STUDY REPORT | JUNE 2021

STUDY REPORT

Formative research to inform the development of interventions to improve timely blood access for obstetric patients with postpartum hemorrhage

August 23, 2021

Version 1.4

USAID FROM THE AMERICAN PEOPLE

POPULATION COUNCIL Ideas. Evidence. Impact.

Breakthrough RESEARCH FOR SOCIAL & BEHAVIOR CHANGE

URC

IMPLEMENTATION SCIENCE COLLABORATIVE

USAID'S HEALTH EVALUATION AND APPLIED RESEARCH DEVELOPMENT (HEARD) PROJECT

Title:

Formative research to develop interventions to improve timely blood access for obstetric patients with postpartum hemorrhage.

Investigators:

Principal Investigator name	Stephen Njolomole, MPH, MBBS
PI's current position	Assistant Lecturer (Hematology)
Institutional affiliation	University of Malawi, College of Medicine, Department of Pathology
Primary email	snjolomole@medcol.mw
Primary telephone #	+265993012997
Co Principal Investigator	Adamson Muula, PhD, MPH, MBBS
Co PI's Current Position	Professor of Epidemiology and Public Health
Institutional affiliation	University of Malawi, College of Medicine, School of Public Health and Family Medicine
Primary email	amuula@medcol.mw
Primary telephone #	+265884233486
Investigator	Bridon M'baya, MPH, PGD Trans.Medicine, MBBS, Medical Director, Malawi Blood Transfusion Service.
Investigator	Luis A Gadama, MMED (UCT), FRCOG (SA), MBBS, Head of Obstetric and Gynecology, University of Malawi, College of Medicine.
Investigator	Phylos Bonongwe, FMAS(India), FCOG(SA), MBBS, Head of Department of Obstetric and Gynecology, Queen Elizabeth Central Hospital, Ministry of Health
Investigator	Benson John, MPhil, Bsc, Lecturer, Demography. University of Malawi. Chancellor College.
Investiagtor	Evans Storey, BSc (Hons) Medical Laboratory Sciences, Acting Laboratory Manager, QECH, Ministry of Health.
Investigator	Slyvester Chabunya, MBBS, Assistant Lecturer, Hematology

Institutions involved:

1. **University of Malawi, College of Medicine**
2. **Malawi Blood Transfusion Service**
3. **Ministry of Health:**
   a. Queen Elizabeth Central Hospital
   b. Mulanje District Hospital

Executive summary

Introduction

Postpartum Hemorrhage (PPH) is commonly defined as blood loss in excess of 500 mL within 24 hours after vaginal delivery and > 1000 mls after Cesarean Section birth, within the same timeframe. Worldwide, nearly a quarter of all maternal deaths are associated with PPH. Despite global progress and interventions to address PPH, it remains the leading cause of maternal death in most low-income countries. Although Malawi's maternal mortality ratio has shown a moderate decline, it continues to be among the highest in Sub-Saharan Africa at 439 per 100,000 live births for the period between 2008 and 2015. According to the Malawi National Statistics Office, obstetric hemorrhage remains the most common cause of maternal death.

Problem studied

Blood access challenges faced by maternal health providers and PPH patients.

Study Justification

Given that obstetric hemorrhage is one of the leading causes of maternal deaths in Malawi, coming up with evidence-based interventions to improve access to blood and blood products for obstetric patients with PPH is critical to saving women's lives.

Main and Sub-objectives

The primary objectives of this study were to 1) investigate challenges to obtaining adequate blood for PPH patients at Queen Elizabeth Central Hospital (QECH) and Mulanje District Hospital (MDH), and 2) identify strategies to overcome these challenges. More specifically, we reviewed outcomes of cases for which blood was requested for transfusion for obstetric cases at QECH and MDH; measure the demand and supply of blood for PPH cases at QECH and MDH; and identify the gaps in carrying out the blood transfusion process at QECH and MDH from January to March 2020 (preCOVID-19, retrospective), May to July 2020 (retrospective) then September to November 2020 (prospective). Additionally, we assessed the impact of COVID-19 on the number of blood units supplied to QECH and MDH from April 2020 to November 2020.

Methodology

This was a cross-sectional study. We employed a mixed methods approach. Both qualitative and quantitative methods were used. The qualitative study addressed the main objectives while the quantitative study addressed the sub objectives.

Qualitative Data Collection

The qualitative study entailed conducting in-depth interviews (IDI) with key informants of which maternal health providers and laboratory personnel at QECH, MDH and MBTS constituted the majority of the participants. Eligibility were those who had worked at the sites (maternity units and laboratory) for at least 6 months and willing to provide informed consent. For other key informants, stakeholder eligibility was defined as those who had the respective status or role for 6 months and willing to provide informed consent. We also invited a sample of women who had experienced a PPH during the study period to participate in IDIs.

Quantitative Data Collection

The quantitative study entailed abstracting information from patient case notes for 9 months, 6 months retrospectively and 3 months prospectively. Only case notes of those patients who had or were diagnosed to have PPH, as per the WHO definition, were the focus of the study. However, in order to get an overview of the blood use and requests, all clients who had blood requested were enrolled. Four paid research assistants with health-related qualifications were recruited for data collection.

Study Sites

Our main study sites were two hospitals: Queen Elizabeth Central Hospital (QECH) and Mulanje District Hospital (MDH). These are both public hospitals. QECH is a referral while MDH is a rural hospital. The annual delivery volume at QECH is approximately 11,000 births; for MDH, it is 7,200 births.

Study period

Data collection began in July and ended in December 2020. There was a one-month delay due to COVID-19, which slowed some study processes.

Data analysis

For the quantitative data analysis, we used Microsoft Excel 2010 and Stata 15. For the qualitative data analysis, we used NVIVO software.

Ethical Clearance

The study was reviewed and approved by the ethics committee of the College of Medicine Research Ethics Committee (COMREC), with COMREC approval number P.04 /20 /3037.

Contents

Abbreviations and acronyms

COVID-19	Coronavirus Disease 2019
CMU	Chatinkha Maternity Unit (maternity unit within QECH)
CRYO	Cryoprecipitate
FFP	Fresh Frozen Plasma
HTC	Hospital Transfusion Committee
ID	Identification
MBTS	Malawi Blood Transfusion Service
MOH	Ministry of Health
MRCS	Malawi Red Cross Society
OR	Odds ratio
PDF	Portable document format
PPH	Postpartum Hemorrhage
PLT	Platelets
QECH	Queen Elizabeth Central Hospital
SSA	Sub-Saharan Africa
WHO	World Health Organization

Definitions

Family Replacement Blood Donor (FRBD): Is a person who donates blood for use by family member, friend or community member [1].

Obstetric Hemorrhage (OH): Any vaginal bleeding in pregnancy irrespective of gestation age.

PPH: Postpartum hemorrhage (PPH) is commonly defined as blood loss in excess of 500 mL within 24 hours after vaginal delivery or 1000 mL or more within the same timeframe after Cesarean Section [2].

Maternal death: The death of a woman while pregnant within 42 days of termination of pregnancy, irrespective of the duration or site of the pregnancy, from any cause related to or aggregated by the pregnancy or its management, but not from accidental causes [3].

MMR: The number of maternal deaths during a given time period per 100,000 live births during the same time period [3].

Voluntary Non-Remunerated Blood Donor: Is a person who donates blood of their own free will and receives no money or other form of payment, which can be considered a substitute for money such as time off work except that reasonably needed for the donation and travel [1].

Obstetric and Gynaecology Clinical Officer: This person is a holder of bachelor's degree in Obstetrics and Gynecology. This caliber was recruited as research assistant.

Registered Nurse and Midwife: This person is a holder of bachelor's degree in General Nursing and University certificate in Midwifery. This caliber was recruited as research assistant.

Postpartum Hemorrhage Case: A patient who has lost in excess of 500 mL within 24 hours after vaginal delivery or blood loss of 1000 mL or more within the same timeframe after Cesarean Section.

Obstetric patient/client: Pregnant woman irrespective of gestation age

Imminent Postpartum Hemorrhage: Blood loss of between 400 to 499 mL within 24 hours after birth through vaginal delivery or blood loss between 800 to 999 for Cesarean Section.

CHAPTER 1: INTRODUCTION

1.1 Background Information

Postpartum Hemorrhage (PPH) is commonly defined as blood loss in excess of 500 mL within 24 hours after vaginal birth, greater than 1000 mL for cesaerean bith, while severe PPH is defined as blood loss of 1000 mL or more within the same timeframe after vaginal birth [2].

Globally, nearly a quarter of all maternal deaths are associated with PPH [4]. Despite global progress and interventions to address PPH, it remains the leading cause of maternal death in most low-income countries. Although Malawi's maternal mortality ratio has shown a moderate decline, it continues to be among the highest in Sub-Saharan Africa (SSA) at 439 per 100,000 live births for the period between 2008 and 2015 [5]. Consistent with other countries in SSA, PPH accounts for at least a quarter of all maternal deaths in Malawi. According to the Malawi National Statistics Office, obstetric hemorrhage remains the most common cause of maternal death [5]. Access to safe blood transfusion is critical to the management of PPH and reduction in maternal deaths due to PPH. However, limited attention has been given to implementing interventions to improve blood transfusion services, particularly for maternity wards. Additionally, there is limited evidence regarding behavioral and structural factors that affect PPH prevention and treatment in Malawi, particularly around access to quality blood supply.

To improve the outcomes of obstetric patients who require blood and blood products, it is necessary to fully understand how current protocols, which address the availability of safe blood and blood products to patients, are being implemented. Particularly, as timely access to blood and blood products within the hospital is often problematic, even in referral institutions [6].

We conducted the study at two hospitals. One central (referral hospital), and one district (rural hospital).

Queen Elizabeth Central Hospital (QECH), a public hospital located in Blantyre, the second largest city in Malawi, treats obstetric patients at the Chatinkha Maternity Unit (CMU). The Unit is one of the busiest maternity units in Malawi, with over 11,000 deliveries per year. The unit has 250 beds for both gynaecology and obstetrics patients [7].

The most recent data from QECH show that PPH is the leading cause of maternal deaths. From July 2018 to June 2019, there were 11,253 deliveries. Out of these, 3,717 (33%) were caesarean sections. There were 463 PPH (4.1%) cases in this time period, consistent with global estimates. The annual total number of maternal deaths occurring at this tertiary referral hospital was 38 against total annual live births of 10,006 translating to Maternal Mortality Rate (MMR) of 380 per 100,000 population. Among the causes, 16 (42%) were due to PPH, 12 (32%) were due to sepsis, 6 (15%) were due pre /eclampsia and the remainder were classified as other causes [7]

Previous studies have shown that PPH was the second leading cause of maternal death at QECH [8,9]. One of the reasons that PPH is now the leading cause of maternal death might access to blood products, though there is paucity of data in Malawi to confirm this. A study conducted in 2002 revealed that if a woman needs blood (or commodities) and it is not available, then the odds of dying in this situation was 75 times higher (95% CI 6.98 - 83.76) than those who received the necessary life-saving product [9].

Mulanje District Hospital (MDH) is a public district hospital located in a rural district of Malawi. It is about 80 KM south of Blantyre. It conducts an estimated 7,200 deliveries per annum [10]. In 2018-2019, there were 6,960 live births. During the same period, there were 20 maternal deaths reported, translating to an MMR of 287 [10]. The MDH Maternity Unit is at a minimum, managed by 2 clinical Officers, 3 Nurse Midwives, and 2 patient attendants, making a total of 7 employees.

Malawi Blood Transfusion Service (MBTS), established in 2003, is the sole agency in Malawi mandated to collect, test, and distribute safe blood and blood products to health facilities nationwide. The MBTS has four regional offices in Blantyre, Lilongwe and Mzuzu and Balaka. The offices are responsible for the collection, processing including production and distribution of blood and blood products to all public, CHAM and private health facilities in both urban and rural areas.

In 2018, the MBTS issued 1,388 units of blood against a request of 2,349 blood units, representing about 60% fulfillment against demand [11]. It is estimated that the blood needs are about 100 per month. Its laboratory is managed by 7 laboratory personnel with at least one laboratory technician working in the blood bank section. The MDH Maternity unit and laboratory has a total of 14 employees. The MDH shares similar characteristics with other rural hospitals in Malawi.

1.2 Study justification

Despite a decline in MMR, Malawi is one of the countries with the highest MMRs in SSA. One of the leading causes of maternal deaths in Malawi is obstetric hemorrhage [5]. Hemorrhage cases refractory to initial management will require blood transfusion. Providers attending emergency

obstetrics cases requiring blood report difficulties in accessing blood in the required quantity and in a timely manner [12]. The underlying challenges in blood access for obstetric emergencies have neither been described nor documented previously in Malawi.

There is a need to better elucidate the supply side gaps and challenges in the blood banking storage and distribution processes, as well as the demand side requests and uses of blood. This information was critical to implement actions to minimize blood shortages, particularly for life-threatening obstetric hemorrhage. Equally important was ensuring that the evidence generated from this research was disseminated to key stakeholders and decision-makers, who could use and respond to the findings. The data from this study will allow key stakeholders to develop evidence-based interventions to improve access of blood and blood products to obstetric patients will save women lives.

1.3 Objective of the study

1.3.1 Main Objectives:

Main objectives were:

- **To investigate challenges to blood supply to PPH patients** at QECH and MDH from January to November 2020.
- **To identify strategies to overcome barriers** to blood access at QECH and MDH.

1.3.2 Sub-Objectives:

- To determine the outcomes of cases for which there has been blood requested for transfusion for obstetric cases at QECH and MDH from January to March 2020 (pre COVID-19 retrospective), May to July 2020 (retrospective) then September to November 2020 (prospective).
- To measure the demand and supply of blood for PPH cases at QECH and MDH from January 2020 to March 2020 (pre COVID-19 retrospective), May to July 2020 (retrospective) then September 2020 to November 2020 (prospective).
- To identify the gaps in carrying out the blood transfusion process at QECH and MDH from January to March 2020 (pre COVID-19 retrospective), May to July 2020 (retrospective) then September to November 2020 (prospective).
- To assess the impact of COVID-19 on the number of blood units supplied to QECH and MDH from April 2020 to November 2020.

CHAPTER 2: METHODOLOGY

2.1 Study Type

The study employed a mixed-methods approach. While mixed-methods research is a relatively new methodology, it is well documented as an approach that allows for a better understanding of what is reported in the patients' case notes, laboratory and maternal registries related to obstetric emergencies, blood availability and postpartum hemorrhage combined with what staff, clinicians and key stakeholders identify as issues related to availability. Either method on its own would limit the ability to make recommendations to improve timely access to blood in emergency settings. "Mixed method research is research in which the investigator collects and analyses data, integrates the findings and draws inferences using both qualitative and quantitative approaches or methods in a single study or program of inquiry" [13]. In this study, we collected qualitative and quantitative data concurrently. This triangulation design allowed the team to obtain different, but complementary, data about timely access and availability of blood. In the quantitative study, we reviewed 6 months retrospective data and three months prospective data. Retropective data were captured over a period of six months because we wanted to analyze data during the three months in the pre-COVID-19 era (January to March 2020), and three months into the COVID-19 era (May to July 2020). We integrated the findings from each strand to interpret the results. This mixed method approach strengthened validity, dependability, and trustworthiness of the study findings

2.2 Qualitative Prospective cross-sectional study

Qualitative data collection methods employed in-depth interviews (IDIs) and Key Informants Interview (KII).

2.2.1 Study location

We conducted the study at QECH, MDH and the MBTS. The study sites were purposively selected. QECH is one of the four referral hospitals in Malawi. We envisaged that the findings would be representative of the other three regional referral hospitals.

Mulanje is a rural district hospital. On average, district hospitals in Malawi collect around 1000 blood units per year from the MBTS, and Mulanje collected 1388 blood units in 2018 [14], so it shares almost the same volume of blood usage as other hospitals. Further to this, MDH's proximity to Blantyre had few logistical challenges during study implementation. The MBTS is the only institution collecting blood from voluntary blood donors in Malawi, hence its inclusion.

Table 1: Nature and number of study participants interviewed for the qualitative study.

Participant category	Number of days the product was not available
Member of parliamentary committee on heath	1
Director of HTSS	1
Director of clinical services	1
Senior member of Malawi Red Cross Society	1
Clinician	7
Laboratory technician	6
Midwife nurse	7
Laboratory assistant (porter)	2
Ward attendant (porter)	3
Driver	3
Blood recipient	4
Family replacement	6
MBST managers	2
Voluntary non- remunerated blood donor	3
TOTAL	**47**

2.2.2 Study population

The qualitative study sought to have a diverse range of participants in order to elicit deep and rich information about phenomena under study. Participants were selected into the study by purposive sampling whilst considering their role in maternal health service provision and blood mobilization. The population included the following: maternal health providers and PPH blood recipients at QECH, Mulanje District Hospital; Laboratory personnel at QECH, MBTS and MDH. There were also some selected Senior MoH employees, members of the Parliament, blood donors and senior representatives of the Malawi Red Cross Society (MRCS) and blood recipients. Details of the participants are outlined in Table 1.

2.2.3 Study period

We planned to conduct these interviews during the months of July and August 2020 but due to delays caused by the COVID-19 pandemic, interviews were completed in December 2020.

