are done through laparotomy and before application; manual compression of the uterus should be done first to assess the potential chance of success of UCS to be applied.

B-Lynch sutures

It is the form of compression suture used to mechanically compress an atonic uterus in severe PPH. It was introduced and published in 1997 by Christopher B- Lynch. It is the most performed and reported among UCS worldwide (10). It involves opening the lower segment of the uterus first (9). This makes it perfect in PPH due to uterine atony associated with retained pieces of placenta or clots, bleeding from placental bed, and some morbidly adhering placenta after CS which occur frequently (36%) comparing with that which occur after vaginal delivery 6-14% (11). It enables the surgeon to inspect the endometrial cavity for any retained placenta, tears, or blood clots before suture placement (9,10)

The BLS procedure: -

1. Under general anesthesia in Lloyd Davies's position, the abdominal wall is opened to access the uterus. The uterine lower segment is incised to open the uterus or the previous incision is re-opened (if the patient was delivered by CS) to access the cavity. The uterine cavity is evacuated, examined and swabbed out. The uterus is then exteriorized to identify any bleeding points.
2. Bimanual compression is first applied to assess the potential chance of success of BLS
3. A 70mm round-bodied needle with number 2 chromic catgut is used. The uterus is puncture 3cm from the right lower edge of the uterine incision and 3cm from the lateral border to enter the cavity then out of the cavity 3cm from the upper incision margin and 4cm from the lateral border. The suture is passed over the fundus at approximately 3-4cm from the right corneal border then posterior vertically and downward to enter the uterine cavity again at the same level as the upper anterior entry point. The suture is passed back posterior through the same surface marking horizontally to the left side then as on the right side to the fundus, the anterior surface to the starting point but on the left side. The two ends of the suture are pulled tight assisted by bimanual compression by assistant then tied (figure 1.below). After this, the uterine incision is closed.

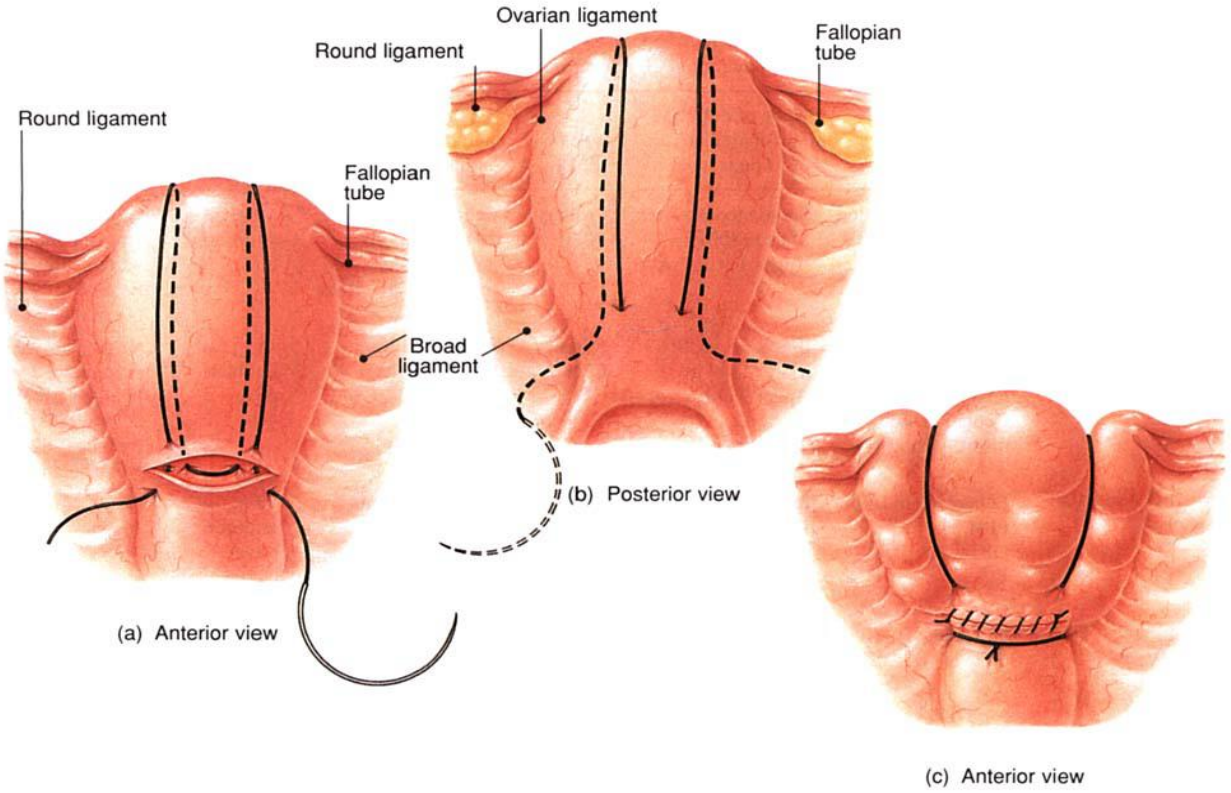


Figure 1: B-Lynch suture procedure

Parts (a) and (b) demonstrate the anterior and posterior views of the uterus showing the application of the B-Lynch Brace suture**.** Part (c) shows the anatomical appearance after competent application. (Illustrations by Mr. Philip Wilson FMAA, AIMI, based on the authors' video record of the operation)

The Hayman sutures

Discovered and first applied by Dr. Hayman in 2002(12). The technique does not need to open the lower uterine segment rather a needle is transfixed from the anterior to posterior uterus walls at the lower segment, the suture is then tied at the fundus in both right and left side(figure 2.below) (10).

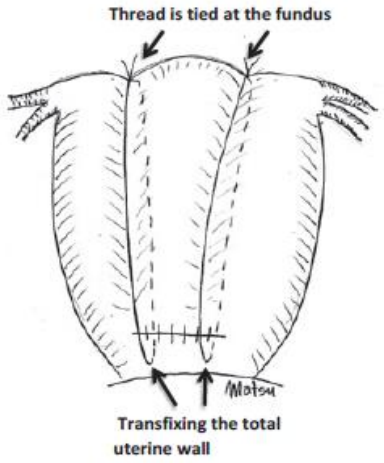


Figure 2: Hayman suture placement technique

(Figure by S. Matsubara et al 2013)

Cho square sutures

This technique was invented in 2000 by Cho and his colleague(13). It involves transfixing (from anterior) the anterior and posterior uterine wall at point a then from posterior to anterior through point b at approximately 3cm apart, the same is done at the point c and d. This as a result creates a square suture compressing tightly the anterior and posterior walls. Up to four square sutures are required to achieve hemostasis. This technique is more effective in PPH due to morbid adherent placenta and bleeding from the lower segment in placenta praevia. The success rate is 93% against 85% of other UCS techniques in these cases(10)

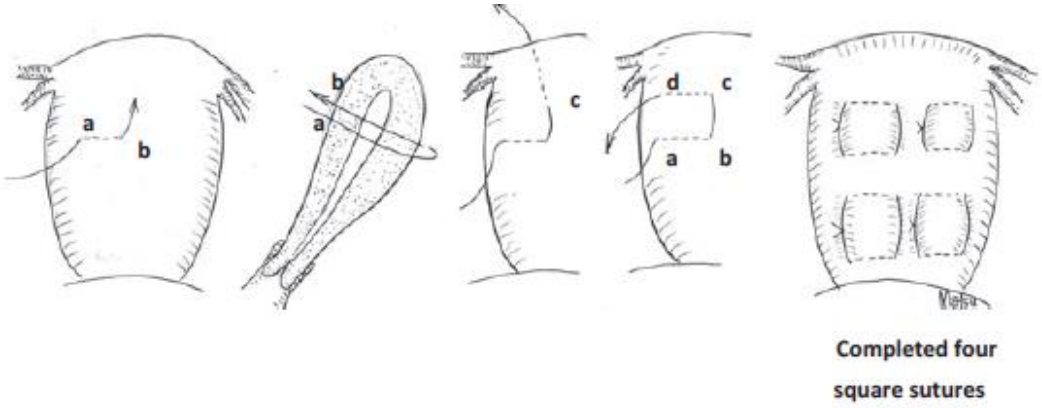


Figure 3: Cho suture placement technique

(Figure by S. Matsubara et al 2013)

At MNH much effort has been put into uterine balloon tamponade especially in the year 2016-2018 under an evidence-based package called "Every Second Matter-Uterine Balloon Tamponade" (ESM-UBT)(14). Recently, UBT is no longer frequently applied due to a lack of UBT kits. Since UCS are relatively newer techniques among the conservative methods for PPH management and the department has not fully put an effort on these techniques, it was important to conduct simulation training on these techniques.