2.2.4 Sample Size

There are no fixed rules for sample in qualitative research, sample size should be based on information needs and guiding principle is data saturation [13]. Data saturation is the collection of qualitative data to the point where a sense of closure is attained because new data yield redundant information [13]. However, some authors have recommended a sample size of at least 12 [15,16]. Guest et al, in their study, which employed non-probabilistic sampling, using data from a study involving 60 in-depth interviews with women in two West African countries, the authors systematically documented the degree of data saturation and variability over the course of thematic analysis. They operationalized saturation and made evidence-based recommendations regarding non-probabilistic sample sizes for interviews. Based on the data set, they found that saturation occurred within the first twelve interviews, although basic elements for meta-themes were present as early as six interviews. Variability within the data followed similar patterns [15,16]. In this study, we planned to interview not more than 12 participants within each health personnel cadre or participant category. In total 47 participants were interviewed.

The study adapted a purposive sampling technique to recruit respondents for qualitative data collection. We interviewed those responsible for the service provision as well as service beneficiaries.

At the facility level, respondents primarily came from the maternity units and the laboratory department: Generally, we intended to stop interviews when data saturation was reached. According to studies [17,18], we proposed to interview minimum of 11 nurses, 6 doctors/specialists, 4 laboratory technicians, 2 laboratory attendants, 10 blood recipients, 8 family replacement blood donors at QECH and MDH. There was a total of 47 interviews shared between QECH and MDH. Within these categories, the selection criteria included, working at the sites for at least 6 months, recently worked in the CMU/ MDH maternity wards, provided regional supervision to labor and delivery services or had treated a patient with PPH in the past 6 months that required transfusion. For PPH clients, only those who had blood requested for transfusion were included in the study.

At the MBTS, we interviewed 6 individuals from key departments: a minimum of 4 laboratory technicians, 2 senior managers in charge of blood collection. We also interviewed three VNRBDs who regulary donate blood at MBTS.

We interviewed a representative of the Parliamentary Committee on Health, DHTSS, Clinical Service directorate and the Malawi Red Cross Society to collect perspectives of government departments and NGOs which are directly involved in blood situation in Malawi.

2.2.5 Recruitment and training of interviewers

Data collectors experienced in qualitative data collection were recruited and trained in a 5-day workshop. In the training sessions, the data collectors were oriented to the aims and objectives of formative research and its approach. Qualitative data collection procedures and methods were reviewed with emphasis on collection of data through individual interviews. The data collectors held mock interviews among themselves prior to piloting the study approach and tools.

A pre-testing exercise was conducted at QECH where 5 individuals/health personnel involved in the collection, processing and distributions of blood were interviewed. The purpose of the pre-testing was for the data collectors to familiarize themselves with the administration of the interview guides as well as gauging the clarity of the questions. The results of the pretest were reviewed and used to adjust the study approach and interview guides in readiness for fieldwork.

2.2.6 Data collection, processing and analysis

The interviews were conducted in both English and Chichewa (a local language), using IDI guide (Appendix 2). Prior arrangements were made with the sampled subjects on the time, day and venue for the interviews. In total, 47 people were interviewed See table 1 for complete lists.

On average, each interview lasted for 30-60 minutes and was audio-taped. The audio-taped interview sessions were transcribed verbatim after completion of fieldwork. The interviews that were conducted in local language were translated into English.

Data analysis was performed using the NVivo software program. During the analysis, we thoroughly read the individual interview guides and selected interview scripts from each category to identify main themes. The themes were assigned codes. The codes were both inductive and deductive. The list of the themes

was expanded with themes that emerged in the interviews. The processed data relating to the different themes was produced ready for report writing.

2.2.7 Ethical Considerations

The study was cleared with the College of Medicine Research and Ethics Committee (COMREC), approval number P.04/20/3037. Study participants were informed in advance about their recruitment and that they would be interviewed. Prior to the start of the interview, the interviewer provided an overview of the PPH research to the participant. Further, the interviewer reviewed a consent form with the respondent. The consent form included elements that assured the privacy and confidentiality for the participants, during and after data collection. Those who accepted to participate in the study signed two copies of the consent form, one for themselves (interviewees) and the other copy for the research principal investigator. All interviews took place in either private rooms or offices.

2.3 Quantitative study

2.3.1 Study Design

This was a retrospective and prospective descriptive cross-sectional study.

2.3.2 Study setting

This was done at QECH's CMU and MDH Maternity Unit and their respective laboratories.

2.3.3 Study population

All women with a diagnosis of PPH at the QECH's CMU and MDH Maternity Unit between January and November 2020 were the main focus of the data. Cases were identified from client inpatient charts and maternity registers. All patients' case notes where blood was requested were included in the study in order to have a comprehensive overview of blood use. All the PPH cases had blood requested hence they were all included in the study.

2.3.4 Study period

The quantitative data spans a nine-month period. Six months of retrospective record review (January to June) and 3 months (September to November) of prospective record review. Retrospective data collection was done during the month of July and August 2020 concurrently with part of prospective quantitative data collection. Prospective data collection was done from September to November 2020.

2.3.5 Sample size

For the quantitative study, the total number of abstractions for this activity was 889 cases notes over the 9 months study period. The main challenges in record collection were missing case notes especially for the restrospective data. This was a census. We planned to review records for all patients who had blood requested during the study period and followed up and analysed. We further analysed those case notes whose patients had PPH.

2.3.6 Data collection tools

We used the following data tools: Blood Bank Request and Report Form (Appendix 3), Laboratory daily blood and reagents stock updates form (Appendix 4), QECH Laboratory Blood Request and Issue Form (Appendix 5), Maternity Unit Transfusion Tracking Form (Appendix 6): Blood Bank Staff Tracking Form (Appendix 7): Maternity Unit Staff Tracking Form (Appendix 8): Quantitative Data Master Questionnaire (Appendix 9): We also extracted data from patient registers.

2.3.7 Data collection process

Data source triangulation was employed to strengthen data validity. Data triangulation is the use of multiple data sources for the purpose of validating conclusions [13]. We abstracted data from patients' case notes which were identified from the archives and also from the wards, Laboratory Information Management System (LIMS). We planned to also abstract data from Ward Blood Transfusion registers but these were not used at both hospital study sites. Crossmatch registers were in use at MDH. Abstracted data was captured onto Kobo datatool kit software.

Data cleaning and analysis was done between December 2020 to February 2021. When there was any missing information in the patient charts or laboratory blood request forms during this prospective portion of the study, a member of the research team reviewed the chart with providers to provide the missing information as much as it was possible. However, this was not possible with retrospective data.

Records of patients' blood transfusions at QECH and MDH were designed to use two parallel systems; paper-based records which were supposed to be available at both the Maternity Units (Ward Blood Transfusion Register) and the laboratory (Crossmatch Files) and the online laboratory system known as LIMS.

The process of blood transfusion for a patient at the CMU and MDH Maternity Unit begins with prescription by a clinician in the patient's case file. The prescription indicates the type of blood or blood product requested, volume, number of units. Then, the Blood Bank Request and Report Form (BBRRF) (Appendix 3) for the client in question is prepared by a nursing officer under the authority of a registered clinician. The completed BBRRF, signed by a clinician, specifies the required tests or investigations to be performed at the laboratory. At minimum, the BBRRF contains information including but not limited to surname and first name of the intended recipient: date of birth, clinical information/history which should include diagnosis, tests required, blood product required, time the

blood products were needed (urgency), and the date and time of blood specimen collection. The details of each completed blood request are then supposed to be documented in the respective Ward Blood Transfusion Register. The blood request form is sent to the laboratory, accompanied by all required blood samples. At the laboratory, the details of the request (excluding diagnosis), the demographics of the client and laboratory test (e.g crossmatch) requested are entered into LIMS. This results in the production of three barcodes, one of which is attached to the patient's BBRRF. The lab technicians use this barcode to enter results of laboratory tests, including, haemoglobin (Hb) level and blood cross matching into LIMS. Depending on the laboratory results and availability of blood, the authorized laboratory personnel issue blood to the client in question. This information in the LIMS appears authorized. When the blood unit (with the second barcode of the printed 3) is collected, the person who collects signs on a blood collection form against corresponding barcode (third barcode of the printed 3). The proof of collection forms is archived in files, monthly. We used these hard copies to verify if the blood units authorized for issue were collected.

At the CMU and MDH Maternity Unit, the details of the issued blood, and whether the blood transfusion was performed for the client in question, were captured in the patient's case file and and were supposed to be further captured in the Ward Blood Transfusion register. During the study period the crossmatch and Ward Blood Transfusion registers were not consistently used in either hospital. During the study, a patient's case files, and the following study specific forms: Laboratory daily blood and reagents stock updates form (Appendix 4), QECH laboratory blood request and issue form (Appendix 5), Maternity transfusion tracking form (Appendix 6), Blood bank staff tracking form (Appendix 7) and Maternity Unit Staff tracking form (Appendix 8) were used.

Data from the forms and files were then transferred to the Quantitative data master questionnaire (Appendix 9), which was in the Kobo data toolkit software. Each case file or study ID had its own Quantitative data master questionnaire. After data collection, data from the Kobo was then exported to Excel for onward analysis.

2.4 Data management

The College of Medicine possesses the primary responsibility for data collection and stewardship. All data collection staff (Research Assistants) were trained so that they understood all the research components that were involved in research ethics. We conducted additional monitoring during data collection that helped the team to confirm that the data collectors were following standard operating procedures for this study.

2.4.1 Data storage

The data server was encrypted; only authorized study personnel had access to the encryption key. Only the investigators had access to password protected files. Temporarily hired, experienced transcribers transcribed and translated the recordings under the supervision of the investigators. If identifying information was accidentally provided by a participant during the interview, the translators redacted this information. All data will be retained for a period of one year after analysis is complete, after which they will be deleted.

2.4.2 Data quality assessment

Data was reviewed closely by the data analysis team on an ongoing basis to ensure it had been fully and correctly compiled and to advise the Research Assistants quickly on how to improve certain aspects of their work. The following measures were put in place to ensure high level of data quality including: (i) applying consistency checks to test the internal validity of data fields; (ii) ensuring proper documentation during data collection and processing and (iii) ensuring that data was clean and accessible before the analysis.

A data management system was put in place to ensure timeliness and quality of data.

2.4.3 Human Resources for Data Management

Research Assistants received dedicated training sessions on how to use the data collection tools, elicit information from enrollees via structured interviews, and questionnaires. The study team provided ongoing supervision and on-the-job mentoring, particularly in the first weeks of implementation. We provided a similar training for the Laboratory Technicians at QECH and MDH regarding recording all blood transfusion related data.

2.4.4 Data ownership and sharing plan

The College of Medicine retains primary stewardship over the data collected in this study.

CHAPTER 3: RESULTS

3.1 Qualitative Findings

3.1.1 Administrative arrangements for blood collection

Malawi Blood Transfusion Service (MBTS), established in 2003, is the sole agency in Malawi mandated to collect, test, and distribute safe blood and blood products to health facilities nationwide. The MBTS has three regional centres, and one depot. Three regional centres are in Blantyre, Lilongwe and Mzuzu, while the depot is in Balaka. The regional centres are responsible for the collection, processing including production and distribution of blood and blood products to all public, Christian Health Association of Malawi (CHAM) and private health facilities in both urban and rural areas while the depot does not make blood products. The depot collects whole blood, sends it to Blantyre for production of blood products and receives and distributes blood and blood products.

The MBTS collects blood through static clinics based at regional offices and mobile clinics whereby blood donor teams regularly visit and conduct blood donor recruitment campaigns in schools, places of worship and workplaces. Prior to blood collection activities, the MBTS conducts blood donation awareness sessions. Blood is collected only from individuals who freely volunteer to donate blood and expect no reward in return. In addition to the blood collected by the MBTS, hospitals are permitted to ask guardians to look for family members or friends who would present themselves at the hospital to donate blood for the sick relatives only when blood from the MBTS is unavailable.

Most study participants expressed reservations with the arrangement that the MBTS is the only institution responsible for blood collection. They argued that currently MBTS is unable to meet demand for blood for transfusion in the country's health facilities. Adequate blood can only be collected if there are many people who are willing to donate blood regularly. However, not many people are willing to freely donate blood. Changing such a mindset requires sensitizations to the general population on the importance of blood donation. MBTS cannot accomplish this task alone given its current setup and resources at its disposal as one officer pointed out:

> *"Lack of funding affects our campaigns and now we are even failing to go to our target areas for blood collection campaigns."* *[MBTS, laboratory officer]*

In advocating the involvement of many institutions in the blood collection, some study participants said:

> *"We have only one organization which deals with blood donation, which distributes blood to hospitals, so if that organization says it has no blood, then we have nowhere else to go to get blood, the end result is that patients die due to lack of blood."* *[Midwife Nurse, CMU, QECH]*

However, some respondents indicated that there were some positive aspects with MBTS being the only agency responsible for blood collection, testing and distribution. They explained that the current arrangement ensures the safety of the blood and blood products for transfusion. The MBTS has the necessary laboratory equipment and qualified personnel to conduct blood tests to meet specified standards of safety and efficacy. A senior Ministry of Health employee remarked as follows:

> *"It is a good mandate to ensure that safe blood and blood products supplies are available."* *[Directorate representative, Health Technical and Support Services]*

This was also corroborated by a clinical officer who reported:

> *"I think the policy is very good, looking at the issues of HIV, hepatitis, and other infectious diseases that we have nowadays, the MBTS has the means to screen every blood, so I feel like the MBTS should continue doing this role."* *[Clinical officer, MDH]*

3.1.2 Challenges to blood supply to PPH patients

When postpartum hemorrhage (PPH) is left untreated or delayed it may lead to hypovolaemia. This may, in turn, lead to maternal death or other life-threatening medical conditions. In order to reduce PPH related morbidity and mortality it is important that women have immediate access to blood and blood products in required quantities. The study found that PPH patients at QECH and MDH had some challenges to access blood at the right time and in adequate volume (please refer to Table 3). The table shows that only 61% and 52% of blood which was requested was supplied at the QECH and MDH respectively.

3.1.2.1 Inadequate availability of blood and blood products

The MBTS started with an initial collection of 4000 units for the whole year of 2004. This figure has steadly risen to 50,000 units per year around 2011. It stagnated around this figure for about 3 years up to 2014. Then steadly rose again to around 70 000 in 2018 up to now, against the annual target of 120 000 per year. During the MBTS era, there has been a constant supply of other blood products all year round such as fresh frozen and cryoprecipitate, frozen blood product prepared from blood plasma. These products play an important role especially for patients experiencing hemorrhage. All blood processing at the MBTS is reportedly done in a quality assured manner as confirmed by its participation in External Quality Assessment (EQAs) schemes. Prior to the establishment of the MBTS, blood was collected by the hospital blood banks relying primarliy on family replacement blood donors.

Just like in many parts of the developing world, the MBTS has not been able to meet the Malawi's blood demand. For the

past 5 years, the MBTS has managed to meet about 60% of the demand.

The study participants reported that during the study reference period MDH and QECH experienced shortages of blood and blood products required for transfusion. They attributed the shortages to the inability of the MBTS to collect adequate blood from the blood donors. With MBTS offices available only at regional levels, it is a huge task of the blood mobilization teams to reach many parts of the country to conduct sensitization campaigns to motivate people to donate blood. The problem is compounded by the prevailing culture where many people in Malawi are not forthcoming to voluntarily donate blood. The unwillingness to donate blood was attributed to ignorance on the importance of donating blood and also due to no or little benefit or reimbursement for donating blood. On resistance to donating blood, one respondent (a blood donor) summarized the sentiments of many people in his community as follows:

"Some people do refuse completely by saying that they cannot donate blood, asking "why should they donate blood when their relative is not sick?."

[Voluntary Blood donor].

There is malpractice by some health personnel demanding patients to pay for blood which is supposed to be given to them for free. This in turn discourages voluntary blood donation especially when the VNRBD's relative fall victim of the malpractice. A senior MBTS employee reported:

" The general issues that we see is that, you know, as I have told you that we are in the actual collection part, we motivate people to come and donate blood but we are not reaching the target, so, you find that there are some people who donate blood and when they get sick or their relatives get sick, they have problems accessing the blood and that demotivates them, they don't come back for donation, so, those are the challenges. Sometimes people donate blood but when they go to the hospitals, we tell them that "this blood, we are not supposed to pay anything especially when you get this blood from government hospitals" but sometimes when they go to the hospital they are told to give in money. So, you look at these donors, they donate blood freely and when they go to the hospitals they pay, and the donors get demotivated, they don't come back to donate blood."

[MBTS senior manager]

Another factor contributing to the inability of the MBTS to collect adequate blood was reported as its reliance on local schools and universities as the primary blood donor population. The strategy is only viable when educational institutions are in session. Access to the students is difficult or almost impossible when the institutions are on recess rendering potential blood donors unavailable. The MBTS should continue with efforts to expand its target blood donor population beyond the school population. On reliance of the school going population, MBTS employee reported:

"We collect our blood from schools, making up to 70% of our blood collection."

[Manager, MBTS]

The study found that sometimes PPH patients did not always have access to the amount of blood they required. This was particularly common when MDH and QECH experienced blood shortages. It was reported that at MDH there were instances where a clinician would request from the hospital blood bank 2 units of blood but would be provided 1 unit due to low supply.

3.2.2.2 Shortage of specific blood product and blood group

PPH patients also faced difficulties in accessing specific blood products as well as specific blood groups e.g O negative. The respondents explained that the problem resulted from scarcity of specific blood group and blood product (component) as well as failure by clinicians to order the right type of blood products needed to deal with specific PPH cases. On scarcity of blood products, a medical officer explained:

"The other problem is the blood products, you will find that maybe the patient is pancytopenic and you need platelets, but you can't find it."

[QECH, medical officer Obstetric]

"Secondly some blood groups are rare. On the other hand, all the blood groups may not be available."

[Senior MDH blood bank personnel]

Table 2 shows the number of days in a month when a particular blood group of blood or blood component was not available at the MBTS.

Table 2: Inavailability of specific blood product in September 2020

Blood Component	Number of days the product was not available
*Platelets	13
AB- Blood	14
*O Negative Blood	8
B Negative blood	1
Cryoprecipitate	1
*On high demand	

Table 3: Inavailability of specific blood product in October 2020

Blood Component	Number of days the product was not available
*Platelets	9
AB- Blood	15
*O Negative Blood	10
B Negative blood	8
*On high demand	

On ordering of wrong blood products, one respondent said:

> ***Platelets are good because they assist in coagulation. We have had cases where a clinician would order fresh frozen plasma, but the patient is having mucocutaneous bleeding. Us as MBTS staff, we would advise them that the product you ordered was not ideal, you would have also ordered platelets.***
>
> **[MBTS, laboratory personnel]**

The information above is also in keeping with what was found during the quantitative part of the study. In addition to ordering wrong component, we noted that Cryoprecipitate and Fresh Frozen plasma was rarely requested. In total, during the 9-month period of the study, 115 blood components were transfused among the study participants and are presented in the quantitative section below.

Table 4: Blood Components transfused to obstetric clients

Blood Component	Number of Units transfused	%
Fresh Frozen Plasma	60	52
Cryoprecipitate	19	17
Platelets	36	31
TOTAL	**115**	**100**

3.1.2.3 Transportation

Transportation was one of the major challenges to timely access of blood for PPH clients. It was reported that sometimes in health facilities blood shortages were experienced despite MBTS having adequate blood and blood products in its storage banks. The shortages arose at the hospitals due to transport problems collecting blood from MBTS. Hospitals require adequate resources (vehicles, fuel and personnel) to collect the blood from MBTS. It was reported that the few available resources at some health facilities are required to accomplish multiple tasks at the same time. This adversely affects timely collection of blood from MBTS.

The challenge in transport was experienced at QECH and MDH. Although QECH is close to the MBTS (about 4 Kilometers apart), there were challenges with transport as one respondent at blood bank reported:

> *" It seems only one vehicle is allocated for daily activities here the same vehicle is shared among several daily activities. This always affects turnaround time."*
>
> [QECH, personnel]

However, at the MDH although availability of a vehicle may be a problem at times, another significant challenge was distance.

> *"For example, right here, let's take a health center which is very far, almost 60km, that's only one trip, which means its 120km to and from MDH."*
>
> [Driver, MDH]

Long distances between hospitals and MBTS was reported as a barrier to timely collection of blood from MBTS by hospitals and compromised management of PPH cases. One respondent summarized the effect of long distance between MDH and MBTS as follows:

> *"Imagine somebody has PPH in Mulanje but at the laboratory there they don't have blood, they have to find an ambulance to come all over to town (MBTS) to collect blood."*
>
> [Voluntary blood donor, College of Medicine / QECH]

3.1.2.4 Communication challenges

Lack of effective official means of communication affected coordination between the wards and blood banks at MDH and QECH which in turn impacted adversely on PPH clients' timely access to blood. At some point, there were no telephones or extensions in working condition linking the two departments. Use of personal phones was at an individual's discretion. Hospital staff do walk to and from wards/labs to request or collect blood, an undertaking which was energy draining considering that wards and laboratories were not situated next to each other, especially at QECH. Sometimes requests for blood might be made in good time, but the samples are submitted late to the laboratories, making the requests as if they were emergencies as a respondent explained:

> *"If they improve their sample delivery to the lab then I think we'll not have any problems with supplying them with blood in good time, because most of the times its like they are running with the samples from Chatinkha, and Chatinkha is very far from the lab."*
>
> [QECH Senior laboratory personnel]

It was also reported that hospital staff working in maternity wards and blood banks rarely conducted joint meetings to share information on challenges and solutions to improve service delivery.

3.1.2.5 Documentation challenges

The study found that PPH clients' access to blood at MDH and QECH was negatively impacted by incomplete or incorrectly filled blood request forms that originate from the wards to the laboratories. To maintain standards and safety of the blood, request forms should be duly filled and signed by the officer making the request. Health facility blood banks are not allowed to process requests that do not provide all the specified information. Despite this requirement it was reported that there were instances where some incomplete request forms were submitted to the blood banks. Such forms end up being sent back. Some officers lacked knowledge on how to complete the forms or hurried in filling the forms in the process leaving out important information. Some students were also tasked with filling out forms. The back-and-forth exchange of the blood request form between the ward and lab results in delays in access to blood by PPH patients. A respondent who has worked in the blood bank explained the insistence on duly completing the request form as follows:

> *"I have once worked in the blood bank and I was even the one mostly calling the wards to say "why didn't you fill it completely" because sometimes the patient needs specific volumes, specific blood products, but they don't indicate. There have been times where you process the whole blood unit yet the patient needed only packed cells (Red Cell Suspension)."*
>
> [QECH, Senior Lab personnel

To support the above, the records at the QECH Lab showed that CMU laborward had highest percentage of rejected laboratory forms, and one of the reasons for reject was incomplete laboratory forms.

Table 5: Causes of recorded rejected laboratory test at QECH during October and November 2020

Department	Ward	Incomplete Forms	No sample	*Other	Total Rejects	% of Rejects
CMU	LW	27	17	4	48	51
	PNW	1	1		2	2
	Other CMU		4		4	4.2
Medical	3B, 3A, 4B,4 A	2	2		4	4.2
Oncology	2 A	1		1	2	2
Paediatrics	All Paeds Wards	1		1	2	2
Surgical	5A, 5 B, 6 A	9	14		23	24
	AETC	2	7		9	10
TOTAL		43	45	6	94	

**Other indication for rejection: inadequate sample, wrong specimen bottle used.*

Though not frequently mentioned by respondents, lack of full documentation and handovers of the PPH case by staff when changing shift was an obstacle to the timely access to blood by PPH patients. Due to lack of or inadequate documentation the incoming members of staff waste time recompiling the records instead of continuing with management of the PPH cases.

3.1.2.6 Mismatched blood group between donor and recipient

Another challenge expressed in interviews was the mismatch of blood and lack of a family member available to provide a blood donation for that particular recipient. Time is wasted in looking for a donor with the matching blood group.

3.1.3 Overcoming barriers to blood access by PPH patients

Addressing the barriers and ensuring safe and timely blood transfusion is necessary to end preventable maternal deaths resulting from PPH at the two hospitals. Actions to address difficulties to blood access by PPH patients can be taken at national and hospital and individual levels.

3.1.3.1 National level

Ensuring an adequate and accessible blood supply is a key to addressing postpartum hemorrhage related morbidity and mortality. Improvement in blood collection requires capacitating the MBTS to conduct blood donation sensitization campaigns and collect blood. MBTS effects should be complemented by involvement of other institutions and influential personalities including members of parliament in public awareness on the importance of blood donation. The possibility of incentivizing blood donors should be explored.

The study participants noted that the MBTS alone was unable to recruit and maintain sufficient number of voluntary blood donors. They felt that asking influential people to sensitize their subjects on the need to donate blood would go a long to motivate people to donate blood. In addition, MBTS needs to have its presence in all the districts. The district MBTS members of staff would be responsible for blood donation campaigns and blood collection in their respective districts instead of relying on the MBTS teams from regional offices A nurse explained the need for MBTS to have district offices:

> *"MBTS is failing to satisfy demand for blood, the demand is more than they can collect but maybe if they extend their branches, they should be found in each and every district in the country, maybe blood collection will increase ."*
> [Nurse Midwife technician, MDH]

Other agencies and individuals too particularly influential leaders should complement MBTS' efforts in educating members of the general public on the importance of donating blood. Every effort should be made to maintain contact with people who are regular blood donors. On involvement of other agencies, one responded said:

> *"Okay, what I have seen is that there is only one Blood Transfusion Service like which don't have other competitors, so, I was suggesting that if government of Malawi can also lobby other partners to have Blood Transfusion Services, so that they can have competitors with MBTS in order to complement each other because blood is still not enough to carter the issues of maternal morbidity because few people are donating, so, if we can engage various partners to establish blood collection centers where they can be deploying staff's to collect blood, they can complement each other, they can learn from the other's mistakes, yeah, they can create a competitive environment. "*
> [Senior NGO representative]

The MBTS needs adequate equipment, and human and financial resources to effectively carry out its activities.

For the MBTS to effectively carry out its activities, they need adequate human, equipment and financial resources to conduct blood donation campaigns to attract many voluntary blood donors. There is need for adequate funding to the MBTS. On the adequate funding, one responded reported:

> *"Let's give on the resources perspective, let's prioritize blood donation to make sure that there is enough money specifically for marketing."*
> [Former Member of Parliament, former Minister of Health]

3.1.3.2 Hospital level

On transportation challenges encountered, for QECH, a specific vehicle can be assigned for blood collection duties only. Other modes of transport for both MDH and QECH can be explored, other than relying on cars. On alternative transport, one key informant suggested:

> *"We need and it's a time to implement motorcycles specifically designated to go to MBTS to get blood and deliver it to sites like Mulanje hospital or use of air drones. Because I think transport is the biggest challenge in this circle of minimizing turnaround time."*

On communication, the study participants expressed the need to improve communication among all players involved in the blood supply chain from MBTS to hospitals and laboratories to maternity wards to avoid unnecessary delays in the distribution of blood. Strategies to address communication difficulties between maternal wards and laboratories may include having a mini blood bank next to obstetric wings or having an officer responsible for obstetric emergencies at the laboratory's blood bank section. The laboratory officer would immediately link up with colleagues in the laboratory once the need for blood has been established in the ward or vice versa. A respondent explained:

"We can have somebody at the end there at the blood blank to say "Okay, you are here at the blood bank, and your duty here is to make sure that when there is a call for an emergency, then you have to make sure that blood has been issued."
[QECH Medical officer]

Further, holding staff meetings involving staff from maternal and laboratory sections/departments would help each department to know what it should do to avoid delays. These meetings could be through hospital transfusion committees or regular meetings between laboratory and maternity wards. Such meetings were rare but important, as one study participant explained:

"The only time that we are communicating is only when we want blood, but there are challenges that they have that they would have liked to actually talk to us maybe formally, or there are challenges that we have but there haven't been meetings whereby we can actually talk about those things. I understand from the lab part, they do hold their meetings or handovers or teaching meetings whatever, of which, a presence of someone from here would actually improve something. Here we do morning meetings… but there's no presence of someone from the lab."
[QECH, clinical officer]

Through meetings, health service providers would understand what they need to do to access blood from the laboratory in time. Similar meetings between MBTS and hospital staff would be helpful in the same vein.

Some participants suggested the need for laboratories to reserve specified amounts of blood groups that were frequently required specifically for maternity wards. For example, the laboratory could be keeping at least 2 units of every blood group specifically for PPH clients. This strategy would guarantee blood supply to PPH clients even during times of blood shortage.

Unwarranted delays in the processing of blood requests by laboratories would be eliminated if health service providers completing the request forms were properly oriented on filling the forms. The duly completed should be submitted to the laboratories without any or with minimal delays. This would allow the laboratory technicians ample time to process the blood.

There should be a PPH management protocol in which all players are trained.

There should be an emergency blood stock of O negative blood which would be managed separately from general blood stock.

The participants mentioned the need to revive hospital blood transfusion committees to improve blood transfusion services within the hospital. It was reported that efforts to revamp the transfusion committees were underway. Hospitals are strategically positioned in blood donation. They should continue and intensify their role of asking guardians to look for relatives or friends to donate to their sick relatives when blood from the MBTS is not available. However, other study participants felt that this was not an effective way of mobilizing blood during emergencies. Some patients may die if the blood is not donated timely.

3.1.3.3 Individual level

When individuals do not voluntarily donate blood, MBTS cannot collect enough blood to meet demand for blood at the hospitals. There is need for identifying and implementing effective interventions to recruit and retain adequate voluntary unpaid blood donors to meet national blood needs.

3.1.4 Knowledge and impact of COVID-19 on blood supply

The study found that all study participants had full knowledge of the COVID-19 pandemic. They explained the origin of the disease, its modes of transmission and measures that one needs to follow to prevent contracting the infection. They dispelled some misconceptions including that a person could contract COVID-19 through blood transfusion. This finding is not surprising considering that all participants were either health personnel or were people who dealt with health-related issues in their daily lives.

All participants in the study agreed that COVID-19 had adversely affected blood availability. The amount of blood collected during the COVID-19 period was perceived to be lower than the blood supply during the pre- COVID-19 era. COVID-19 had not only negatively affected blood donation campaigns but also availability and willingness of potential blood donors to present themselves for blood donation.

As a result of the COVID-19 pandemic, all schools and universities were closed to limit the spread of the disease. This meant the MBTS had no access to students who are the primary blood donors in the country. In commenting on the effects of COVID-19 on blood collection, one participant said:

"It has affected a lot. You should know that MBTS collects most of its blood from students in colleges and secondary schools and we know that from March 2021 schools and colleges were closed. That affected blood collection. So COVID-19 has really affected blood collection because the population that we depend on a lot in blood donation was not available."
[MBTS, laboratory technician]

Other participants explained that potential blood donors could not present themselves for blood donation fearing that they could catch the virus. One COVID-19 preventive measure is to avoid crowded places. Many people believe blood donation events create a fertile ground for COVID-19 transmission if preventive measures are not strictly adhered to. Relatedly, it was difficult for MBTS blood donation teams to organize public gatherings to woo people to voluntarily donate blood. Public gatherings were banned for safety concerns.

3.2 Quantitative Findings

Quantitative data for the study was captured using Kobo software. Data was sent to a central server on a daily basis. At the end of the data collection period, the data was extracted from Excel files and exported into STATA 15. Data analysis included calculation of frequencies, cross-tabulations and Chi-square test for bivariate relationships between indicators to explore patterns and outcomes of cases for which there has been blood request for obstetric cases. For example, researchers conducted descriptive quantitative analysis to look for trends such as age range, parity and other demographic characteristics of women most likely to request blood for transfusion.

3.2.1 Overall recruited participants

A total of 889 clients who had blood requested were identified, these comprised Gynaecological and Obstetric cases. 650 clients were from QECH and 239 were from MDH. Below are results of the quantitative data of the study per site.

3.2.2 Results from QECH

3.2.2.1 Description of the Study clients at QECH

A total of 555 obstetric client records were reviewed in the study. These patients were identified as having had a request for blood submitted. 67.6 % (375) of the clients were between 20 to 30 years of age, 61.4% (341) reside in the urban, 43.3 % (240) were either para 0 or para 1, 33.3% (185) had pre-transfusion hemoglobin level of 7 mg/dl (severe anaemia), and about 40 % were blood group O.

Among the 555 obstetric cases, 32.4 % (180) were clients with Postpartum Hemorrhage (PPH).

Of these 180 PPH clients, 67.8 % (122) were between 20 to 30 years of age, 75.6% (136) reside in the urban, 42.2% (76) were para 1, 28.2% (58) had pre-transfusion haemoglobin level of between 7.0 to 9.9 mg/dl (moderate anaemia), 75% (135) had lost more than 1000 mls of blood and about 30 % were blood group O. These and other variabales are depicted in Tables 6 and 7 below.