1.2 LITERATURE REVIEW

In PPH management, UCSs are applied when pharmacological and/ or mechanical methods fail to control the bleeding (2,3). The application of UCS in the management of PPH in both developed and developing countries is rising. However, at MNH the application of the UCS in PPH management is still low(review of OBS theatre record of 10 years, 2009-2019) despite atonic PPH being the second most cause of PPH requiring hysterectomy (15).

Various reasons have been postulated as to why UCSs are still not used frequently. Mode of surgical skills training in which "No hands-on training" and/ or non-simulation trainings are reported as the cornerstone hindering factor. Such training provides knowledge without actual surgical skills. A recent meta-analysis of 609 studies on simulation training has shown constant improvement in knowledge, practical skills, self-confidence and behavior. Hands-on and/ or simulation training has shown to reduce the gap between rare event and the need for high degree technical competence(16,17).

Practical training on UCS

Uterine compression sutures are relatively newer procedures. In Mexico, 92% of resident physicians reported knowing UCSs theoretically, only 25% of them learned UCS by simulation models while the majority were through course work and conferences(18)**.**In the UK, a survey of the senior and accredited trainees in obstetrics and gynecology reported 39.5% had practical training on BLS (19).A survey of the final year residents at Lille University France showed, 95% felt they needed more practical training on uterine sparing techniques as about 50% were not able to perform any of the techniques(17).

Survey of uterine compression sutures application

Since the introduction of uterine compression sutures in the year 1997 by Christopher B-Lynch, many hospitals and teaching institutes have adopted the technique and applied it. Some other UCS techniques were then designed either by modifying the original B-Lynch technique or started completely new techniques(10,12,13,20). At the moment, more than 10UCS techniques have been designed, used and reported(10). A study on BLS, "a decade of experience and outcome of B-Lynch suture" reported in 2006 showed more than 1600 procedures had been done worldwide: 460 Africa/Middle East, 212 Asia, 312 North America, 179 Central America and others(21)**.** However, in some countries, the procedure is indeed underutilized despite its advantages. A survey of surgical experience in the UK reported, while 100% of graduates (senior and recently accredited trainees in obstetrics and gynecology) were confident in performing simple total abdominal hysterectomy only 41.7% could apply B-Lynch(19).

The impact of simulation training on UCS knowledge, skills, and attitude

Any training done practically has shown great improvement in knowledge, skills, competence, and change of behavior or attitude toward the subject trained(22).Uterine compression suture placement, simulation training has shown marked improvement to trainees. Many doctors found it difficult to apply B-lynch sutures unless they had opportunities to see the suture placed first. Following training with a simulation model, there was a significant increase in self-perceived understanding of BLS with median Likert scale score increased from 3 to 5(100%) ($p < 0.01$)(23).A study to assessing long-term knowledge retention following single-day simulation training for uncommon obstetric events showed significant knowledge improvement which lasted for over a year. In this study, 80% of participants felt they were able to manage PPH confidently (24).Simulation training on management of PPH at Abington memorial hospital reported knowledge improvement and participants felt that the ability to perform UCS improved too, scored 4.8/5 and 4.1/5 on the Likert scale respectively(25). In one study, a post-simulation survey, 100% of participants showed improved theoretical knowledge, technical skills and self-confidence(17). In another study, 67% of residents and attending physicians reported discomfort

in BLS application, following simulation training; all were comfortable while surgical skills improved by 88%(26).

The necessity of UCSs Practical training

As stated earlier, practical training imparts more and long-lasting knowledge and skills. Participants who underwent such training have acknowledged, and recommended that such training should be part of training in academic institutes(19,25,27). Some institutes have started developing guidelines and protocols to incorporate such training in their annual curriculums. A simulation training to teach PPH surgery to residents at Lille university-France showed that 95% of residents felt they needed practical training more than theory. Indeed 100% stated that the simulation course should be done twice during residency and should be mandatory(17)**.**The same response was reported from a survey of senior and accredited trainees in obstetrics and gynecology in the UK. In this survey, 80% (82 of 103) felt that basic surgical skills courses should be a mandatory component in obstetrics and gynecology training(19). The Abington Memorial hospital in the USA has already developed the curriculum to teach resident skills in the management of PPH. In this curriculum, UCS simulation with a uterine model was one of the components and it involved an objectively structured assessment of technical skills (OSATS)(25). In a study titled "A low-cost trainer for surgical management of PPH", 91% of participants agreed and recommended that the simulation should be used as a teaching tool for the management of PPH (26).