Table 6: Social Demographic Characteristics of All Obstetric and PPH Clients at QECH with blood requests

Age:	ALL OBS		ALL PPH	
Range				
	n	%	n	%
< 19	98	17.7	28	15.6
20 TO 34	375	67.6	122	67.8
>35	82	14.8	30	16.7
Marital Status :	**ALL OBS**		**ALL PPH**	
	n	%	n	%
Single	38	6.8	9	5.0
Marrled	267	48.1	120	66.7
Divorced/Widowed	14	2.5	1	0.6
Not knowm	238	42.5	50	27.8
Education Level	**ALL OBS**		**ALL PPH**	
	n	%	n	%
No Eductn	7	1.3	1	0.6
Primary	117	21.1	57	31.7
Sec/Tertiary	141	25.4	87	37.2
Unknown	290	52.3	55	30.6
Occupation	**ALL OBS**		**ALL PPH**	
	n	%	n	%
Casual Work	41	7.4	17	9.4
Professional work	12	2.7	5	7.8
Not working	148	26.7	76	42.2
Not knowm	324	58.4	75	41.7
Unknown/ Other	30	5.4	14	7.8
Resldence	**ALL OBS**		**ALL PPH**	
	n	%	n	%
Residence				
Urban	341	61.4	136	75.6
Rural	92	16.6	28	15.6
Not Known	122	22.0	18	8.9

Table 7: Some clinical characteristics of all obstetric requests for blood and those with diagnosis of PPH cases at QECH

Gestatlon Age	ALL OBS		ALL PPH		
Weeks	**n**	**%**	**n**	**%**	
< 27	81	14.6	O	0.0	
28 -34	45	8.1	17	9.4	
35-37	101	18.2	80	33.3	
38 <40	142	25.6	74	41.1	
> 41	39	7.0	12	6.7	
Unknown	147	26.5	17	9.4	
Parity	**ALL OBS**		**ALL PPH**		
	n	**%**	**n**	**%**	
O to 1	240	43.2	84	35.6	
2 to 3	223	40.2	76	42.2	
>4	92	16.6	40	22.2	
Birthweight	**ALL OBS**		**ALL PPH**		
	n	**%**	**n**	**%**	
< 2500	84	15.1	34	18.9	
2501-3999	234	42.2	135	75.0	
> 4000	15	27	9	5.0	
unknown	222	40.0	2	1.1	
Pretransfuslon Haemoglobln	**ALL OBS**		**ALL PPH**		
	Range in m	**n**	**%**	**n**	**%**
	> 12.1	22	3.96	16	7.77
Normal	12	1	0.18	1	0.49
Mild	10.0 - 11.9	69	12.43	37	17.96
Moderate	7.0-99	143	25.77	58	28.16
Severe	< 7.0	185	33.33	25	12.14
unknown		135	24.32	43	20.87
Estimated blood loss	**ALL OBS**		**ALL PPH**		
	n	**%**	**n**	**%**	
500 < 999	34	18.9	34	18.9	
>1000	135	75.0	135	75.0	
unknown	11	6.1	11	6.1	

Blood Groups	ALL OBS		ALL PPH		
	n	%	n	%	
A+	105	18.9	30	16.7	
A-	7	1.3	1	0.6	
B+	104	18.7	34	18.9	
B-	4	0.7	1	0.6	
AB	18	3.2	7	3.9	
O+	206	37.1	52	28.9	
O-	14	2.5	5	2.8	
Not Known	97	17.5	50	27.8	

3.2.2.2 Overview of blood supply from the MBTS to QECH

During the 9-month study period, QECH requested 12 791 units of blood of which 7816 were supplied, representing 61% percent supply compliance. This means that there was a deficit of 39% of blood units to be supplied. The supply compliance was lowest in May 2020, with 48% (776), and highest in March 2020, with a compliance of 76.9% (1051).

Table 8: Blood requested and supplied to QECH in January-March, May-July, and September-November 2020

Month	Request	Supplied	% Supplied
January	1678	965	57.5
February	1545	1020	66.0
March	1366	1051	76.9
May	1608	776	48.3
June	1418	757	53.4
July	1277	654	51.2
September	998	723	72.4
October	1263	680	53.8
November	1638	1190	72.6
TOTAL	**12791**	**7816**	**61.1**

3.2.2.3 Overview of blood use according to Departments at QECH

Over the nine-month study period, a total of 7,741 units were issued to patients according to departments to which they were admitted, as indicated in Table 9. There is a difference of 75 units between blood supplied by the MBTS and those issued to wards. The difference is due to expired units, especially platelets. Among these, the most blood units 24% (1,891) were issued to the CMU, followed by 23% (1,774) which were supplied to the pediatric department. The CMU also includes gynecological wards.

Table 9: Blood supplied to Departments at QECH in January-March, May-July, and September-November 2020

Department	Units	%
Chatinkha Maternity Unit	1891	24
Paediatric	1774	23
Emergency Adult (AETC)	1434	19
Medical	1294	17
Surgical	698	9
Other Wards	650	8
TOTAL	**7741**	**100**

3.2.2.4 Overview of blood use within CMU

According to the LIMS, a total of 1,891 units were issued to the CMU. In our study, a total of 1,275 units were captured translating to sample representation of 67%. In terms of blood units transfused, of the 1,275 blood units issued to the CMU, 84% (1,076) of units were transfused to obstetric clients, and the remainder was transfused to gynecological clients. There was a total of 650 clients who had blood requested, and of these, 85% (555) were obstetric clients and 15% were gynecological. Of the 650 clients for whom blood was requested, 86% (559) were transfused with at least 1 unit of blood. Of the 555 obstetric clients, 464 (84%) received at least 1 unit of blood.

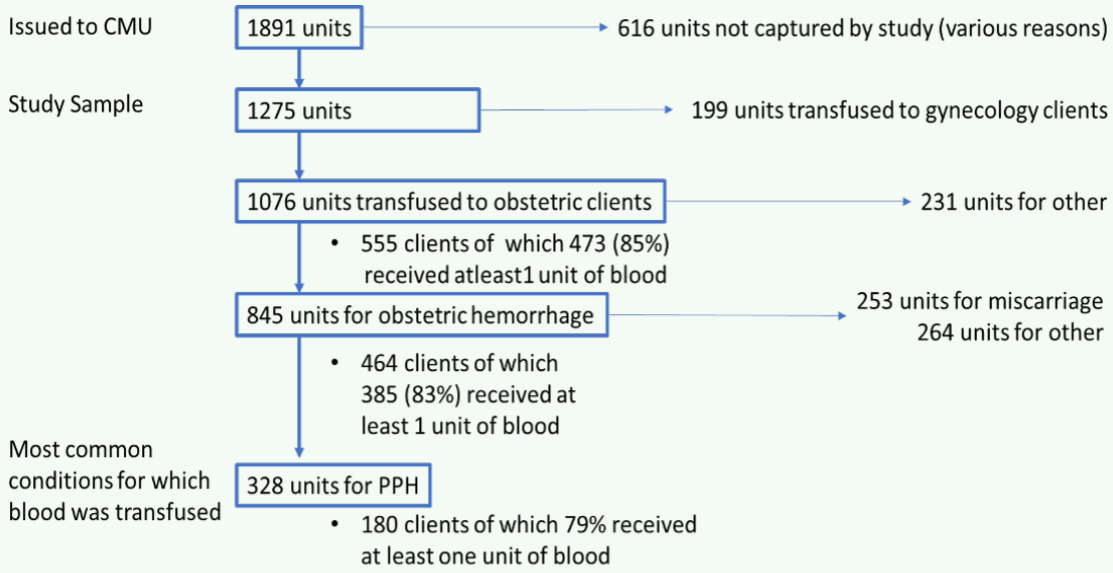
3.2.2.5 Overview of blood use among Obstetric Clients

Among the 1,076 blood units transfused to obstetric clients, 78.5% (845) were transfused to clients with Obstetric Hemorrhage (OH).

Out of the 464 requests of the OH clients, 83% (385) got transfused with at least 1 unit of blood.

Of 845 blood units which were transfused by the OH clients, the 2 main patient conditions which utilized most of the blood units were PPH at 25.7% (328 units) followed by miscarriages at 19.8 % (253 units). Summary of blood use among clients is indicated in Figure 1 below.

FIGURE 1: SUMMARY OF BLOOD USE AMONG STUDY CLIENTS AT QECH TO CHATINKHA MATERNITY UNIT.



Blood use for specific obstetric conditions is indicated in the tables below.

Table 10: Blood request, clients transfused, and total number of units transfused by diagnosis (condition)

Diagnosis	Request	%	Transfd	%	units trans	%	Average units
Antepartum haemorrhage	38	8.2	31	8.1	62	7.3	2
Miscarriage	119	25.6	111	28.8	253	29.9	2
PPH	180	38.8	143	37.1	328	38.8	2
*Imminent PPH	83	17.9	62	16.1	132	15.6	2
Ruptured ectopic pregnancy	35	7.5	29	7.5	52	6.2	2
Molar pregnacy	5	1.1	5	1.3	13	1.5	3
Other	4	0.9	4	1.0	5	0.6	1
Total	**464**	**100.0**	**385**	**100.0**	**845**	**100.0**	**2**

*Vaginal delivery with blood loss between 400 and 499mls . C/S with blood loss between 800 and 999mls

3.2.2.6 The outcomes of cases for which there has been blood requested for transfusion for obstetric cases at QECH during the study period.

There were 555 obstetric cases who had blood requested during the study period of which 85% (470) were transfused at least 1 unit of blood. Among the 555 obstetric cases who had blood requested, 84% (464) were obstetric cases with hemorrhage. Among the hemorrhage cases, PPH constituted 39% (180). Almost 83% (385) of 464 obstetric cases with hemorrhage got 1 unit of blood. Among the PPH cases, at least 79% (143) were transfused with 1 unit of blood.

3.2.2.7 Outcome on discharge of PPH client.

There were 2 major outcomes on discharge for PPH clients. Either the obstetric client was discharged alive or dead. During the study period, the hospital recorded 20 maternal deaths (MDs). Among the 555 obstetric cases, 535 were alive on discharge. Among those who were discharged alive, 85% (453) clients were transfused with at least 1 unit of blood and 15% (82) did not get any blood at all.

Of the 20 maternal deaths 20% (4) were due to PPH, 15% (3) were APH, 15% (3) were miscarriages, 15% (3) were sepsis, 15% (3) were pre-eclampsia, 5% (1) was anaemia due to a medical cause, 5% (1) had endometritis, 5% (1) had ruptured uterus and 5% (1) had unknown cause of death but went for Cesarean Section. In summary, 60% (12) of the MDs were due to obstetric hemorrhages.

Among the MDs, 85% (17) got transfused with at least 1 unit of blood, and 15% (3) did not receive any transfusion despite the indication for it. Among the 4 MDs with PPH, 50% (2) did not get any blood after request and 50% (2) got 1 unit each but it was reported inadequate.

3.2.2.8 Patients with PPH

There were 7985 deliveries at QECH within the 9-month data collection period. Of these, there were 180 PPH cases for which there was blood requested which translates to an incidence of 23 per 1,000 deliveries. All of these recorded PPH cases had blood requested and about 79 % got transfused at least one unit of blood. The main cause of PPH at QECH was uterine atony which constituted 36.3 % (74) of the causes (Table 11), followed by genital tears 22.5% (46) and retained products of conception 22.1% (45).

Of the total number of units transfused, approximately 80% of blood units were transfused to clients with uterine atony 30.2% (99 units), ruptured uterus 29.9% (98 units), and genital tears 19.5% (64).

Table 11: Blood requested and transfused by cause of PPH at QECH

Causes Of PPH	Cause by Request	%	Cause Transfusd	%	Units Transfused	%	Avg Units
Uterine atony	74	36.3	54	32.9	99	30.2	2
Genital Tears	46	22.5	36	22.0	64	19.5	2
Retained POCs	45	22.1	38	23.2	53	16.2	1
Ruptured uterus	23	11.3	23	14.0	98	29.9	4
Other	16	7.8	13	7.9	14	4.3	1
TOTAL	**204**	100	**164**	100	**328**	100	**2**

3.2.2.9 Demand and supply of blood for PPH cases at QECH during the study period.

Among the total number of PPH cases, at least 79% (143) were transfused with 1 unit of blood. Due to documentation gaps, it was not possible caluculate the real number of units requested per patient. For example, if a unit was requested and was not supplied on the same day, the request was repeated on the subsequent days until it was supplied. There is a need to design a study which can capture this accurately.

3.2.2.10 Gaps identified in carrying out the blood transfusion process at QECH during the study period.

The following gaps were identified:

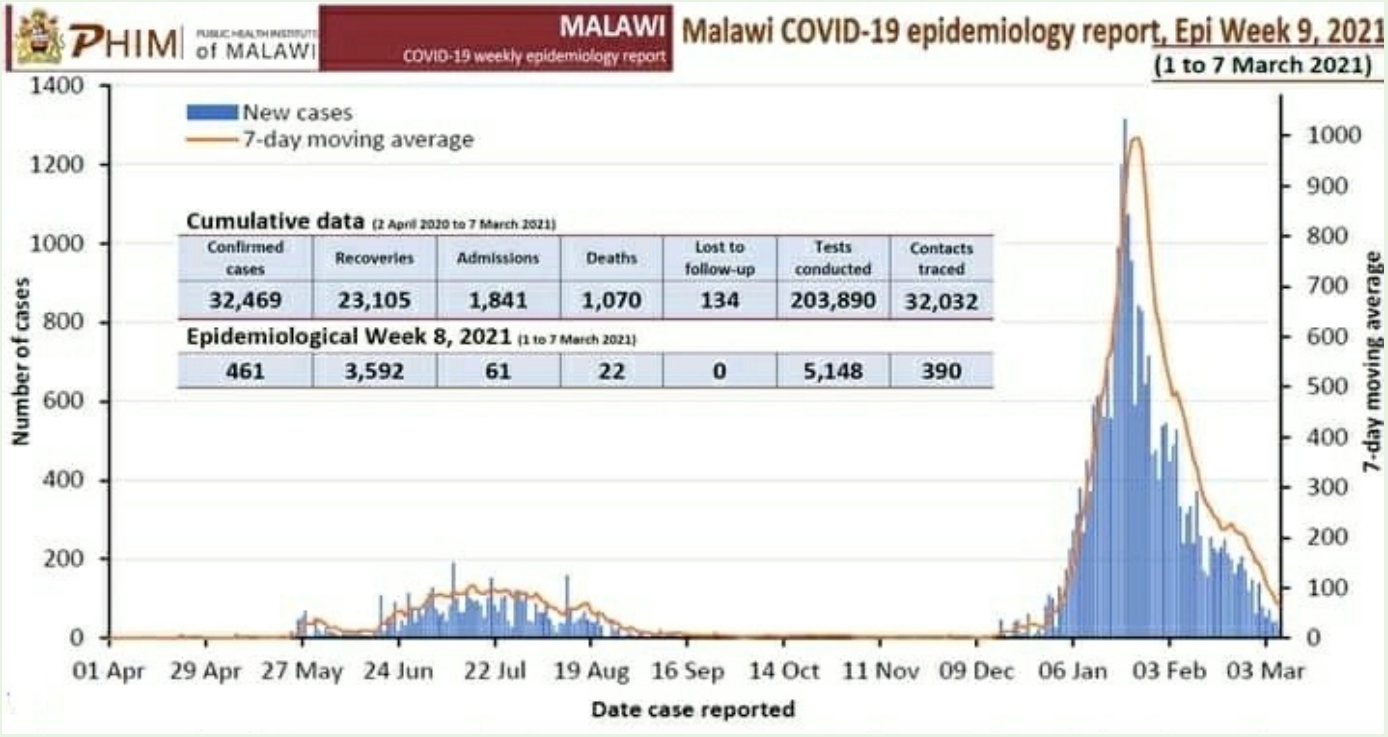
- Inconsistent data on the number blood units dispensed
- Underutilisation of blood components
- Incomplete documentation (blood request in the case notes e.g number of units required, incomplete blood laboratory requests, documentation on monitoring patients on blood transfusion)
- Communication breakdown within the wards (including handovers)
- Unavailability of blood bank reagents e.g Anti-Human Globulin (AHG)

3.2.2.11 Impact of COVID-19 on the number of blood units supplied to QECH

The first COVID-19 case was confirmed April 2, 2020. Following this announcement, several measures were instituted which included closing of schools and limiting the number of participants in public gatherings. Due to this, the MBTS adjusted its blood collection procedures to conform to the COVID-19 preventive measures.

Figure 2 below shows the trend in National COVID-19 infections.

FIGURE 2. NATIONAL TRENDS IN COVID-19 INFECTIONS IN MALAWI, APRIL 2020- MAR 2021.



3.2.2.11.1 Trends in Blood Collections

Compared to the same period of 2019, there were 6532 fewer blood units collected in April-November 2020. This translated to an 18% reduction in blood collections. However, the difference was not statistically significant (p-value = 0.264).

Table 12: Comparison in the National Blood Collections between April-November 2019 and 2020.

MONTH	2020	2019
April	1940	2193
May	1980	3145
June	2429	2693
July	2428	3177
August	4516	3988
September	3490	4036
October	4500	7846
November	8950	9687
TOTAL	**30233**	**36765**

3.2.2.11.2 Trends in Blood distribution to the CMU

Compared to the same period of 2019, there were 299 fewer blood units distributed to CMU in 2020. This translated to a 17% reduction in blood distributions (transfusions). However, the difference was not statistically significant (p-value = 0.054).

Table 13: Blood Distribution to the CMU in April- November 2019 and 2020

MONTH	Year	
	2020	2019
April	154	175
May	202	197
June	153	183
July	157	268
August	171	275
September	158	188
October	168	222
November	292	246
Total	**1455**	**1754**

3.2.3 Results from MDH

3.2.3.1 General description of study clients

A total of 206 Obstetric clients were identified. 61.2% (126) were between 20 to 30 years of age, 99% (204) stayed in the urban, 53.4 % (110) were either para 0 or para 1, 31.1% (64) had pre-transfusion hemoglobin level of 7 mg/dl (severe anemia), and about 41 % (85) were blood group O.

Among the 206 obstetric cases, 38.4% (79) were clients with PPH.

Of these PPH clients, 62.8% (49) were between 20 to 30 years of age, 98.7% (136) stayed in the rural, 46.8 % (37) were para 1, 31.6 % (28) had pre-transfusion hemoglobin level of between 7.0 to 9.9 mg/dl (Moderate anaemia), 75% (135) had lost more than 1,000 mls of blood and about 70.9% (56) were blood group O. Variabales are depicted in Tables 14 and 15 below.

Table 14: Social Demographic Characteristics of ALL Obstetric and ALL PPH Clients who had blood requested at MDH.

Age:				
	ALL OBS		**ALL PPH**	
Range				
	n	%	n	%
< 19	48	23.3	18	22.8
20 to 34	126	61.2	49	62.0
>35	32	15.5	12	15.2
Marital Status :				
	ALL OBS		**ALL PPH**	
	n	%	n	%
Single	18	8.7	12	15.2
Married	119	57.8	56	70.9
Divorced/Widow	2	1.0	0	0.0
Not knowm	67	32.5	11	13.9
Education Level				
	ALL OBS		**ALL PPH**	
	n	%	n	%
No Eductn	4	1.9	0	0.0
Primary	103	50.0	58	305.3
Sec/Tertiary	22	10.7	10	52.6
Unknown	77	37.4	11	57.9
Occupation				
	ALL OBS		**ALL PPH**	
	n	%	n	%
Casual Work	29	14.1	16	20.3
Professional worl	2	1.0	2	2.5
Not working	87	42.2	44	55.7
Not knowm	87	42.2	17	21.5
Unknown/ Other	1	0.5	0	0.0
Residence				
	ALL OBS		**ALL PPH**	
	n	%	r	%
Residence				
Urban	0	0.0	0	0.0
Rural	204	99.0	78	98.7
Not Known	2	1.0	1	1.3

Table 15: Some clinical characteristics of ALL Obstetric Clients and ALL PPH clients who had blood requested at MDH

Gestatlon Age	ALL OBS		ALL PPH		
Weeks	**n**	**%**	**n**	**%**	
< 27	16	7.8	0	0.0	
28-34	18	8.7	7	8.9	
35-37	37	18.0	20	25.3	
38<40	59	28.6	42	53.2	
>41	15	7.3	4	5.1	
Unknown	61	29.6	6	7.6	
Parity	**ALL OBS**		**ALL PPH**		
	n	**%**	**n**	**%**	
O to 1	110	53.4	37	46.8	
2 to 3	58	28.2	29	36.7	
>4	38	18.4	13	16.5	
BIrthwelght	**ALL OBS**		**ALL PPH**		
	n	**%**	**n**	**%**	
< 2500	38	18.4	15	19.0	
2501-3999	92	44.7	56	70.9	
> 4000	5	2.4	3	3.8	
unknown	71	34.5	5	6.3	
Pretransfuslon Haemoglobln	**ALL OBS**		**ALL PPH**		
	%	**n**	**%**	**n**	**%**
	Range in mg/dl				
	> 12.1	11	5.3	12	15.2
Normal	12	2	1.0	1	1.3
Mild	10.0 - 11.9	39	18.9	28	35.4
Moderate	7.0-99	56	27.2	25	31.6
Severe	< 7.0	64	31.1	11	13.9
unknown		34	16.5	2	2.5
Estimated blood loss	**ALL OBS**		**ALL PPH**		
	n	**%**	**n**	**%**	
500 < 999	15	19.0	15	19.0	
>1000	56	70.9	56	70.9	
unknown	8	10.1	8	10.1	

Blood Groups	ALL OBS		ALL PPH		
	n	%	n	%	
A+	45	21.8	17	21.5	
A-	0	0.0	0	0.0	
B+	50	24.3	21	26.6	
B-	3	1.5	1	1.3	
AB	6	2.9	1	1.3	
O+	84	40.8	35	44.3	
O-	1	0.5	0	0.0	
Not Known	17	8.3	4	5.1	

3.2.3.2 Overview of Blood supply from the MBTS to MDH

During the 9-month study period, MDH requested 1,778 units of blood which 929 were supplied, representing 52.2% percent supply compliance. This means that there was a deficit of 47.8% of blood units to be supplied. The supply compliance was lowest in May, 36.4 % (82), and highest in March, with a compliance of 87.0% (134).

Table 16: Blood supply against request to MDH in 2020.

Month	Request	Supplied	%Supplied
January	181	88	48.6
February	218	140	64.2
March	233	136	58.4
May	225	82	36.4
June	204	84	41.2
July	233	97	41.6
September	154	134	87.0
October	149	65	43.6
November	181	103	56.9
TOTAL	**1778**	**929**	**52.2**

3.2.3.3 Overview of blood use according to Departments at MDH

A total of 875 units were issued to patients according to departments to which they were admitted as indicated in Table 17. There is a difference of 54 units between what was collected from the MBTS and what the MDH issued to wards. The difference could be that these units were not traced between the laboratory and wards. It is not surprising because at MDH, they employ a manual method of recording blood units to wards. These units may have been missed. Among these, the most blood units 33.3% (291) were issued to the Pediatric Ward, followed by 24.3% (213) which were supplied to the Maternity Unit. At the MDH, miscarriages and gynecological cases are admitted to the Female Ward, hence the units for these patients were reflected in the Female Ward.

Table 17: Blood Distribution to Wards at MDH

Department	Units	%
Maternity (LW, PNW, ANW)	213	24.3
Paediatric	291	33.3
Female Ward (Medical, Surgical,Gynae)	259	29.6
Male Ward (Medical, Surgical)	110	12.6
Other Wards	2	0.2
TOTAL	**875**	**100**

3.2.3.4 Overview of blood use within the Maternity Wards

A total of 213 units were issued to the Maternity Wards according to the laboratory records. In our study, using the client cases notes, a total of 298 units were captured indicating that not all blood units issued to the wards were captured in the laboratory records. There was a total of 237 clients who had blood requested, and of these, 87% (206) were obstetric clients and 13% (31) were gynaecological. 87% (180) of the 206 obstetric clients who had blood requested were transfused with at least 1 unit of blood.

In terms of blood units transfused, of the 298 blood units issued to the MW, 84% (252) of units were transfused to obstetric clients, and the remainder was transfused to gynaecological clients.

3.2.3.5 Overview of blood use among Obstetric Clients

Among the 252 blood units transfused to obstetric clients, 78% (196) were transfused to clients with Obstetric Hemorrhage (OH).

Of the 206 obstetric clients, 174 were clients with OH. Out of the blood requests for the 174 OH clients, 86% (150) got transfused at least 1 unit of blood.

Of 196 blood units transfused to the OH clients, the two main patient conditions which utilized most of the blood units were PPH with 29% (87 units) followed by miscarriages with 19.8% (43 units). A summary of blood use is summarized in Figure 3 below and Table 18 below.

FIGURE 3: SUMMARY OF BLOOD USE AMONG STUDY PARTICIPANTS

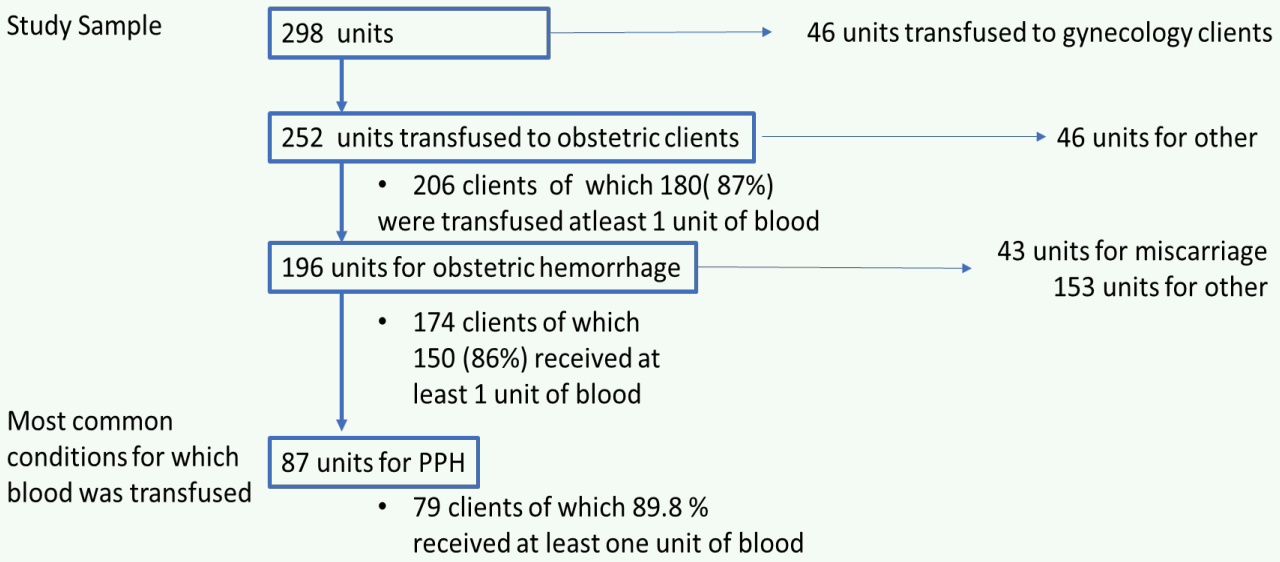


Table 18: Blood request, clients transfused, and total number of units transfused by diagnosis (condition) at MDH

Diagnosis	Request	%	Transfd	%	Units trans	%	Avg units
Antepartum haemorrhage	6	3.4	4	2.7	6	3.1	2
Miscarriage	34	19.5	31	20.7	43	21.9	1
PPH	79	45.4	71	47.3	87	44.4	1
Imminent PPH	32	18.4	23	15.3	28	14.3	1
Ruptured ectopic pregnancy	22	12.6	20	13.3	28	14.3	1
Molar pregnacy	1	0.6	1	0.7	4	2.0	4
Other	0	0.0	0	0.0	0	0.0	0
TOTAL	**174**	**100.0**	**150**	**100.0**	**196**	**100.0**	**2**

*Vaginal delivery with blood loss between 400 and 499mls , C/S with blood loss between 800 and 999mls

3.2.3.6 The outcomes of cases for which there has been blood requested for transfusion for obstetric cases at MDH

There were 206 obstetric cases who had blood requested during the study period of which 87% (180) were transfused with at least 1 unit of blood. Among the 206 obstetric cases who had blood requested, 84.4 % (174) were Obstetric cases with hemorrhage. Among the hemorrhage cases, PPH constituted 45% (79). Almost 86% (150) of 174 obstetric cases with hemorrhage got 1 unit of blood. 89.8% (71) of PPH cases got transfused with at least 1 unit of blood.

During the study period, the hospital recorded 8 maternal deaths among the 206 obstetric cases, and 98% (198) were alive on discharge.

Of the maternal deaths 50% (4) were PPH, 25% (2) were miscarriages, 12.5% (1) had ruptured uterus, and 12.5% (1) had uterine atony. In summary, 100 % (8) of the MDs were due to obstetric hemorrhages.

Among the total MDs, 87.5% (7) got transfused at least 1 unit of blood, and one (PPH patient) died before getting transfused because the sample was still being processed.

Of the 4 MDs due to PPH, 75% (3) got transfused at least 1 unit of blood although it was reported inadequate. As mentioned, one patient did not get blood because she died before blood processing in the laboratory was completed.

Among the 198 who were discharged alive, 87 % (173) clients were transfused with at least 1 unit of blood and 13% (25) did not get any blood at all.

3.2.3.7 Demand and supply of blood for PPH cases at MDH during the study period.

It was difficult to ascertain the actual demand for blood due to the lack of information in the case notes. Such pertinent information was the number of units requested.

We encountered a scenario whereby, when a clinician requested a certain number of units on a particular day and it was not supplied, the request was repeated on the following day with either more units or less units than the previous day. There was also no thorough documentation on any audit for need for blood transfusion e.g comparing the haemoglobin level with clinical findings. Nevertheless, the results have documented the high demand of blood units for PPH clients based on the number of units that were transfused to the PPH clients.

3.2.3.8 Gaps identified in carrying out the blood transfusion process at the MDH during the study period

1. Gaps were identified in the following areas:
2. Data: Inconsistent blood units data
3. Documentation: Incomplete documentation (Blood request in the case notes e.g number of units required, incomplete blood laboratory requests, documentation on monitoring patients on blood transfusion)
4. Communication: Communication within the wards (including handovers), communication between Wards and Laboratory
5. Unavailability of some blood bank reagents, e.g Anti Human Globulin (AHG)

3.2.3.9 Impact of COVID-19 on the number of blood units supplied to MDH during the study period.

3.2.3.9.1 Trends in Blood distribution to MDH

Compared to the same period of 2019, there were 76 less blood units distributed to MDH in 2020. This translated to a 42% reduction in blood distributions, and the difference was statistically significant (p-value= 0.027).

Table 19: Blood distribution to MDH in April- November 2019 and 2020

Month	2020	2019
April	66	159
May	82	121
June	84	83
July	97	140
August	85	85
September	134	97
October	65	143
November	103	179
Total	**716**	**1007**

CHAPTER 4: DISCUSSION

Both the qualitative and quantitative parts of this study have shown that inadequate supply of blood and blood products is one of the challenges contributing to delays in timely access of blood for obstetric clients. The estimated annual national blood need is 120,000 units and MBTS is currently collecting 70,000 units annually. There are several questions which need answers as to why the MBTS is not collecting adequate blood. Is it that the MBTS is not conducting enough blood donation activities? With a total population 18,000,000 people, Malawi needs 0.6% (120,000) of its population to donate blood once a year or about 1.2 % (60,000) of its population to donate twice a year.

Another challenge could be funding, however in 2019 to 2020 the MBTS conducted about 3,000 blood collection drives and collected about 64000 units. This means that 21 blood donors turned up for blood collection at each blood donation drive. On the other hand, had it been that 40 people presented themselves at each of the above activities, MBTS could have collected enough blood. One may argue the deficiency in the number of blood and blood products is due to people's unwillingness to donate blood. The current negative attitude of people towards blood donation means that the MBTS has to do a lot of activities to collect enough blood of which at the end of the day will need more funds. The need for more funds will be there up to a point when more people start donating blood voluntarily to meet the national blood need. There is a need to design an intervention which will attract an increased number of people to donate blood.

Just like it is in many countries in the developing world, the blood supppy is not adequate. As such, when blood from the MBTS is not available, and there is an urgent need for blood, family replacement donors or directed blood donors should be allowed to donate blood as these type of blood donors are not prohibited in Malawi according to the National blood policy. Furthermore, emerging evidence suggests that fresh wholeblood is essential as it contains viable clotting factors and platelets as compared to packed stored whole blood [17]. However, when such an option is taken, blood screening tests should be conducted to not compromise blood safety.

We noted MBTS compliance of 61% at QECH and 52% at MDH to supply blood. The QECH compliance to requests higher than the rural hospital. This could be due to prioritization, as the referral hospitals treat more complicated cases. Although there seems to be a deficit at both sites, it could also be that the hospital requests were deliberately inflated due to the fact that the MBTS would not provide 100% of their request. Therefore, the deficit might be lower than what is documented in this study.

At QECH, it was noted that the Maternity unit used most of the blood. This could be due to increased demand from this unit owing to obstetric emergencies, especially hemorrhage related emergencies. The Laboratory responded quickly to the CMU in an attempt to mitigate maternal mortality due to obstetric hemorrhage. At both sites, at least 80 % of obstetric cases who had requested got at least 1 unit of blood, this further confirms that obstetric clients were prioritised with the limited safe blood available from the MBTS.

Within the Maternity wards at both sites, it was noted that miscarriage was the second most common diagnosis for blood requests. Usually, clients with miscarriage, if managed in a timely and effective manner, should not lead to excessive bleeding. The increased blood use could be: over prescription by clinicians, the clients could already be anaemic before miscarrying or the clients could have other underlying complications e.g sepsis, or it may be that cases are not treated expeditiously. This finding needs further review to determine why this group of patients reoresent such a high proportion of blood requests.

On impact of COVID-19 on blood supplies, compared to the same period of 2019, there were 6532 less blood units which were collected in 2020. This translated to an 18% reduction in blood collections. However, the difference was not statistically significant, p-value 0.264; a unique finding to Malawi compared to most parts of the world. The MBTS should be commended for the efforts during the pandermic to solicit blood donations and should strive to maintain such resilience in future disasters. It is impossible to determine the impact of this reduction in supply on these results.

CHAPTER 5: CONCLUSION

PPH continues to be a leading cause of maternal death and timely access to blood and blood products could improve survival. Inadequate blood supply remains a major challenge contributing to delayed access of blood transfusion by obstetric patients, especially those with postpartum hemorrhage. There is a need to design interventions which will attract increased numbers of people to donate blood. Despite challenges in the blood supply, at least 80% of obstetric clients who had blood requested, received at least 1 unit of blood. There were also challenges identified at the institutional level such as transport, communication and long distance to the MBTS.

Obstetric hemorrhage was the leading cause of maternal death, constituting 60% at QECH and 100% at MDH.

CHAPTER 6: RECOMMENDATIONS

As efforts are ongoing to increase blood donations and improve blood supply by the MBTS through the National Blood Donor Mobilisation Plan, there is a need to put systems in place so that the limited blood units available should be accessed timely. The recommendations are from the findings of the study, discussions from the APPHC portifolio dissemination and expert recommendations after reviewing the study findings.

Below are the recommendations:

6.1 Short term recommendations:

National level

- Need for stakeholder / partner engagement to strategize to ensure availability of blood transfusion related supplies.
- Comprehensive operationalisation of the current National Blood Donor Mobilisation.
- Convene taskforce to determine MBTS funding requirements and address system gaps
- Explore alternative transportation modes (e.g., drones, motorbikes, dedicated vehicles, delivery of blood to be done by MBTS,)
- The MBTS to consider supplying blood giving sets together with the blood units.