1.3 CONCEPTUAL FRAMEWORK

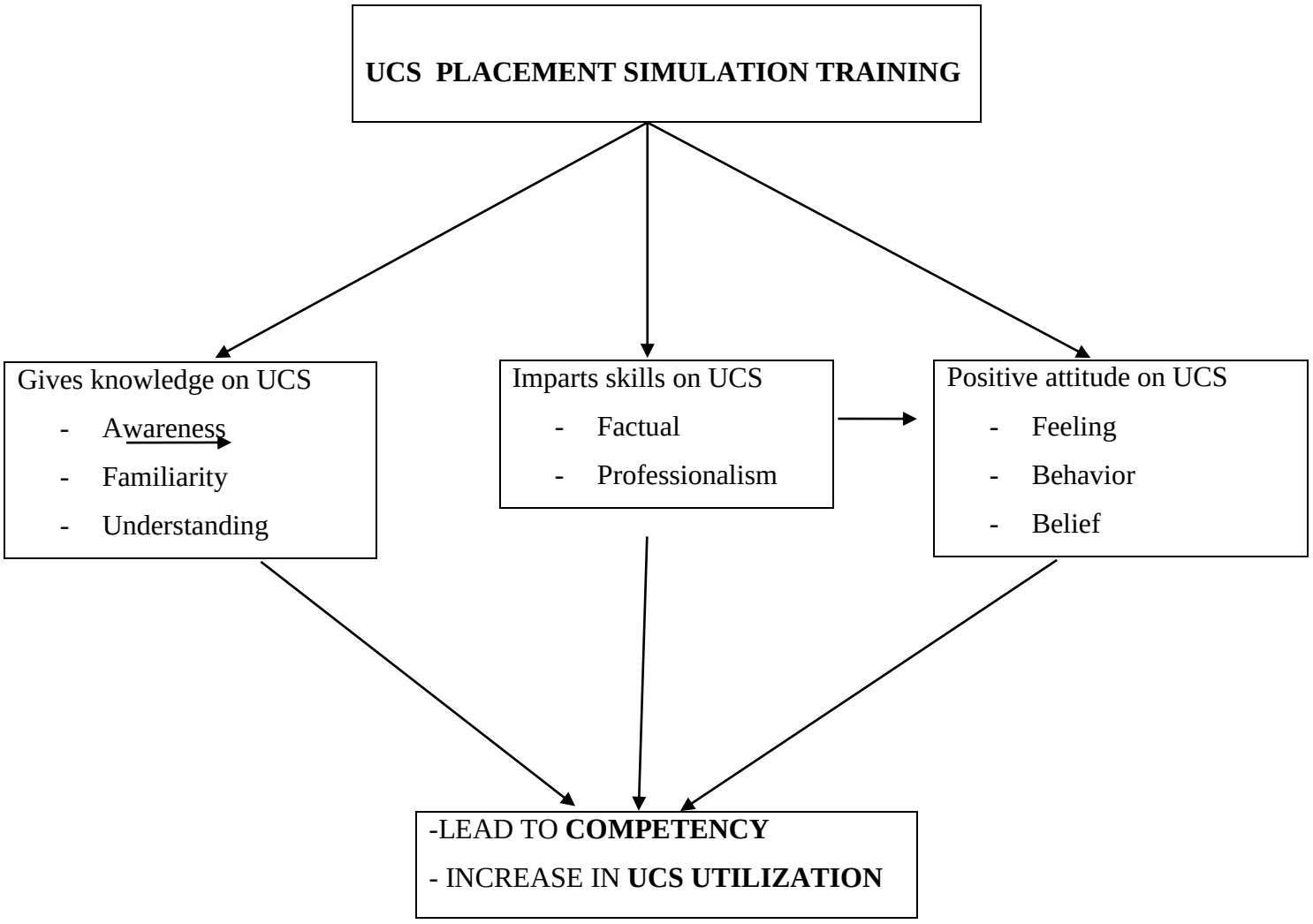


Figure 4: Conceptual framework showing the impact of UCS simulation training

In this conceptual framework, UCS simulation training imparts knowledge, skills and a positive attitude on UCS. The three domains give competency which leads to UCS application. On the other hand, the 3 domains can affect each other: knowledge can increase personal skills while skills can result in a positive attitude on UCS.

1.4 PROBLEM STATEMENT

Postpartum hemorrhage is the major cause of maternal death worldwide. When medical treatment fails UCSs have shown to control PPH effectively in uterine atony, placental site bleeding, some morbidity adherent placentas, and in disseminated intravascular coagulopathy (DIC). The techniques are cost-effective, quick, easy to learn, have less blood loss, are less challenging, and are applicable even to very low resource health facilities.

At MNH, UCS techniques were seldom applied to manage PPH due to uterine atony and the associated conditions mentioned above. A recent unpublished review on trends, incidence, indications, and maternal outcome at MNH has shown an increase of Peripartum Hysterectomy (PH) over the past 10 years by 4 fold, involving 11% of primi-parous and 76.2% of those with parity 2 to 4. In this review, uterine atony is the second most common leading cause of PH by 18.5%, followed by 12.2 % of placenta praevia associated PPH. A review in obstetrics analysis procedure book in OBGY theatre for the past 10 years (2009-2019), showed that UCS (B-Lynch suture) has been applied to only 3 patients. Hysterectomy is associated with serious morbidity and long-term complications and to young women, it causes sterility, which can result in lifelong catastrophes; socially, traditionally, and psychologically(9).

According to the head of the OBGY department, there has been no UCS techniques placement training or sensitization at the department. To serve the purpose, simulation training using mattress uterine model was done to doctors in the obstetrics and gynecology department to imparting knowledge and positive attitude on BLS, HS and CSS for uterine atony management.

1.5 RATIONALE

The study provided knowledge, skills and a positive attitude to doctors on UCS. The knowledge and skills attained will help to reduce the rising PH incidence and its associated co-morbidities to patients by applying UCSs instead of hysterectomy while managing PPH due to uterine atony and some morbid adherent placenta. It will help to preserve fertility for some women especially the young ones. To MUHAS and MNH-OBGY departments, the training approach and the uterine model designed may help in teaching other doctors and medical students the application

of UCS in the management of PPH due to uterine atony and/ or the associated PPH due to some morbid adherent placenta.

1.6 Research question

What is the effect of UCS placement simulation training on self-perceived knowledge, skills, and attitude in UCS for the management of PPH at MNH?

1.7 OBJECTIVES

1.7.1 Broad objective

To determine the effect of UCS simulation training on self-perceived knowledge, skills, and attitude in UCS placement for the management of PPH at MNH.

1.7.2 Specific objectives

1. To determine the proportion of doctors who ever attended UCS placement training with practical and/ or simulation components.
2. To compare the levels of self-perceived knowledge, and attitude on B-Lynch, Hayman, and Cho sutures before and after training.
3. To evaluate the immediate relevance of the UCS simulation training.

2.0METHODOLOGY

2.1 Study design

The study was an interventional cross-sectional study

2.2 Study population

Doctors working in the obstetrics department at MNH-Upanga campus

2.3 Study area

Department of OBGY Muhimbili National Referral Hospital-Upanga

It is the largest hospital in Tanzania. It has two campuses, the first situated at Upanga, Ilala district in Dar es Salaam city while the second campus is at Mloganzila Ubungo district in Dar es Salaam. The study was done at MNH-Upanga only. It is the largest campus with 90% of obstetricians and registrars as compared to the latter and hence easy to get many participants at a time. It serves patients who come directly from home and referral patients mainly from hospitals in Dar es Salaam city (with a population of about 6 million people) and all over the country. It serves also as a teaching hospital for MUHAS and St. Joseph University. The referred patients to the obstetrics and gynecology department from within the Dar es Salaam city are normally emergency cases while those outside the city most of them are of chronic illnesses.

The obstetrics department has two maternity blocks and an annex that serves as a post-operative ward for private patients. One main block comprises four antenatal and postnatal wards each with a capacity of 50 beds, labor ward, neonatal wards, and the intensive care unit (ICU). The other block, has private antenatal and postnatal wards, antenatal care (ANC) services, and a Kangaroo Mother Care unit. The department has a theatre near the main maternity block with four operating rooms, two for emergency procedures and two for electives. The department works in four firms in which doctors; - gynecologists, residents, registrars, and intern doctors are divided into four groups in respect to the main four antenatal and postnatal wards. At the moment, each firm has an average of 6 gynecologists, 14 residents, 2 registrars, and 6 intern doctors. The department has daily morning report meetings from Monday to Friday which are

done in one room in the main maternity block. On Tuesday the meeting is done in the outpatient department building in a large room, and it includes all health workers in the department. On this day various presentations are done but mostly the maternal and perinatal audit review.

About 60% of the patient admitted to MNH-Upanga for obstetrics care are referrals and 75% of caesarian section (CS) done are emergencies. It is estimated to conduct 9000 deliveries per year with a rate of CS approximately 59%(28).Most emergency caesarian sections are done by residents except hysterectomy which most of the time are done by Obstetricians or residents under the supervision of obstetrician. In PPH management, the department protocol recommends the use of medical methods first when uterine atony is the cause. When the medical method fails, the next step is surgical interventions which include: uterine and/ or vaginal tamponade, hemostasis brace suture application (i.e. B-Lynch or Hayman compression suture), bilateral ligation of uterine arteries and hysterectomy in cases of uterine rupture, placenta accreta or uncontrolled massive hemorrhage. The mechanical method with uterine balloon tamponade has been emphasized especially in the 2016 to 2018 period as the second option when medical management fails(14). It included training of all nurses, registrars, residents, and obstetrician in the department. However, for over 2 years now it has been less used due to the lack of UBT kits. Therefore, at the moment, when medical management and temporary mechanical compression fail to control PPH, hysterectomy has been used most of the time.

2.4Sample size and Sampling method

Convenience sampling was used, where all doctors involving directly in decision-making and performs both emergency and elective caesarian sections (Registrars, Residents and Obstetricians only) available at the training day were involved. This was important because this training approach had not been applied at the department before, therefore, using the doctors who are expert in the field with at least basic surgical skills helped to evaluate the training before it is used for interns, medical students and theatre staffs. Moreover, the available space, time and materials for the training were not adequate for all other medical workers in the department.