Facility level

- Ensure regular training on completing blood requests, enforce refresher training for individuals who routinely do not complete forms properly
- Training on appropriate clinical use of blood and blood products; Updating of the guidelines on the Clinical Use of blood and blood products.
- Revamp or strengthen the Hospital Blood Transfusion Committees
- Use Crossmatch and Ward Blood Transfusion Registers
- There should be an emergency blood stock of O negative blood which is managed separately from general blood stock
- Explore options for ensuring functional communication lines are available (e.g., credit for personal phones if facility lines are down)
- Refresher training in early detection and management of PPH and abortion
- Hospitals should consider bleeding from family replacement blood donors/directed blood donors during an emergency and when blood from the MBTS is not readily available.

Individual level

- Become voluntary blood donor or if not eligible, encourage others to become voluntary blood donors

6.2 Long-term recommendations: National level

Acquire real-time electronic database to capture blood and blood products data

The study team is to consider establishing a consortium/project (Transfusion Science Initiative or any related name) which will concentrate on activities within the hospital setting. The main activities will be transfusion sciences short courses/trainings and research. It will also ensure that the recommendations in this report are followed up. Membership will include MoH, KUHeS, MBTS, funding partners and others. The motivation behind this is that there is a duly established institution given the mandate to collect blood but there isn't any organization which soley look at transfusion relation issues within the hospital, although these activities are partly done by the MBTS.

Some research ideas proposed: the prevalent causes for anemias among pregnant women, research needed to establish the normal hemoglobin levels for the Malawian population as it was reported thet the MBTS defers some prospective blood donors due to low Haemoglobin, further analysis on why clients who had miscarriages were among those who were transfused a lot of blood.

Facility level

- Need to explore how best blood transfusions in miscarriage can be minimized
- Need to comprehensively discuss and address alleagtions on the issue of blood selling taking place at some hospital blood banks as the malpractice demotivates regular or prospective blood donors.
- Consider piloting a satellite Blood Bank at the CMU, QECH.

References

1. Government of Malawi.2012. National Blood Policy. Ministry of Health.
2. World Health Organization; 2017. Managing complications in pregnancy and childbirth: a guide for midwives and doctors – 2nd ed. Geneva:. Licence: CC BY-NC-SA 3.0 IGO.
3. World Health Organization; 2020. Health Statistics and Information Systems. Geneva.Accessed on 26/03/2020. https://www.who.int/healthinfo/statistics/indmaternalmortality/en/
4. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller AB, Daniels J, et al.2014. Global causes of maternal death: a WHO systematic analysis. Lancet Glob Health. 2014 Jun;6(2):e33–323. https://doi.org/10.1016/S109-2214X(-70227)14X PMID:25103301
5. National Statistics Office (NSO) [Malawi] and ICF. 2017. Malawi Demographic and Health Survey 2015-16. Zomba, Malawi, and Rockville, Maryland, USA. NSO and ICF.
6. Barriers to Timely and Safe Blood Transfusion for PPH Patients: Evidence from a Qualitative Study in Dhaka, Bangladesh. Akhter S, Anwar I, Akter R, Kumkum FA, Nisha MK, Ashraf F, Islam F, Begum N, Chowdhury ME, Austin A, Islam SS, Rahman A. Accessed on 26/08/2019. https://www.ncbi.nlm.nih.gov/pubmed/27911959.
7. QECH 2019. Queen Elizabeth Central Hospital data repository.
8. Kanyighe C, Channon A, Tadesse E, Madise N, Changole J, Bakuwa E, et al. Determinants of postpartum maternal mortality at Queen Elizabeth Central Hospital, Blantyre, Malawi: a case-control study 2001–2002. Afr J Reprod Health. 2008 Dec;(3):35–48. [PubMed] [Google Scholar]
9. Wiebenga J.E, 1992. Maternal Mortality at Queens Elizabeth Central Hospital, 1989 to 1990. Malawi Medical Journal, 1992. April, Vol 8, No.1.
10. Mulanje District Hospital data repository 2019
11. MBTS 2018: Malawi Blood Transfusion Service data repository.
12. Bloch E. M; Ingram C; Hull.J; Fawcus S , Anthony J, Green ,R et al 2013 . Risk factors for peripartum blood transfusion in South Africa: a case-control study. Transfusion 2018;58;2149–2156
13. Polit, DF and Beck CT: Nursing research: generating and assessing evidence for nursing practice. 9th Edition. Philadelphia: Wolters Kluwer; Lippincott, Williams & Wilkins 2012.
14. Guest, Greg & Bunce, Arwen & Johnson, Laura. (2006). How Many Interviews Are Enough?. Field Methods - FIELD METHOD. 18. 59-82. 10.1177/1525822X05279903.
15. Mipando-Nyondo, L.2019. Qualitative Data analysis. Powerpoint presentation. Young Researchers Forum, College of Medicine.
16. Watkins DC. Rapid and rigorous qualitative data analysis: The “RADaR” technique for applied research. International journal of qualitative methods. 2017;16(1):1609406917712131
17. Spinella PC. Warm fresh wholeblood transfusion for severe hemorrhage: U.S Military and potential civilian applications. Critical Care Medicine.2008; 36:S340-S345.

Investigation Team

Roles and Responsibilities (Institution and Investigation Team)

University Research Co.LLC.	URC will provide oversight of the activities of the protocol implementation. Provide technical input in protocol development, provide subject matter guidance in support of activities listed in the protocol, and participate in the analysis, report writing and dissemination of information. URC will implement above tasks through the following personnel: Grant Administration: Addis Gemeda ,Senior Contracts officer. Technical Direction: Danielle Charlet, Technical Director for Research Studies HEARD
USAID Malawi	Provide technical input in protocol development, provide subject matter guidance in support of activities listed in the protocol, and participate in the analysis, report writing and dissemination of information.
Stephen Njolomole	He is the PI, with 7 years progressive experience in blood transfusion service. A Public Health Specialist and currently assistant lecturer in Haematology at UNIMA, COM. He participated in the study design and drafting of concept and protocol. He will lead implementation of the study; he will also contribute to the preparation of the final report and any other manuscripts that may be derived from this project. He is the contact person for the study team.
Adamson Muula	He is professor of Epidemiology at UNIMA, COM. A high-profile research scientist and academician who has also managed several multi-donor funded research projects, in this study will be taking on a role of a Co-PI. Prof Muula has conducted and supervised several previous quantitative and qualitative studies. He participated in the study design and drafting of concept and protocol. Working hand in hand with the PI, he will lead implementation of the study; he will also contribute to the preparation of the final report and any other manuscripts that may be derived from this project.
Bridon M'baya	He is the Medical Director of the MBTS , Public Health Specialist and Transfusion medicine expert. He participated in the study design and drafting of concept and protocol. He will assist in recruiting study participants, including facilitating access to MBTS staff. He will also participate in the preparation of the final report and any other manuscripts that may be derived from this project.
Benson John	Consultant statistician, from the UNIMA, Chancellor College. He has done statistical analyses for several cutting-edge studies, both qualitative and quantitative. He played a vital role in literature review. He participated in the drafting of the concept and proposal. He will supervise data collection and analyze data of the whole study. He will also participate in the preparation of the final report and any other manuscripts that may be derived from this project.

Luis Gadama	Consultant Obstetrician and Gynacologist, Head of Department of the Obstetric and Gyanaecology, University of Malawi, College of Medicine. He played a vital role in literature review. He participated in the drafting of the concept and proposal. He will support the supervision of study personnel during data collection phase. He will also participate in the preparation of the final report and any other manuscripts that may be derived from this project
Phylos Bonongwe	Consultant Obstetrician and Gynacologist, Head of Department of the Obstetric and Gyanaecology of Queen Elizabeth Central Hospital, Ministry of Health. He played a vital role in literature review. He participated in the drafting of the concept and proposal. He will support the supervision of study personnel during data collection phase. He will also participate in the preparation of the final report and any other manuscripts that may be derived from this project
Evans Storey	Acting Laboratory Manager for QECH. He played a vital role in retrieving QECH laboratory data. He will assist in recruiting study participants, including facilitating access to QECH laboratory staff. He will also participate in the preparation of the final report and any other manuscripts that may be derived from this project
Silvester Chabunya	He participated in the drafting of the concept and proposal. He will be the first person of contact with the RAs to resolve any issues. He will assist in detailed review of patients who receive blood including outcome of blood transfusion and refer any issues to the senior hematologist. He will also participate in the preparation of the final report and any other manuscripts that may be derived from this project

Sponsor monitoring

URC will conduct monitoring of the Grant program, including site visits as appropriate to ensure the scientific integrity of the study and to ensure the rights and protection of study participants. Monitoring and auditing activities may be conducted by:

- URC Staff (“internal”)
- Authorized representatives of URC (e.g., a contracted party considered to be “external”)
- Both internal and external parties

Monitoring or auditing may be performed by means of on-site visits to the collaborator’s facilities or through other communications such as telephone calls or written correspondence. The visits will be scheduled at mutually agreeable times, and the frequency of visits will be at the discretion of URC. During the visit, any study-related materials may be reviewed and the Investigator along with study staff should be available for discussion of findings. The study may also be subject to inspection by regulatory authorities (national or foreign) as well as the IECs/IRBs to review compliance and regulatory requirements.

Appendix 1a: English Informed Consent Form (ICF)

Informed Consent Form for participants Malawi Blood Transfusion Service staff, QECH Laboratory staff, Frontline Technical Chatinkha Unit Staff (Nurses), Clinicians (clinical officers), Registrars, and Specialists working at the maternity unit, High-profile selected Malawi Government/Non-Governmental Organisation Officials directly involved in Maternal and Child Health, Incumbent/former Chairperson of the Parliamentary Committee of Health and Former Minister Of Health.

Name of Principle Investigator:
Stephen Njolomole

Name of Organization:
University of Malawi, College Of Medicine.

Name of Sponsor:
USAID's HEARD Project

Name of Project:
Formative research to develop an intervention to improve timely blood access for obstetric patients with postpartum hemorrhage.

Study Identification Number:

Contact:

Cellphone: 0993 012 997,
Email: snjolomole@medcol.mw
Postal Address , College Of Medicine , Private Bag 360 ,Chichiri , Blantyre 3

Or visit at the Mahatma Ghandi Campus, Blantyre.

This Informed Consent Form has two parts:

- Information Sheet (to share information about the study with you)
- Certificate of Consent (for signatures if you choose to participate)

You will be given a copy of the full Informed Consent Form

Part I: Information Sheet

Introduction

My name is _____, I am part of the team from the following instituitions: the University of Malawi, College of Medicine, Malawi Blood Transfusion Service and the Ministry of Health. In Malawi, studies have shown that Postpartum Hemorrhage (excessive loss of blood during child birth) remains the most common cause of maternal death . I am going to give you information and invite you to be part of this research. COVID-19 disease has affected availability of blood in hospitals; as such, we will have about 5 questions on the disease in regard to blood collections. You do not have to decide today whether or not you will participate in the research. Before you decide, you can talk to anyone you feel comfortable with about the research.

This consent form may contain words that you do not understand. Please ask me to stop as we go through the information, and I will take time to explain. If you have questions later, you can ask them of me or of another researcher.

Purpose of the research

Providers attending emergency obstetrics cases requiring blood often have difficulty accessing blood in the required quantity and in a timely manner. We are talking to people in this institution in order to find out challenges and proposed solutions to timely access of blood and blood products to patients who are diagnosed with Postpartum Hemorrhage (excessive loss of blood during childbirth). The information we collect is useful to make sure that PPH patients have access to blood when they need it.

Type of Research Intervention

In participating in this study, you will be required to respond to questions which will take about 30-60 minutes. The responses will be kept locked in specified filing cabinets which will be accessed by the researchers only. A tape recorder will be used to capture discussion that could be lost during the interview. The results which will be reported will reflect group responses not individual data. You will not be requested to donate blood or give any blood samples.

Participant Selection

You are being invited to take part in this research because we feel that your experience as a ..... can contribute much to our understanding and knowledge of challenges and proposed solutions to timely access of blood and blood products to patients who are diagnosed with Postpartum Hemorrhage (excessive loss of blood during child birth).

Voluntary Participation

Participation in this study is strictly voluntary and failure to volunteer will not result in any disciplinary action by the institution's management or withdrawal of treatment. Your answers are anonymous. Your name will not be written on this form. Your names will never be used in connection with any of the information you tell me. Your honest answers to these questions will help us better understand challenges and proposed solutions to timely access of blood and blood products to PPH patients. We would greatly appreciate your help in participating in this interview.

Procedures

We are asking you to help us learn more about challenges and propose solutions to timely access of blood and blood products to patients who are diagnosed with Postpartum Hemorrhage (loss of a lot of blood by pregnant mothers). Main questions will cover the following:

1. Blood donation and availability in hospitals and challenges
2. Suggested solutions to challenges identified
3. Other related questions you may want to ask.

We are inviting you to take part in this research project. If you accept, you will be asked to participate in an interview with [name of interviewer.....] or myself.

During the interview, I or another interviewer will sit down with you in a comfortable place at the Institution. You do not have to answer any questions that you do not want to answer. You may end this interview at any time you want to. If you do not wish to answer any of the questions during the interview, you may say so and the interviewer will move on to the next question. No one else but the interviewer will be present unless you would like someone else to be there. The information recorded is confidential, and no one else except the study team will have access to the information documented during your interview. The entire interview will be tape-recorded, but no one will be identified by name on the tape. The tape will be kept under lock and key, the key will only be accessed by the study team. The information recorded is confidential, and no one else except the study team will have access to the tapes. The tapes will be destroyed after 2 years

Duration

This interview will last about 30 to 60 minutes.

Risks

Minimal risks in participating in the study would be fatigue, physical discomfort or boredom in responding to some questions in the interview guide.

Benefits

Participating in this study may not benefit you directly, however potential benefit for participating in this study is personal satisfaction that the information you will provide will help us better understand challenges and proposed solutions to timely access of blood and blood products to PPH patients.

Reimbursements

You will not be provided with any incentive to take part in the research. However, as we are conducting these interviews over your lunch hour , we will give you an equivalent of K4 410.00 to cater for your lunch.

Confidentiality

The information that we collect from this research project will be kept private. Your answers are anonymous. Your name will not be written on this form. Your names will never be used in connection with any of the information you tell me. The responses will be kept locked in specified filing cabinets which will be accessed by the researchers only. The results which will be reported will reflect group responses not individual's data. It will not be shared with or given to anyone except the research team.

Sharing the Results

Nothing that you tell us today will be shared with anybody outside the research team, and nothing will be attributed to you by name. The knowledge that we get from this research will be shared with you before it is made widely available to the public. Each participant will receive a summary of the results. There will also be some meetings at QECH and a selected venue in Lilongwe where these results will first be shared to stakeholders and these will be announced. Following the meetings, we will publish the results so that other interested people may learn from the research.

Right to Refuse or Withdraw

You do not have to take part in this research if you do not wish to do so and choosing to participate will not affect your job or job-related evaluations in any way. You may stop participating in the interview at any time that you wish without your job being affected. I will give you an opportunity at the end of the interview/discussion to review your remarks, and you can ask to modify or remove portions of those, if you do not agree with my notes or if I did not understand you correctly.

Who to Contact

If you have any questions, you can ask them now or later. If you wish to ask questions later, you may contact any of the following:

Dr Stephen Njolomole ,

Cellphone: 0993 012 997, 0888364 201

Email: snjolomole@medcol.mw

Postal Address , College Of Medicine , Private Bag 360 ,Chichiri , Blantyre 3

Or visit at the Mahatma Ghandi Campus, Blantyre.

This proposal has been reviewed and approved by COMREC, which is a committee whose task it is to make sure that research participants are protected from harm. If you wish to find out more about COMREC , contact: COMREC

College Of medicine,

3rd Floor, John Chiphangwi Learning Resource Centre,

Private bag 360, Chichiri , Blantyre 3.

Malawi.

Email: comrec@medcol.mw

Phone: +26511871 911

You can ask me any more questions about any part of the research study, if you wish to. Do you have any questions?

Part II: Certificate of Consent

I have been invited to participate in research about challenges and proposed solutions to timely access of blood and blood products to patients who are diagnosed with Postpartum Hemorrhage.

I have read / been verbally given the foregoing information. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a respondent in this research.

Print Name of Participant_____

Signature of Participant _____

Date: _____

Day/month/year

If illiterate

_____

A literate witness must sign (if possible, this person should be selected by the participant and should have no connection to the research team). Participants who are illiterate should include their thumb print as well.

I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

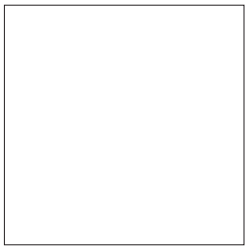
Print name of witness_____

Signature of witness _____

Date _____

Day/month/year

Thumb print of participant



Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

1. Conduct in depth Interview
2. Will be given a lunch allowance of K4410.00

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily. A copy of this Informed Consent Form has been provided to the participant.

Print Name of Researcher/person taking the consent_____

Signature of Researcher /person taking the consent_____

Date _____

Day/month/year

Appendix 1b: Chichewa Informed Consent Form (ICF)

Informed Consent Form for participants: Family Replacement Blood Donors and Voluntary Non Remunerated Blood Donor , PPH blood recipients. This consent will be administered by research assistants.

Name of Principle Investigator:

Stephen Njolomole

Name of Organization:

University of Malawi, College Of Medicine.

Name of Sponsor:

USAID's HEARD Project

Name of Project:

Formative research to develop an intervention to improve timely blood access for obstetric patients with postpartum hemorrhage (PPH)

Study Identification Number:

Contact:

Cellphone: 0993 012 997,

Email: snjolomole@medcol.mw

Postal Address , College Of Medicine , Private Bag 360 ,Chichiri , Blantyre 3

Or visit at the Mahatma Ghandi Campus, Blantyre.

Gawo loyamba: M'ndandanda wa kafukufuku

Mau oyambirira:

Dzina langa ndine_____, mmodzi mwa anthu omwe achoka mmalo awa : ku sukulu ya ukachenjede , ya College of Medicine , Bungwe lomwe limaona kuti magazi ndiokwanila mu mzipatala za dziko lino, la Malawi Blood Transfusion Service komaso ku unduna wa za Umoyo. M'dziko muno, Kafukufuku waonetsa kuti , pazifukwa zomwe azimayi oyembekezera akutayira miyoyo yawo nthawi yomwe akuchira , kutaya magazi ndivuto lomwe likutenga miyoyo ya mbiri.Komaso , Mlili wakolona wakhudzaso mapezekedwe a magazi mzipatala. Chifukwa cha ichi, tikambilanso za nthendayi makamaka momwe akhudzila kapezekedwe ka magazi.

Ndikupatsani tsatane tsatane wa kafukufukuyu kenako ndikumemani kuti mutenge nawo mbali. Mutha kupanga chisankho choti mutenge nao mbali kapena ayi tsiku lina lirilonse. Tsatane tsatane yu atha kukhala ndi mau oti simungathe kumvetsa , chonde ndiimitseni kuti ndikutambasulireni. Ngati mungakhale ndi mafuso titatha kukufotokozerani, mutha kudzandifusa kapena kufusaso ena mwa omwe ndikupanga nawo kafukufukuyu

Chifukwa chopangira kafukufukuyu.

Ogwira ntchito mzipatala nthawi zambiri amakumana ndi mavuto kuti apeze magazi okwanira omwe angathe kukampatsa mwachangu mzimayi yemwe akutaya kwambiri magazi pomwe akuchira . Tikupanga kafukufuku yemwe cholinga chake ndikudziwa zovuta zomwe zimakhalapo zomwe zimapangitsa amayi omwe amataya magazi ambiri pomwe akuchira kuti asathilidwe magazi mwachangu , komaso kupelekakoso maganizo omwe angathandize kuthetsa zovutazo .

Mfundo zomwe mutiuuze zitithandiza kuti amayi oyembekezera omwe akutaya magazi kwambiri athe kulandila magazi mwachangu nthawi yomwe magaziwo akufunika.

Zochitika mu kafukufukuyu.

Mukafukufukuyu, mufunsidwa kuyankha mafunso omwe agathe mphindi makumi atatu mpaka ola limodzi. Mayankho anu adzasungidwa mwachisisi mmalo moti wina aliyense sangafikemo kupatula akuluakulu a kafukufukuyu. Tigwilitsa ntchito wailesi pojambula mau anu kuopa kuti mfundo zina zitha kuiwalidwa osalembedwa. Pokalemba zotsatila , tikalemba mayankho anu ngati gulu koma osati aliyese payekha payekha.Mukafuku fukuyu , simufunsidw kupeleka magazi.

Kusankha otenga nawo mbali mukafukufukuyu

Mukumemedwa kuti mutenge nawo mbali pa kafukufukuyu chifukwa tili ndichikhulupiliro kuti ndi udindo wanu ngati....., mutha kupeleka fundo zomwe zingapangitse kuti timvetsetse ndikudziwa za zovuta zomwe zimakhalapo zomwe zimapangitsa amayi omwe amataya magazi ambiri pomwe akuchira kuti asathilidwe magazi mwachangu.

Kutenga nawo mbali mosaumilizidwa

Muli ndi ufulu kulowa mu kafukufukumu popanda kuumilizidwa. Palibe amene angakuimbeni mulandu ngati mutakana kutenga nawo mbali kapena kukusalani polandila chithandizo mchipatala. Dzina lanu silirembedwa pa pepalari. Mayankho anu sitiyikapo dzina lanu. Simuli okakamizidwa kuyankha funso liri lonse lomwe simukufuna kuyankha. Muli ndiufulu kulekeza pa njira pa kufunsana ndi kuyankha mafunso athu. Koma, dziwaniso kuti potiyankha mafuso athu mwachilungamo mutithandiza kudziwa zovuta komaso mayankho okhudzana ndikupelekedwa kwa magazi kwa azimayi oyembekezera omwe akutaya magazi kwambiri nthawi yomwe akuchira. Tithokoza kwambiri ngati mutatengapo mbali pa kafukufukuyu.

Ndondomeko

Tikukupemphani kuti mutithandize kuti tidziwe zovuta zomwe zimakhalapo zomwe zimapangitsa amayi omwe amataya magazi ambiri pomwe akuchira kuti asathilidwe magazi mwachangu .

Mitu ikuluikulu yomwe tikambirane ndi iyi:

1. Kupeleka magazi, kapezekedwe ka magazi mnzipatala , komaso zovuta zomwe zimakhalapo kuti magazi afikile odwaala
2. Maganizo anu momwe ndingathetsele mavutowa
3. Mafunso ena alionse okhudzana ndi nkhaniyi.

Tikukumemani kuti mutenge nawo mbali pakukambirana zimenezi, ngati mungavomereze, mucheza ndi [.....] kapena ine amene. Nthawi yakufusana mafusoyi, Ineyo kapena wina aliyense amene mungacheze naye mukhala pa malo opita mphepo. Wina aliyense sakakhala nawo pomwe tikukambirana pokhapokha ngati inuyo mutafuna kuti zitero. Dzina lanu silirembedwa pa pepalari. Mayankho anu sitiyikapo dzina lanu. Simuli okakamizidwa kuyankha funso liri lonse lomwe simukufuna kuyankha. Mayankho anu adzasungidwa mwachisisi mmalo moti wina aliyense sangafikemo kupatula akuluakulu a kafukufukuyu. Pokalemba zotsatila , tikalemba mayankho anu ngati gulu koma osati aliyese payekha payekha. Mayankho anu sitikaonetsa wina aliyense kupatulako akuluakulu omwe akutsogolera kafukufukuyu. Tigwilitsa ntchito wailesi pojambula mau anu kuopa kuti mfundo zina zitha kuiwalidwa osalembedwa. Wailesiyi tikamaliza ikabisidwa mmalo omwe tikatseke ndi makiyi. Palibe wina aliyense amene akavele zomwe takambiranezi pokhapokha ngati iyeyo ali mmodzi mwa akuluakulu akafukufuyu.. Zomwe zijambulidwezo zidzafufutidwa pakatha zaka ziwiri.

Nthawi yomwe kucheza kwathu kungatenge

Mukafukufukuyu, mufunsidwa kuyankha mafunso omwe agathe mphindi makumi atatu mpaka ola limodzi.

Chiopsyezo

Palibepo chiopsyezo chachikulu potengapo mbali kupatula kutimwina mutha kutopa ndimafunso, kumva kupweteka kamba kokhala pamodzimodzi nthawi yayitali , komaso kutha chidwi pomwe mukuyankha mafuso.

Chiongola dzanja

Palibepo cholowa chilichonse chomwe mupezepo potenga mbali pa kafukufukuyu kupatula kumva bwino mu mtima kuti mfundo zomwe mutapeleke zithandiza kuti odwalawa adzilandila magazi ku chi patala mwa changu.

Zobwezela pa zomwe mwagwilitsa ntchito

Palibe cholowa chili chonse chomwe mupatsidwe potengapo nawo mbali pa kafukufukuyu. Koma ngakhale zilichonchi, chifukwa chakuti tikupanga kafukufukuyu nthawi yankhumaliro , tikupatsani ndalama yokwana K4410.00 kuti mukagule chakudya.

Chinsinsi

Zomwe tikambilane pano tizisunga mwa chisisi. Dzina lanu silirembedwa pa pepalari. Mayankho anu sitiyikapo dzina lanu. Simuli okakamizidwa kuyankha funso liri lonse lomwe simukufuna kuyankha. Mayankho anu adzasungidwa mwachisisi mmalo moti wina aliyense sangafikemo kupatula akuluakulu a kafukufukuyu. Pokalemba zotsatila , tikalemba mayankho anu ngati gulu koma osati aliyese payekha payekha. Mayankho anu sitikaonetsa wina aliyense kupatulako akuluakulu omwe akutsogolera kafukufukuyu.

Kudziwitsana zotsatila za kafukufukuyu

Chilichonse chomwe tikambirane pano sitikauza wina aliyense yemwe sali okhudzidwa ndi kafukufukuyu. Palibe yankho lomwe liikidwepo dzina lanu. Zomwe tipeze pa kafukufukuyu , tidzagawana nanu tisanafalitse kwa antu ena. Wina aliyense atengepo mbali adzapatsidwa zotsatila za kafukufukuyu. Onse oyenera tikadzagawana nawo zotsatilazi, tisanadzazifalitse kwa wina aliyese.

Ufulu okana kapena kusiya kafukufukuyu

Simuli okakamizidwa kutengapo mbali pa kafukufukuyu ngati simukufuna, kusankha kuti mupangenawo kafukufukuyu sikusintha chilichonse pa chithandizo chomwe mukulandira ku chipatala / kapena momwe ma bwana anu amakulamulirani pa kagwilidwe kanu ka ntchito. Mutha kusiyila panjira nthawi ina iliyonse popanda chovuta chilichose kugutsana ndi ntchito / chithandizo chomwe mumalandira ku chipatala. Ndikupatsani mwayi, pomaliza pa kucheza kwathu kuti muunikire bwinobwino mayankho omwe mwapeleka. Mutha kusintha mayankhidwe kapena kochotselatu yankholo ngati simugwilizana nalo .

Yemwe munga lumikizane naye

Ngati muli ndimafunso, mutha kundifunsa pano kaepena nthawi ina. Ngati mungafune kufusa nthawi ina , mukhoza kulankhula ndi awa:

Dr Stephen Njolomole ,
lamya: 0993 012 997, 0888364 201
Email: snjolomole@medcol.mw
keyala, College Of Medicine , Private Bag 360 ,Chichiri , Blantyre 3
Kapena bwerani ku Mahatma Ghandi Campus, Blantyre.

Ndondomeko ya kafukufukuyu yaunikidwa ndikuvomelezedwa ndi a COMREC , komiti yomwe ntcthito yake ndikuonetsetsa kuti omwe akutenga nawombali pa kafukufuku akhale otetezedwa pa ufulu ndi umoyo wawo. Ngati mukufuna kudziwa zambiri za COMREC, funsani:

COMREC
College Of medicine,
3rd Floor, John Chiphangwi Learning Resource Centre,
Private bag 360, Chichiri , Blantyre 3.
Malawi.
Email: comrec@medcol.mw
Lamya: +26511871 911

Mungakhale ndimafunso ena ali onse panopo ?

Gawo la Chiwiri: Chikalata Chotsimikizila kuti mwavomeleza kutenga nawo mbali.

Ndapemphedwa kuti nditenge nawo mbali pakafukufuku yemwe cholinga chake ndikudziwa zovuta zomwe zimakhalapo zomwe zimapangitsa amayi omwe amataya magazi ambiri pomwe akuchira kuti asathilidwe magazi mwachangu , komaso kupelekako maganizo momwe zovutazo zingathetsedwere.

Ndikutsimikiza kuti ndauzidwa/ ndawelenga ndondomeko ya kafukufukuyu. Ndinapatsidwa mwayi ofunsa mafunso ndipo ndayankhidwa bwino lomwe. Pano ndikuvomeleza kutengapo mbali pa kafukufufukuyu popanda kuumilizidwa.

Dzina la otengapo mbali _____

Saini _____

Tsiku: _____
Tsiku/mwezi/Chaka

If illiterate

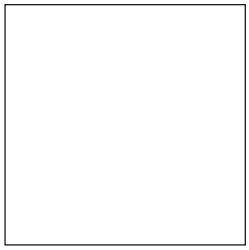
I have witnessed the accurate reading of the consent form to the potential participant, and the individual has had the opportunity to ask questions. I confirm that the individual has given consent freely.

Print name of witness_____

Signature of witness _____

Date _____
Day/month/year

Thumb print of participant



Statement by the researcher/person taking consent

I have accurately read out the information sheet to the potential participant, and to the best of my ability made sure that the participant understands that the following will be done:

1. Conduct in depth Interview
2. Will be given a lunch allowance of K4410.00

I confirm that the participant was given an opportunity to ask questions about the study, and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

A copy of this Informed Consent Form has been provided to the participant.

Print Name of Researcher/person taking the consent_____

Signature of Researcher /person taking the consent_____

Date _____
Day/month/year

Appendix 2: Semi Structured Indepth Interview Guides

Formative research to develop an intervention to improve timely blood access for obstetric patients with PPH

The interview guides have been developed to capture general blood donation and blood distribution issues, intraorganisational and extraorganisational contextual themes (materials and resources, work organization design, teamwork, timeliness, coordination and communication), representing multiple cadres that are involved with blood and blood transfusion. Though the questions and themes are similar for each targeted respondent group, the guides are broken into the following cadres:

Appendix 2a: Semi Structured Indepth Interview Guides - Malawi Blood Transfusion Service Staff Interview Guide

Introduction of research by the interviewer to the interviewee and informed consent

[The interviewer will provide an overview of the research-intervention to the interviewee. She/he must also indicate the interest of the interview in capturing his/her impressions about management of obstetric hemorrhage and the role of blood transfusion. Before beginning the interview, the interviewer will review the Consent Form (Appendix I) with the respondent and obtain written consent. Two copies must be signed, one for the interviewee and the other to the research principal investigator. We anticipate the interviews will last approximately 30-60 minutes.]

Questions and some supportive appointments

1. To begin, could you start by telling me about your role in this institution, what kind of employment (temporary, contract or permanent) you have and how long you've worked here? Do you work anywhere else?
2. Thinking about blood transfusions services at this hospital and other places you have worked [if they have worked elsewhere], what are the general issues you see?
3. Thinking about supplying blood to the QECH laboratory blood bank:
    a. What would you say are the strengths of the MBTS?
    b. What are your main challenges?
4. What problems do you face trying to supply safe blood to QECH?
5. Frequently, medical records (e.g Laboratory blood request forms) are criticised because of their incompleteness. What do you think are the challenges in this sense at this Institution?
6. What would you say about communication among the MBTS laboratory staff and between your lab team and QECH in terms of adequacy for coordination with regard to supplying blood to QECH laboratory?
7. How would you describe the working relationships between professionals along the blood supply chain to QECH laboratory?
    a. Among MBTS laboratory staff?
    b. Between the MBTS laboratory staff and the QECH laboratory staff?
    c. How do you all work as a team and what affect does it have on the coordination of blood supply to QECH laboratory?
8. Malawi's maternal mortality rate is still high among the countries in sub-Saharan Africa. According to NSO, one of the leading causes of maternal mortality is obstetric hemorrhage. From your point of view, what role should the MBTS play to deal with the cause of maternal mortality?
9. Have any improvement efforts been tried to improve supply to QECH laboratory? What were they and how well (or not) did they work?
10. If you had to propose interventions to improve number of blood units supplied to the QECH laboratory, what would you propose?
11. If you had to propose interventions to improve the turn-around time of blood supply to the QECH laboratory, what would you propose?
12. Which factors, in your opinion, may facilitate or make difficult the implementation of blood supply access interventions to QECH laboratory?
    a. Who should be involved?
    b. What are the institutional barriers?
13. If a friend or family member of yours was going to QECH Maternity for management of PPH, would you have any concerns? What would you be most concerned about?
14. The National Blood Policy gives mandate to the MBTS to be the only institution responsible for collecting , processing and issueing blood to authorized hospitals in Malawi. What are your views about this mandate ?

Now I want to ask you about your experiences since the start of the COVID-19 pandemic

1. How has the COVID-19 pandemic affected blood collection activities across the country.
2. In your facility / lab /, What has been the impact of COVID-19 on blood requests / availability access in hospitals? What are the biggest challenges?

3. What would you suggest to be done at National, Instituitional (hospitals/MBTS) and individual level in order to mitigate the challenge(s) mentioned above.
4. Who do you think is likely to transmit Covid-19 through donating blood? Please explain
5. In view of COVID-19, would you be afraid of contracting the disease through blood donation process?
6. If you or your relative were to get a blood transfusion , what concerns would you regarding a transfusion during COVID-19 ? Please explain your answer

Appendix 2b: Semi Structured Indepth Interview Guides - QECH Laboratory staff Interview Guide

Introduction of research by the interviewer to the interviewee

[The interviewer will provide an overview of the research-intervention to the interviewee. She/he must also indicate the interest of the interview in capturing his/her impressions about management of obstetric hemorrhage and the role of blood transfusion. Before beginning the interview, the interviewer will review the Consent Form (Appendix I) with the respondent and obtain written consent. Two copies must be signed, one for the interviewee and the other to the research principal investigator. We anticipate the interviews will last approximately 20-60 minutes.]