2.5 Study variables

2.5.1 The independent variable

The independent variable was simulation training on UCS

2.5.2 The dependent variables

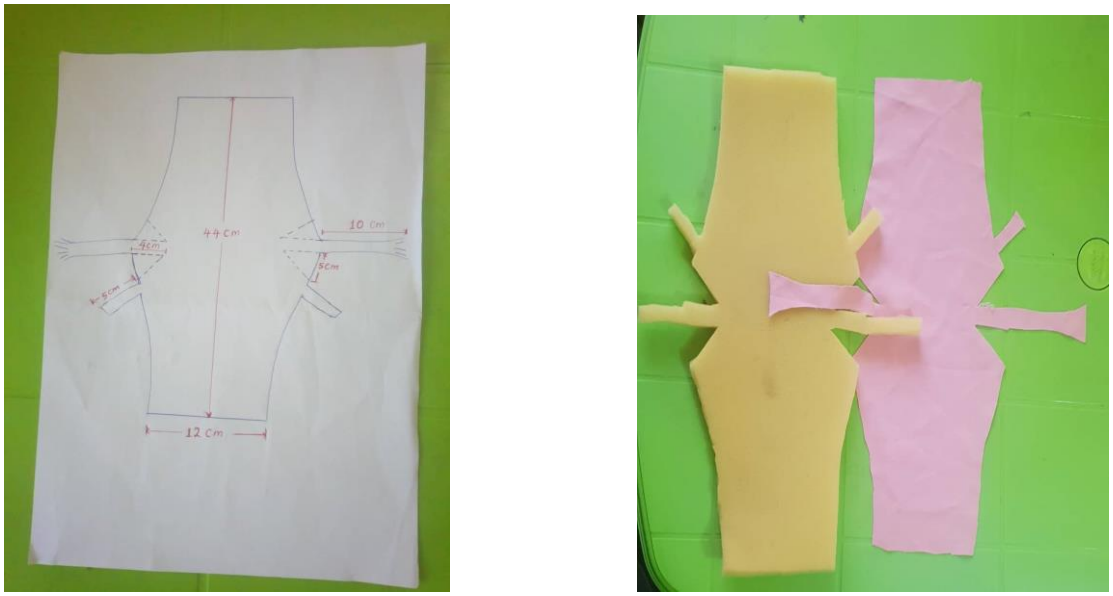
The dependent variables were knowledge, skills, and attitude on UCS

2.6 Data collection

2.6.1The uterine model construction

We used locally available materials to design the uterine model. The materials were pieces of mattress, fine slightly elastic pale-pinky piece of cloth, sewing needle and thread and clipboard. All materials were available in respective street shops.

The uterine model was prepared by cutting both the mattress and a piece of cloth in a shape that the middle part is broader with thin extensions bilaterally (to serve as fallopian tube) at the same level while the ends are tapered progressively from the broader middle part. Another two extensions 5 cm from the middle toward one of the tapered end and 4cm long were made (to serve as an ovarian ligament). The length from one tapered end to the other was 44cm; the middle part width was 20cm while the width of the tapered ends was 12cm. The extension process length was 10cm each while the thickness of the mattress was 1 to 2 cm. In either side of the mid extensions at the proximal part, triangular cut sections excised (4*5 cm inward and laterally respectively). This was important for a sloping appearance of the model at the fundus (figure5 below shows the dimensions and cut sections).



(a) (b)

Figure 5: Cut sections of a sketch map and pieces of mattress and cloth

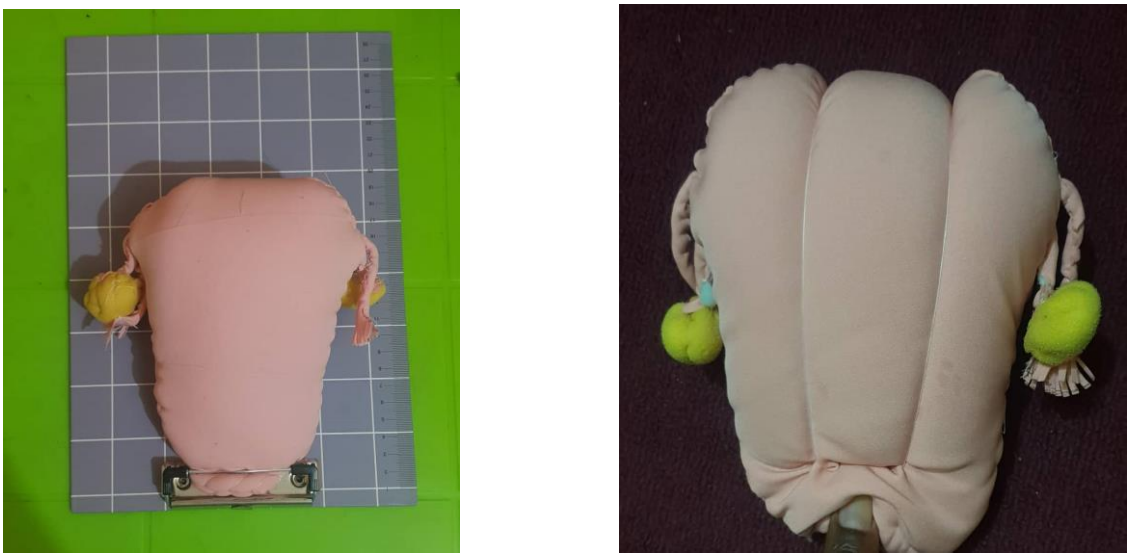
(a)Sketch map cut-section dimensions, (b) Cut section of pieces of Mattress and fine cloth

Next, the cut pieces of mattress and cloth were adhered together with staples and folded, the piece of cloth being outward (figure 6). The mattress acted as myometrium while the piece of cloth on top was the peritoneal layer of the uterus (serosa). The tapered ends created the lower segment of the uterus while the middle part with its extensions formed the uterus fundus and fallopian tubes respectively. Other small pieces of the mattress were placed inside at fundus to improve the appearance of the uterine model.

(a) **(b)**

Figure 6: Adhering and folding the pieces of mattress and cloth

(a) Adhering the mattress **(b)** Folding and suturing using Cornelius's technique



(a) (b)

Figure 7: The uterine model is ready

(a) Uterine model on the clipboard (b) uterine model with compression sutures in situ

2.6.2 The PowerPoint presentation preparation

The presentation prepared had an introduction which consisted of a general overview on PPH, the cause, and general algorithm in management of PPH due to uterine atony. It continued with uterine compression suture description, classification, effectiveness, and its importance. It outlined complications, possible causes, and ways to avoid (minimize) such complications. As a vivid example, five cases managed with UCS following PPH were presented. These procedures were done between January and December 2020 by the principal researcher. Finally, the presentation had a mnemonic (COMPASS) designed by the principal researcher. The mnemonic was designed to help doctors remember the important steps and requirements while applying UCS to patients. The presentations as well the uterine model were reviewed by two consultant-Obstetricians who gave technical comments and approval. The PowerPoint presentation is attached as supplement material.

2.6.3 Data collection tool

Two self-administered structured questionnaires were developed, for pre and post-training. The questionnaires were of English Version only because all doctors in Tanzania are familiar with the English language. The pre-training questionnaire had two main parts. The first part had five questions, comprised of demographic characteristics of the participants and general information on surgical management of PPH. The second part with eight questions concerned with information on previous UCS training, experience, knowledge, skills and, attitude on UCS techniques. It comprised “Yes” “No” and Likert scale questions. The post-training questionnaire had three Likert scales and one "Yes" "No" question to assess perceived levels of knowledge, skills, attitude, and usefulness of the training respectively.

2.6.4 The Research assistant

The principal investigator (PI) was assisted by one obstetrician as an assistant researcher (AR). Two days prior to simulation training, the PI and AR went through the PowerPoint presentation and then practical application of UCS placement on the uterine model was done. This was important so that both were familiar with all important steps during the actual training day.

2.6.5Pretesting the questionnaires and uterine model

Pre-testing of the questionnaires and the uterine model was done at Sinza hospital-Dar es Salaam. The questionnaire’s questions' clarity and length were evaluated. On the uterine model, UCS techniques were applied to evaluate the validity of the model before the actual training day.

2.6.6 The training method

It was done once, in the OBGY morning report. Permission from the head of the department was granted. On this day there was no usual morning report meeting instead, the whole time was used for training. Doctors What Sapp groups were used to advertise the day of training two weeks before the date of the training. Verbal emphasis on the training was done also to individual doctors and through daily morning report meetings.

The simulation training took one and a half hours. Before training, the participants signed the consent form and the pre-training questionnaire. The training had two parts.

The first part was a theory on UCSs over 30minutes using PowerPoint. The presentation focused on the overview of PPH, theoretical teaching on BLS, HS, and CSS techniques. It included some possible complications of UCS, the possible causes, and possible ways to avoid such complications. A summary of 5 case reports of PPH managed by UCSs at MNH was finally presented as examples.

The second part was practical which was done for 1hour. In this session, the above-named UCS techniques were trained. Participants were in pairs, in two columns of tables each pair with the uterine model, needle and, thread. The principal researcher and one obstetrician facilitated the session. While explaining, the principal researcher and the obstetrician showed the first BLS technique using the model then the participants did it on their models. When all participants had mastered it, the HS technique was shown then the CSS technique. The participants were allowed to ask questions any time during training so that no one was left behind. The PI and AR moved around the two columns of tables to supervise and to make sure all participants have mastered the techniques.

2.6.7 Data collection procedure

The principal researcher explained the purpose of the study before starting the training. Sincerity before filling the questionnaire was emphasized. Each participant was provided with a number as his/her identity to be used in both questionnaires. First, the Pre-training questionnaire was given to participants to fill it before UCS technique training. Immediately after training the post-test questionnaire was given to participants to fill it too.

2.7 Data analysis

Data were coded, entered, and analyzed using a statistical package for social sciences (SPSS) software version 23.0. Analysis of participants' age was done using the measure of central tendency and their corresponding measure of dispersion. For nominal variables; sex, doctors' qualification, types of surgical techniques, and "Yes/No" data were analyzed using frequencies

and percentages. The data were summarized in frequency distribution tables and bar charts. The first objective was analyzed by taking the proportion of participants that had previous UCS practical training over the total number of participants. The proportion was expressed in percentage. The third objective was analyzed Using three variables: - knowledge, skills, and attitude (feeling able to). A Likert scale with 5 points was used for each variable. Very low or strongly disagree equal to 1 point, low or disagree 2 points, medium or neutral 3points, high or agree 4 points, and very high or strongly agree equal to 5points. Each participant scored him/herself on the three variables on each UCS technique in both pre and post-training. Since the data did not follow a normal distribution, a nonparametric-Wilcoxon matched-pairs signed-rank test was used to compare the scores for each variable in pre and post-training using median and range. A p-value of < 0.05 was considered statistically significant. The fourth objective was analyzed through the proportion of participants answering "Yes" to the question "was the simulation training helpful?" over all participants. The proportional is expressed in percentage. After analysis, the filled questionnaires were stored in a locker with a key. The summarized and analyzed data were stored electronically password-protected database. The data will be accessible only to MUHAS and MNH when needed.

2.8 Ethical clearance

Ethical clearance was obtained from the MUHAS senate Research and publication committee and permission to research from MNH Executive Director. For the training, permission from the head of the OBGY-MNH department was requested and so the training was done. No names of participants were used. The informed consent form was signed before training. After training, the uterine models were distributed to the OBGY department and MUHAS so that doctors and students continued with the practice.

2.9 Dissemination Plan

The dissertation report will be presented first at MUHAS and MNH conferences and will be made available at the library. The findings will be used to prepare a manuscript for publication in peer review journals.

3.0 RESULTS

Sixty-nine participants (78.4% of expected participants) completed the training and pre and post-training survey. Forty-nine (71.01%) were residents equivalent 87.5% of all expected Residents, 15 (21.7%) Obstetricians equal to 62.5% of all expected obstetricians and 5 (7.3%) Registrars equal to 62.5% of all expected Registrars. The majority of participants' age was between 30 and 39 years (56.5%). Fifty-one (73.91%) participants reported were able to manage PPH using surgical methods confidently. The commonest surgical method reported was hysterectomy 33 (47.82%). The B-Lynch suture technique was the most known by participants (91.3%) (table1.)

Table 1: Participants demographic and general characteristics

Characteristics	n (%)
Age (years)	
≤ 29	9 (13.0)
30 and 39	39 (56.5)
≥40	21 (30.5)
Mean age (±SD)	37 (±7.8)
Sex	
Male	42 (60.9)
female	27 (39.1)
Qualifications	
Registrar	5(07.3)
Resident	49 (71.0)
obstetrician	15 (21.7)
Confidence in management of atonic PPH by surgical method	
Yes	51(73.9)
No	18 (26.1)
The most frequent surgical methods used in the Management of uterine atony	
Uterine artery ligation	4 (08.8)
Hysterectomy	33 (47.8)
Uterine Compression suture	14 (20.3)
Not able to apply any method	18(26.1)
Knowledge on B-Lynch suture	
Yes	63 (91.3)
No	6(08.7)
Knowledge on Hayman suture	
Yes	30 (43.5)
No	39 (56.5)
Knowledge on Cho suture	
Yes	9 (13.0)
No	60 (87.0)

1. **Participants with previous UCS Practical training**

Nine participants (13%) reported having previous UCS training with practical sessions, see figures7 below.

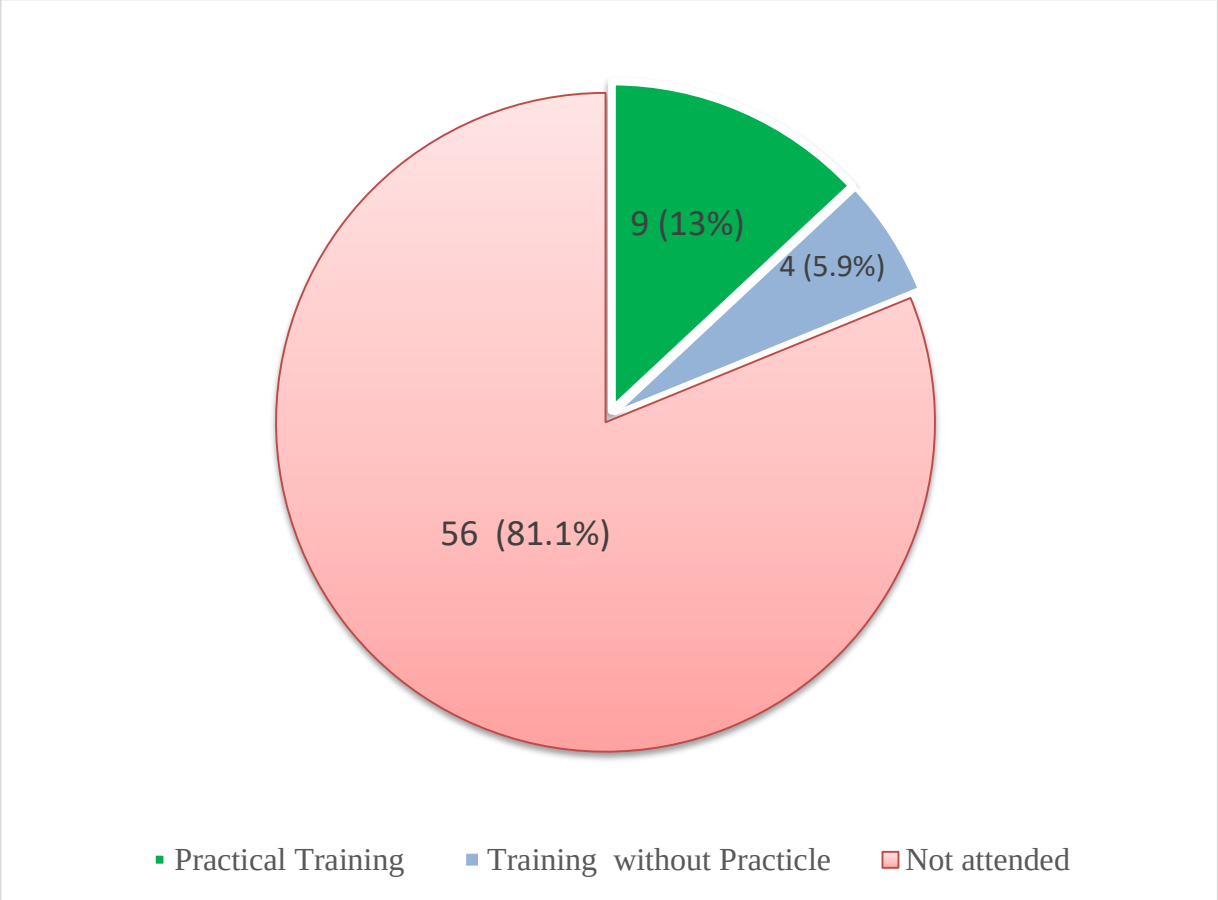


Figure 8: Pie chart showing Participants previous UCS training status

2.Comparison of pre and post-training scores

(a) Comparison of all participants' pre and post-training scores

Statistically, there was a significant improvement in self-perceived levels of knowledge, skills, and attitude (feel) to apply UCSs after training on B-Lynch, Hayman, and Cho sutures. The median scores before training were between 1 and 3 except on the attitude on B-lynch suture which was 4. The score range was 1-5. Post-simulation, the median score improved to 5 (100%) with range (3 - 5) in all 3 domains (p-value<0.001). Table 2 below summarizes the results.

Table 2: All participants' pre and post-training scores on knowledge, skills, and attitude on UCS

	Score before training		Score after training		
VARIABLE UCS technique	**Median**	**Range**	**Median**	**Range**	**P-value**
Knowledge					
B-Lynch	3.0	1 - 5	5.0	3 - 5	<0.001
Hayman	2.0	1 - 5	5.0	3 - 5	<0.001
Cho sutures	1.0	1 - 5	5.0	3 - 5	<0.001
Attitude*					
B-Lynch	4.0	1 - 5	5.0	3 - 5	<0.001
Hayman	3.0	1 - 5	5.0	3 - 5	< 0.001
Cho sutures	2.0	1 - 5	5.0	3 - 5	<0.001

*attitude was evaluated on the component" feeling"; if the participants felt could apply UCS techniques or not

(b) Score comparison according to doctor's qualifications

All groups had statistically significant improvement in median scores after training (all groups' p-value < 0.05). Table 4 below shows the results summary

Table 3: Median score across doctors' sub groups

VARIABLE (UCS technique)	Registrars (n=5)			Residents(n=49)			Obstetricians(n=15)		
	Training score		P-value	Training score		P-value	Training score		P-Value
	Before Median (Range)	After Median (Range)		Before Median (Range)	After Median(Range)		Before Median (Range)	After Median (Range)	
Knowledge									
B-Lynch	3.0 (2 - 4)	5.0 -	0.039	3.0 (1 - 5)	5.0 (3 - 5)	<0.001	4.0 (2 - 5)	5.0 (3 - 5)	0.010
Hayman	1.0 (1 - 4)	5.0 -	0.034	1.0 (1 - 5)	5.0 (3 - 5)	<0.001	3.0 (1 - 5)	5.0 (3 - 5)	0.005
Cho	1.0 (1 - 3)	4.0 (3 - 5)	0.042	1.0 (1 - 4)	5.0 (3 - 5)	<0.001	1.0 (1 - 5)	5.0 (3 - 5)	0.001
Attitude									
B-Lynch	4.0 (2 - 4)	5.0 -	0.034	4.0 (2 - 5)	5.0 (4 - 5)	<0.001	4.0 (1 - 5)	5.0 (3 - 5)	0.034
Hayman	1.0 (1 - 4)	5.0 -	0.039	1.0 (1 - 5)	5.0 (4 - 5)	<0.001	3.0 (2 - 5)	5.0 (3 - 5)	0.011
Cho	1.0 (1 - 3)	4.0 (4 - 5)	0.042	1.0 (1 - 5)	5.0 (3 - 5)	<0.001	3.0 (1 - 5)	5.0 (3 - 5)	0.020

(c) Comparison of Pre and post-training scores for participants with prior practical UCS training

Comparing the participants who had UCS practical training previously, there was still statistically significant improvement of median score post-simulation except for knowledge on B-Lynch suture (p-value 0.180). Table 4 below

Table 3: Participants' with previous UCS practical training: pre and post-simulation comparison of median scores (n=9)

	Score before training		Score after training		
VARIABLE UCS technique	**Median**	**Range**	**Median**	**Range**	**P-value**
Knowledge					
B-Lynch	5.0	3 - 5	5.0	4 - 5	0.180*
Hayman	2.0	3 - 5	5.0	4 - 5	0.020
Cho sutures	1.0	1 - 5	5.0	3 - 5	0.011
Attitude					
B-Lynch	4.0	1 - 5	5.0	-	0.039
Hayman	3.0	3 - 5	5.0	4 - 5	0.023
Cho sutures	2.0	3 - 5	5.0	3 - 5	0.041

***** Knowledge on B-Lynch was higher to participants with previous practical UCS training even before our training.

3. The overall UCS simulation training evaluation

On answering the question "was the training useful" Post training, 68 (98.6%) of participants agreed that the simulation training was useful.

4.0 DISCUSSION

We found that, simulation training improved self perceive knowledge, and attitude on UCSs. The pre training survey showed that a small number of doctors had attended UCS training previously with practical components. The majority of participants agreed that the training was useful.

Simulation and/ or practical training are the key factors for surgical procedure learning. In our survey before training, the number of participants that had attended UCS training previously was low. One study in UK reported nearly similar findings (14). However, other two studies reported slightly higher proportion (17,23). The higher proportional in the later two studies may be due to; their studies were multicenter based survey.

We found that, following practical training, there was marked improvement in self perceived knowledge and attitude to apply UCS in the management of PPH. Other studies have shown the same results(19–21). Some studies have reported persistence of knowledge acquired after simulation even more than a year since last training(20).

In our training, we noted that the participants with previous practical training on UCS showed no improvement of their perceived knowledge on BLS. Their pre training scores were comparable to the scores post training. The same finding was reported in a survey by Vetere et al. (19). Nevertheless, there was an improvement of knowledge and attitude statistically in HS and CS. Our results outline that, BLS technique is the most known, trained, and spoken among other UCS techniques. This has been shown in other studies that the single most UCS technique trained and reported is BLS technique (8,12,24). The results signify the importance of UCS technique training and may explain the reason why the participants with previous training had higher knowledge only on BLS in pre training survey. In our study survey, the majority of participants were aware with BLS while CS was the least known UCS technique participants.

Teaching by simulation is now considered as a bridge between theoretical and actual practice especially for rarely occurring conditions and it helps doctors in building skills and confidence (11,14,18,19,21,25). It is important because currently there have been an increase in the number of students than the number of teachers and the available space in the theatre to learn surgical procedures. In our study, most of the participants agreed that the simulation was helpful. The same response was expressed by participants in simulation training of PPH management done in Nigeria and France. In these countries, the curriculum of teaching by simulation has been proposed already(18,21,25,26).

STUDY LIMITATIONS

Participants did self-assessment; hence information provided could be biased. Moreover, the principle researcher was junior (resident) before the obstetricians, this could result into courtesy bias. The uterine model was non biological; therefore, the skills attained might not be actual clinical but perceive skills only.

STUDY STRENGTH

In this study we have invented a new uterine low cost model which can be of great help in simulation training not only for UCS placement but also for other obstetrics and gynecology conditions and procedures demonstration like; caesarian section

The majority of participants (residents) were from different regions in Tanzania and outside Tanzania. This will help spread the knowledge, and skill to other health workers easily. The study approach may have opened further research areas regarding emergence obstetric procedures evaluation and hence set procedure drill protocols to medical practitioners and students.

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Simulation training of UCS placement techniques was reported low. The training on uterine compression suture techniques using mattress uterine model showed significant improvement on self-perceived knowledge and attitude in applying BLS, HS, and CSS in the management of PPH. The model and approach developed can be adopted by teaching institutions and hospitals to teach students and doctors at work respectively.

5.2 Recommendations

Uterine compression sutures are relatively newer procedures. To know these techniques and put them to use, regular simulation training are needed and should be done repeatedly in the department to updates skill for newly recruited staff and postgraduate students. Instead of self-assessment, there should be actual questions about UCS so that the participants are evaluated objectively to minimize the information bias. In addition to that, there could be a regular follow-up of participants, evaluating the persistence of knowledge attained at an interval of 6 to 12 months.

REFERENCES

1. FIGO Committee, Health S motherhood and newborn. Prevention and treatment of postpartum hemorrhage in low-resource settings ☆. Int J Gynecol Obstet [Internet]. 2012;117:108–18. Available from: https://www.sigo.it/wp-content/uploads/2015/10/FIGO-Guidelines_Prevention-and-Treatment-of-PPH-etc1.pdf

2. World Health Organization. WHO recommendations for the prevention and treatment of postpartum haemorrhage [Internet]. Geneva; 2012. Available from: http://apps.who.int/iris/bitstream/handle/10665/75411/9789241548502_eng.pdf?sequence=1

3. ACOG committee. Postpartum Haemorrhage. Clinical Management Guidelines for Obstetrician-Gynecolgists. In: Practice Bulletin Number 183 [Internet]. Washington,DC: The American College of Obstetrics and Gynecologist; 2017. p. e168–86. Available from: https://journals.lww.com/greenjournal/Abstract/2017/10000/Practice_Bulletin_No__183__Postpartum_Hemorrhage.56.aspx

4. Ayadi AM El, Robinson N, Geller S, Miller S. Advances in the treatment of postpartum hemorrhage. Expert Rev Obstet Gynecolgy [Internet]. 2013;8(6):525–37. Available from: https://www.tandfonline.com/doi/abs/10.1586/17474108.2013.847622

5. Aflaifel N. " Postpartum haemorrhage : new insights from published trials and the development of novel management options " [Internet]. University of Liverpool; 2015. Available from: https://core.ac.uk/download/pdf/80773123.pdf

6. Natarajan A, Alaska A, Nelson BD, Ahn R, Oguttu M, Dulo L, et al. Provider experiences with improvised uterine balloon tamponade for the management of uncontrolled postpartum hemorrhage in Kenya. Int J Gynecol Obstet [Internet]. 2016;135(November):210–3. Available from: http://dx.doi.org/10.1016/j.ijgo.2016.05.006

7. Bishanga DR, Charles J, Tibaijuka G, Mutayoba R, Drake M, Kim Y, et al. Improvement in the active management of the third stage of labor for the prevention of postpartum hemorrhage in Tanzania : a cross-sectional study. BMC Pregnancy Childbirth [Internet]. 2018;18(Jun 13):1–10. Available from: https://doi.org/10.1186/s12884-018-1873-3

8. Pembe AB, Paulo C, Brenda SD, Roosmalen J Van. Maternal mortality at muhimbili national hospital in Dar-es-Salaam , Tanzania in the year 2011. BMC Pregnancy Childbirth [Internet]. 2014;14(September):1–7. Available from: https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/1471-2393-14-320

9. B-Lynch C, Coker A, Lawal AH, Abu J, Cowen MJ. The B-Lynch surgical technique for the control of massive postpartum haemorrhage : an alternative to hysterectomy ? Five cases reported. Br J Obs Gynecol [Internet]. 1997;104(March):372–5. Available from: https://obgyn.onlinelibrary.wiley.com/doi/abs/10.1111/j.1471-0528.1997.tb11471.x

10. Matsubara S, Yano H, Ohkuchi A, Kuwata T, Usui R, Suzuki M. Uterine compression sutures for postpartum hemorrhage : an overview. 2013;92(January):378–85.

11. Bischoff K, Lehane C, Lang B, Meerpohl J, Schmucker C. Lack of controlled studies investigating the risk of postpartum haemorrhage in cesarean delivery after prior use of oxytocin: A scoping review. BMC Pregnancy Childbirth. 2017 Nov 29;17(November):1–13.

12. Hayman RG, Arulkumaran S, Steer PJ. Uterine Compression Sutures : Surgical Management of Postpartum Hemorrhage. 2002;99(3):502–6.

13. Cho JH, Jun HS, Lee CN. Instruments & Methods. 2000;96(1):129–31.

14. Burke TF, Danso-Bamfo S, Guha M, Ogutttu M, Tarimo V, Nelson BD. Shock progression and survival after use of a condom uterine balloon tamponade package in women with uncontrolled postpartum hemorrhage. Int J Gynecol Obstet. 2017;138(October):34–8.

15. Pembe AB, Wangwe PJT, Massawe SN. Emergency peripartum hysterectomies at Muhimbili National Hospital , Tanzania : a review of cases from 2003 to 2007. Tanzan J Health Res. 2012;14(1):1–10.

16. Spiegelman J, Sheen JJ, Goffman D. Readiness: Utilizing bundles and simulation. Semin Perinatol [Internet]. 2019;43(1):5–10. Available from: https://doi.org/10.1053/j.semperi.2018.11.002

17. Kerbage Y, Debarge V, Lucot JP, Clouqueur E, Rubod C. Simulation of poatpartum hemorrhage surgery. Eur J Obstet Gynecol Reprod Biol [Internet]. 2016;201(Jan):27–30. Available from: http://dx.doi.org/10.1016/j.ejogrb.2016.03.013

18. Lumbreras-marquez MI, Campos-zamora M, Laura A, Avila R, Soto-galindo JC, Olivas-chavez JC, et al. Training for the surgical management of postpartum hemorrhage : a multicenter survey of resident physicians. J Matern Neonatal Med [Internet]. 2019;0(0):1–7. Available from: https://doi.org/10.1080/14767058.2019.1685974

19. Ghaem-Maghami S, Brockbank E, Bridges J. Survey of surgical experience during training in obstetrics and gynaecology in the UK. J Obstet Gynaecol (Lahore) [Internet]. 2006 Jan 2;26(4):297–301. Available from: http://www.tandfonline.com/doi/full/10.1080/01443610600594740

20. Pereira A, Nunes F, Meirinho M. Compressive Uterine Sutures to Treat. 2005;106(3):5–8.

21. El-Hamamy E, Wright A, B-Lynch C. The B-Lynch suture technique for postpartum haemorrhage: A decade of experience and outcome. J Obstet Gynaecol (Lahore). 2009 May;29(4):278–83.

22. CEMACH. Improving care for mothers, babies and children: CEMACH-Why Mothers die 2000-2002, [Internet]. London: The RCOG Press; 2004. Available from: https://stratog.rcog.org.uk/sites/default/files/Gynaecological emergencies/CEMACH_Why_Mothers_Die_00-02_2004.pdf

23. Vetere PF, Wayock CP, Muscat J, Sicuranza G. A Novel Approach to Teaching Placement of a B-Lynch Suture: Description of Technique and Validation of Teaching Model. J Grad Med Educ. 2012;4(3):367–9.

24. Vadnais MA, Dodge LE, Awtrey CS, Ricciotti HA, Golen TH, Hacker MR. Assessment of long-term knowledge retention following single-day simulation training for uncommon but critical obstetrical events. 2012;25(9):1640–5.

25. Quinn KH, Mackey A, Cohen J, Smith SJ. A curriculum to teach and evaluate resident skills in the management of postpartum hemorrhage *. J Perinat Med. 2012;40(6):635–9.

26. Chuang M, Fazzari MJ, Kaplan J, Banks EH. A Low-Cost Trainer for the Surgical Management of Postpartum Hemorrhage. 2020;15(4).

27. Chukwu N. Simulation Based Post-Partum Hemorrhage Training in Nigeria : A Pilot Project. San Francisco; 2017.

28. Mgaya AH. Improving the quality of caesarean section in a low-resource setting [Internet]. Uppsala; 2017. Available from: https://uu.diva-portal.org/smash/get/diva2:1086307/FULLTEXT01.pdf

29. Seufert, M J, Chokshi, P R, Wishall, M. K, et al. Knowledge of the B-Lynch Brace Suture Technique Among Obstetrics and Gynecology Resident Physicians. 2015;31(3):151–4.

30. Martineria L, Rasoaherinomejanahary F, Ronot M, Fournier P, Dousset B, Tesniere A, et al. Health Care Simulation in Developing Countries and Low-Resource Situations. JCEHP. 2018;38(3):205–12.

APPENDICES

Appendix I. Questionnaire

Serial No._____

PRE-TRAINING QUESTIONNAIRE ON UTERINE MODEL-BASED SIMULATION TRAINING ON UTERINE COMPRESSION SUTURES PLACEMENT FOR MANAGEMENT OFPOSTPARTUM HEMORRHAGE AT MUHIMBILI NATIONAL DAR ES SALAAM

PART I: DEMOGRAPHIC DATA AND GENERAL INFORMATION ON SURGICAL MANAGEMENT OF PPH

Instruction: Please, answer the questions honestly.

1. Age (years)_____

2. Sex: Tick in the box below;-

1= Male	
2 = Female	

3. Qualification as doctor;-

1= Registrar	
2= Resident	
3= obstetrician	

4. Are you confident in the management of PPH due to atony requiring surgical intervention?

1= Yes	
2 = No	

If yes answer question 5

5. Which surgical method do you use often in the management of uterine atony when medical and mechanical methods fail? Tick only one method in the table below ;

SURGICAL METHOD		ANSWER
1	Uterine artery ligation	
2	Hysterectomy	
3	Uterine compression suture placement	

PART II: COMPRESSION SUTURES

6. Theoretically, do you know (in terms of what is it? how is it done? Indications, suture material used, possible complications) B-Lynch, Hayman, and Cho uterine compression sutures techniques? In each type of compression, suture tick your response in the table below;-

Types of uterine compression suture		YES	NO
1	B-LYNCH SUTURE		
2	HAYMAN SUTURE		
3	CHO SQUIRE SUTURE		

7. What is your level of knowledge on B-Lynch, Hayman, and Cho uterine compression sutures techniques? In each method, tick your response in the table below;-

Types of uterine compression suture		**Response (Theoretical knowledge)**				
		1= Very low	2= low	3= medium	4= High	5= Very high
1	B-LYNCH SUTURE					
2	HAYMAN SUTURE					
3	CHO SQUIRE SUTURE					

8. Have you ever attended any uterine compression suture training/ workshop? _

1= Yes	
2 = NO	

If yes, answer question 9 below.

9. Were there any practical components (hands-on) in your training/learning? Tick your response in the table below ;

1= Yes	
2 = NO	

10. Have you ever seen any uterine compression sutures applied in practice?

1= Yes	
2 = NO	

11. Have you ever performed any uterine compression suture technique in PPH management?

1= Yes	
2 = NO	

12. What is your level of practical skill (even if you haven't done one) on B-Lynch, Hayman, and Cho uterine compression suture techniques? Tick your response in the table below;-

Types of uterine compression suture		**Response (practical skills)**				
		1= Very low	2= low	3= medium	4= high	5= Very high
1	B-LYNCH SUTURE					
2	HAYMAN SUTURE					
3	CHO SQUIRE SUTURE					

13. Do you feel you can apply uterine compression sutures if the need arises while managing PPH? In each of the three techniques (B-Lynch, Hayman, and Cho), tick the appropriate response in the table below.

Types of uterine compression suture		**Response**				
		1= strongly disagree	2= disagree	3= neutral	4= agree	5= strongly agree
1	B-LYNCH SUTURE					
2	HAYMAN SUTURE					
3	CHO SQUIRE SUTURE					

Serial No_____

POST TRAINING QUESTIONNAIRE ON PRE-TRAINING QUESTIONNAIRE ON UTERINE MODEL-BASED SIMULATION TRAINING ON UTERINE COMPRESSION SUTURES PLACEMENT FOR MANAGEMENT OF POSTPARTUM HEMORRHAGE AT MUHIMBILI NATIONAL DAR ES SALAAM

After this training; -

1. What is your level of knowledge on B-Lynch, Hayman, and Cho uterine compression sutures techniques? In each method, tick your response in the table below;-

Types of uterine compression suture		**Response (Theoretical knowledge)**				
		1= Very low	2= low	3= medium	4= high	5= Very high
1	B-LYNCH SUTURE					
2	HAYMAN SUTURE					
3	CHO SQUIRE SUTURE					

2. What is your level of practical skills on B-Lynch, Hayman, and Cho uterine compression suture techniques? Tick your response in the table below;-

Types of uterine compression suture		**Response (practical skills)**				
		1= Very low	2= low	3= medium	4= high	5= Very high
1	B-LYNCH SUTURE					
2	HAYMAN SUTURE					
3	CHO SQUIRE SUTURE					

3. Do you feel you can apply uterine compression sutures if the need arises while managing PPH? In each of the three techniques (B-Lynch, Hayman, and Cho), tick the appropriate response in the table below.

Types of uterine compression suture		**Response**				
		1= strongly disagree	2= disagree	3= neutral	4= agree	5= strongly agree
1	B-LYNCH SUTURE					
2	HAYMAN SUTUE					
3	CHO SQUIRE SUTURE					

4. Was the uterine model-based simulation training effective? _____

1= Yes	
2 = NO	

Appendix II: Consent Form

STUDY TITLE: UTERINE MODEL-BASED SIMULATION TRAINING ON UTERINE COMPRESSION SUTURES PLACEMENT IN POSTPARTUM HEMORRHAGE MANAGEMENT AT MUHIMBILI NATIONAL DAR ES SALAAM

PART I: INFORMATION

Dear Participant,

I am Francisco Mdiga Baraka, a resident in obstetrics and gynecology at Muhimbili University of Health and Allied Sciences (MUHAS). I would like to request you to participate in this research entitled *"uterine model-based simulation training on uterine compression sutures placement for the management postpartum hemorrhage at Muhimbili national Dar es salaam"***.** I am conducting this study as part of the postgraduate study program.

Aim: To assess self-perceived knowledge, skills, and attitude on UCSs after training.

Participation: Principal investigator and research assistants will give you two self-administered questionnaires pre and post-training respectively. You will answer the questions to the best of your knowledge and sincerity.

Confidentiality: All the information obtained will be kept confidential and will only be used for the intended study aim. Names will not be used.

Withdrawal right: Your participation in this study is voluntary and you may get out of the study any moment you wish after you have consented and no penalty shall be imposed on you.

Benefits: There is no financial incentive upon your participation in this study. The findings of this study will help us know what is known and not known about uterine compression sutures. It will help to evaluate if the hands-on training approach is effective in imparting knowledge, surgical skills, and confidence.

Injury/Harm: We do not expect any harm to you as a result of your participation in this study.

Who to contact: For any inquiry regarding this study please contact Dr. Francisco Mdiga Baraka, a resident doctor in the Obstetrics and Gynecology Department at the Muhimbili University of Health and Allied Sciences (MUHAS), who is the principal investigator of this

study; P.O Box 65001, Dar es Salaam, mobile +255753 781 755. Email: barakamdiga@gmail.com

For any questions about rights as a research participant, contact person Dr. Bruno Sunguya, the Director of Research and Publications Committee at MUHAS; P.O. Box 65001, Dar es Salaam, Tel: 022 2150302-6/ 252489.

PART II: CERTIFICATE OF CONSENT

I have read the above information/it has been read to me. I have had the opportunity to ask questions about it and any questions I asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Signature of the participant _____

Signature of researcher _____

Date of signed consent _____