Questions and some supportive appointments

1. To begin, could you start by telling me about your role in this institution, what kind of employment (temporary, contract or permanent) you have and how long you've worked here? Do you work anywhere else?
2. Thinking about supplying blood to the Chatinkha Unit what would you say are the strengths of the QECH laboratory?
3. And what are your main challenges? What problems do you face trying to supply safe blood to Chatinkha Unit in terms of:
   a. Adequate supply
   b. Timeliness (shortest turnaround time)
4. Frequently, medical records (e.g Laboratory blood request forms) are criticised because of their incompleteness. Do you identify any difficulty in this sense at this laboratory?
5. Would you say that communication among the QECH laboratory staff and between your lab team and MBTS staff is adequate for coordination with regard to supplying blood to QECH laboratory?
6. What would you say about the communication between your lab team and Chatinkha staff in terms of adequacy for coordination with regard to supplying blood to QECH laboratory?
7. What would you say about communication between your laboratory team and Chatinkha staff in terms of adequacy for coordination with regard to shortest turnaround time in supplying blood to your ward?
8. How would you describe the working relationships between professionals along the blood supply chain to QECH laboratory?
   a. Among QECH laboratory staff?
   b. Between the MBTS laboratory staff and the QECH laboratory staff?
   c. Between the MBTS laboratory staff and the Chatinkha staff?
   d. Would you say you all work as a team and how does it affect coordination of blood supply to Chatinkha Unit?
9. Do you think that it is important the presence of leaders in the blood supply process. For you, who are these leaders and which role do they play or should they play?
   a. Formal structures
   b. Informal leadership
10. Malawi's maternal mortality is still high among the countries in sub-Saharan Africa. According to the NSO, one of the leading causes of maternal mortality is obstetric hemorrhage. From your point of view, what role should the QECH laboratory play to deal with this cause of maternal mortality?
11. Have any improvement efforts been tried to improve supply to maternity ward? How well (or not) did they work?
12. If you had to propose interventions to improve the number of blood units supplied to the maternity unit, what would you propose?
13. If you had to propose interventions to improve the turn-around time of blood supply to the Chatinkha Unit, what would you propose?
14. Which factors, in your opinion, may facilitate or make difficult the implementation of blood supply access interventions to maternity work?
15. If a friend or family member of yours was going to Chatinkha Unit for management of PPH, would you have any concerns? What would you be most concerned about?
16. The National Blood Policy gives mandate to the MBTS to be the only institution responsible for collecting , processing and issueing blood to authorized hospitals in Malawi. What are your views about this mandate ?

Now I want to ask you about your experiences since the start of the COVID-19 pandemic

1. How has the COVID-19 pandemic affected blood collection activities across the country .
2. In your facility / lab /, What has been the impact of COVID-19 on blood requests / availability access in hospitals ? What are the biggest challenges?
3. What would you suggest to be done at National , Instituitional (hospitals/MBTS) and individual level in order to mitigate the challenge(s) mentioned above.
4. Who do you think is likely to transmitted Covid-19 through donating blood? Please explain
5. In view of COVID-19, would you be afraid of contracting the disease through blood donation process?
6. If you or your relative were to get a blood transfusion , what concerns would you regarding a transfusion during COVID-19 ? Please explain your answer

Appendix 2c : Semi Structured Indepth Interview Guides - Frontline Technical MDH and Chatinkha Unit Staff (Nurses)

Introduction of research by the interviewer to the interviewee

[The interviewer will provide an overview of the research-intervention to the interviewee. She/he must also indicate the interest of the interview in capturing his/her impressions about management of obstetric hemorrhage and the role of blood transfusion. Before beginning the interview, the interviewer will review the Consent Form (Appendix I) with the respondent and obtain written consent. Two copies must be signed, one for the interviewee and the other to the research principal investigator. We anticipate the interviews will last approximately 20-60 minutes.]

Questions and some supportive appointments

7. To begin, could you start by telling me about your role in this maternity, what kind of contract you have and how long you've worked here? Do you work anywhere else?
8. Thinking about blood access to obstetric patients with or without postpartum hemorrhage, what would you say are the strengths of this maternity unit?
9. And what are your main challenges? What problems do you face trying to provide safe blood to obstetric patients?
10. Frequently, medical records (e.g Laboratory blood request forms) are criticised because of their incompleteness and inadequacy for the coordination and continuity of patients' care. Do you identify any difficulty in this sense in this maternity?
11. Would you say that communication among the members of your team and between your team and others (clinicians, laboratory staff) is adequate for coordination with regard to requesting blood from the laboratory?
12. How would you describe the working relationships between professionals here?
    a. Amongst nurses?
    b. Between doctors and nurses?
    c. Between nurses/clinicians and laboratory staff
    d. Would you say you all work as a team? How does it affect coordination of blood access to obstetric patients?
13. Do you think that it is important the presence of leaders in the healthcare process. For you, who are these leaders and which role do they play, or should they play?
    a. Formal structures
    b. Informal leadership
14. .According to NSO, one of the leading causes of maternal mortality is obstetric hemorrhage. From your point of view, how should this maternity deal with this cause of maternal mortality?
15. Have any improvement efforts been tried to improve blood access to obstetric patients with PPH? How well (or not) did they work?
16. If you had to propose blood access interventions in this maternity unit, what would you propose?
17. Which factors, in your opinion, may facilitate or make difficult the implementation of blood access interventions in this maternity?
18. If a friend or family member of yours was coming here for management of PPH, would you have any concerns? What would you be most concerned about?
19. The National Blood Policy gives mandate to the MBTS to be the only institution responsible for collecting , processing and issueing blood to authorized hospitals in Malawi. What are your views about this mandate ?

Now I want to ask you about your experiences since the start of the COVID-19 pandemic

1. How has the COVID-19 pandemic affected blood collection activities across the country .
2. In your facility / lab /, What has been the impact of COVID-19 on blood requests / availability access in hospitals ? What are the biggest challenges?
3. What would you suggest to be done at National , Instituitional (hospitals/MBTS) and individual level in order to mitigate the challenge(s) mentioned above.
4. Who do you think is likely to transmitted Covid-19 through donating blood? Please explain

5. In view of COVID-19 , would you be afraid of contracting the disease through blood donation process?
6. If you or your relative were to get a blood transfusion , what concerns would you regarding a transfusion during COVID-19 ? Please explain your answer

Appendix 2d: Semi Structured Indepth Interview Guides - Clinicians (clinical officers), Registrars and Specialists working at the maternity unit Interview Guide

Introduction of research by the interviewer to the interviewee and informed consent

[The interviewer will provide an overview of the research-intervention to the interviewee. She/he must also indicate the interest of the interview in capturing his/her impressions about management of obstetric hemorrhage and the role of blood transfusion. Before beginning the interview, the interviewer will review the Consent Form with the respondent and obtain written consent. Two copies must be signed, one for the interviewee and the other to the research principal investigator. We anticipate the interviews will last approximately 30-60 minutes.]

Questions and some supportive appointments

1. To begin, could you start by telling me about your role in this institution, what kind of employment (temporary, contract or permanent) you have and how long you've worked here? Do you work anywhere else?
2. Thinking about blood transfusions services at this hospital and other places you have worked (if they have worked elsewhere), what are the general issues you see?
3. Thinking about supplying blood to the Obstetric patients with PPH:
   a. What would you say are the strengths of the system at QECH?
   b. What are the main challenges?
   c. What problems do you face trying access blood for Obstetric patients with PPH?
4. Frequently, medical records (e.g Laboratory blood request forms) are criticised because of their incompleteness. What do you think are the challenges in this sense at this Institution?
5. What would you say about communication among the clinicians/doctors MBTS laboratory staff and between your lab team and QECH, in terms of adequacy for coordination with regard to supplying blood to QECH laboratory?
6. How would you describe the working relationships between professionals along the blood supply chain to Obstetric patients with PPH?
   a. Amongst maternity staff?
   b. Between the maternity staff and the QECH laboratory staff?
   c. How do you all work as a team and what effect does it have on the coordination of blood supply to obstetric patients with PPH?
7. Malawi's maternal mortality is still high among the countries in sub-Saharan Africa. According to NSO, one of the leading causes of maternal mortality is obstetric hemorrhage. From your point of view, what role should the clinicians treating obstetric patients play to deal with this cause of maternal mortality?
8. Have any improvement efforts been tried to improve supply to Obstetric patients with PPH? What were they and how well (or not) did they work?
9. If you had to propose interventions to improve the number of blood units supplied to the Obstetric patients with PPH, what would you propose?
10. If you had to propose interventions to improve the turn-around time of blood supply to the Obstetric patients with PPH, what would you propose?
11. Would you tell me any preventive intervention of PPH :
    a.During antenatal
    b.During vaginal delivery or Cesarean Section
    c.further blood loss of PPH patients
12. Which factors, in your opinion, may facilitate or make difficult the implementation of blood supply access interventions to Obstetric patients with PPH?
    a. Who should be involved?
    b. What are the institutional barriers?
13. If a friend or family member of yours was going to QECH Maternity for management of PPH, would you have any concerns? What would you be most concerned about?
14. The National Blood Policy gives mandate to the MBTS to be the only institution responsible for collecting , processing and issueing blood to authorized hospitals in Malawi. What are your views about this mandate ?
15. Some experts have proposed alternative means of providing safe blood to women with obstetric hemorrhage e. g autologous blood transfusion .What is your view on this?
16. Do you have anything else you would like to add related to the subjects above.

Now I want to ask you about your experiences since the start of the COVID-19 pandemic

1. How has the COVID-19 pandemic affected blood collection activities across the country .

2. In your facility / lab /, What has been the impact of COVID-19 on blood requests / availability access in hospitals ? What are the biggest challenges?
3. What would you suggest to be done at National , Instituitional (hospitals/MBTS) and individual level in order to mitigate the challenge(s) mentioned above.
4. Who do you think is likely to transmitted Covid-19 through donating blood? Please explain
5. In view of COVID-19 , would you be afraid of contracting the disease through blood donation process?
6. If you or your relative were to get a blood transfusion , what concerns would you regarding a transfusion during COVID-19 ? Please explain your answer

Appendix 2e : Semi Structured Indepth Interview Guide – High-profile Selected Malawi Government/Non-Governmental Organisation Officials directly involved in Maternal and Child Health.

Introduction of research by the interviewer to the interviewee and informed consent

[The interviewer will provide an overview of the research-intervention to the interviewee. She/he must also indicate the interest of the interview in capturing his/her impressions about management of obstetric hemorrhage and the role of blood transfusion. Before beginning the interview, the interviewer will review the Consent Form with the respondent and obtain written consent. Two copies must be signed, one for the interviewee and the other to the research principal investigator. We anticipate the interviews will last approximately 30-60 minutes.]

Questions and some supportive appointments

1. To begin, could you start by telling me about your role in this institution, what kind of employment (temporary, contract or permanent) you have and how long you've worked here? Do you work anywhere else?
2. Thinking about blood availability for transfusion in Malawi , what are the general issues you see?
3. Thinking about supplying blood to the Obstetric patients with PPH:
   a. What would you say are the strengths of the system at Central Hospitals in generalor QECH in particular?
   b. What are the main challenges?
   c. What problems do you think the Central Hospitals (QECH) face trying to access blood for Obstetric patients with PPH?
4. How would you describe the working relationships between professionals along the blood supply chain to Obstetric patients with PPH?
5. Malawi's maternal mortality is still high among the countries in sub-Saharan Africa. According to NSO, one of the leading causes of maternal mortality is obstetric hemorrhage. From your point of view, what role should the GoM / MoH to deal with this cause of maternal mortality?
6. Are you aware of any improvement efforts tried to improve supply to Obstetric patients with PPH? If yes , What were they and how well (or not) did they work?
7. If you had to propose interventions to improve the number of blood units supplied to the Obstetric patients with PPH, what would you propose?
8. If you had to propose interventions to improve the turn-around time of blood supply to the Obstetric patients with PPH, what would you propose?
9. Would you tell me any preventive intervention of PPH :
   a. During antenatal
   b. During vaginal delivery or Cesarean Section
   c. further blood loss of PPH patients
10. Which factors, in your opinion, may facilitate or make difficult the implementation of blood supply access interventions to Obstetric patients with PPH?
    a. Who should be involved?
    b. What are the institutional barriers?
11. If a friend or family member of yours was going to QECH Maternity for management of PPH, would you have any concerns? What would you be most concerned about?
12. The National Blood Policy gives mandate to the MBTS to be the only institution responsible for collecting , processing and issuing blood to authorized hospitals in Malawi. What are your views about this mandate ?
13. Some experts have proposed alternative means of providing safe blood to women with obstetric hemorrhage e. g autologous blood transfusion /family replacement donations .What is your view on this?
14. Do you have anything else you would like to add related to the subjects above.

Now I want to ask you about your experiences since the start of the COVID-19 pandemic

1. How has the COVID-19 pandemic affected blood collection activities across the country .
2. [if negative impact] What would you suggest to be done at National , Institutional (hospitals /MBTS) in order to mitigate the challenge(s) mentioned above.
3. .In view of COVID-19 , would you be afraid of contracting the disease through blood donation process?

4. If you or your relative were to get a blood transfusion, what concerns would you have regarding a transfusion during COVID-19 ? Please explain your answer

Appendix 2f : Semi Structured Indepth Interview Guide - Incumbent/former Chairperson of the Parliamentary Committee of Health, Former Minister of Health.

Introduction of research by the interviewer to the interviewee and informed consent

[The interviewer will provide an overview of the research-intervention to the interviewee. She/he must also indicate the interest of the interview in capturing his/her impressions about management of obstetric hemorrhage and the role of blood transfusion. Before beginning the interview, the interviewer will review the Consent Form with the respondent and obtain written consent. Two copies must be signed, one for the interviewee and the other to the research principal investigator. We anticipate the interviews will last approximately 30-60 minutes.]

Questions and some supportive appointments

1. To begin, could you start by telling me about your role in this committee/Institution, what kind of employment (temporary, contract or permanent) you have and how long you've worked here? Do you work anywhere else?
2. Thinking about blood availability for transfusion in Malawi , what are the general issues you see?
3. Malawi's maternal mortality is still high among the countries in sub-Saharan Africa. According to NSO, one of the leading causes of maternal mortality is obstetric hemorrhage. From your point of view, what role should the GoM / MoH play to deal with this cause of maternal mortality?
4. If you had to propose interventions to improve the number of blood units supplied to the Obstetric patients with PPH, what would you propose?
5. If you had to propose interventions to improve the turn-around time of blood supply to the Obstetric patients with PPH, what would you propose?
6. Which factors, in your opinion, may facilitate or make difficult the implementation of blood supply access interventions to Obstetric patients with PPH?
   a. Who should be involved?
   b. What are the institutional barriers?
7. If a friend or family member of yours was going to QECH Maternity for management of PPH, would you have any concerns? What would you be most concerned about?
8. The National Blood Policy gives mandate to the MBTS to be the only institution responsible for collecting, processing and issueing blood to authorized hospitals in Malawi. What are your views about this mandate?
9. Some experts have proposed alternative means of providing safe blood to women with obstetric hemorrhage e. g autologous blood transfusion /family replacement donations .What is your view on this?
10. Do you have anything else you would like to add related to the subjects above.

Now I want to ask you about your experiences since the start of the COVID-19 pandemic

1. How has the COVID-19 pandemic affected blood collection activities across the country .
2. [if negative impact] What would you suggest to be done at National , Institutional (hospitals /MBTS) in order to mitigate the challenge(s) mentioned above.
3. .In view of COVID-19 , would you be afraid of contracting the disease through blood donation process?
4. If you or your relative were to get a blood transfusion, what concerns would you have regarding a transfusion during COVID-19 ? Please explain your answer

Appendix 2g : Semi Structured Indepth Interview Guide - Family Replacement Blood Donors at QECH and MDH, Voluntary non-remunarated blood donors at MBTS (English Version)

Introduction of research by the interviewer to the interviewee and informed consent

[The interviewer will provide an overview of the research-intervention to the interviewee. She/he must also indicate the interest of the interview in capturing his/her impressions about management of obstetric hemorrhage and the role of blood transfusion. Before beginning the interview, the interviewer will review the Consent Form with the respondent and obtain written consent. Two copies must be signed, one for the interviewee and the other to the research principal investigator. We anticipate the interviews will last approximately 30-60 minutes.]

Questions and some supportive appointments (English)

1. To begin, could you start by telling me how many times you have donated blood and over how much period.
2. Thinking about blood availability for transfusion in Malawi, what are the general issues you see?
3. Malawi's maternal mortality is still high among the countries in sub-Saharan Africa. According to NSO, one of the leading causes of maternal mortality is obstetric

hemorrhage. From your point of view, what role should the GoM/MoH play to deal with this cause of maternal mortality?

4. If you had to propose interventions to improve number of blood units supplied to the Obstetric patients with PPH, what would you propose?
5. If you had to propose interventions to improve the turn-around time of blood supply to the Obstetric patients with PPH, what would you propose?
6. If a friend or family member of yours was going to QECH / MDH Maternity for management of PPH, would you have any concerns? What would you be most concerned about?
7. The National Blood Policy gives mandate to the MBTS to be the only institution responsible for collecting, processing and issuing blood to authorized hospitals in Malawi. What are your views about this mandate?
8. Some experts have proposed alternative means of providing safe blood to women with obstetric hemorrhage e.g autologous blood transfusion /family replacement donations .What is your view on this?
9. Do you have anything else you would like to add related the subjects above.

Now I want to ask you about your experiences since the start of the COVID-19 pandemic

1. What do you know about COVID-19?
2. How has the COVID-19 pandemic affected blood collection activities across the country .
3. [if negative impact] What would you suggest to be done at National , Institutional (hospitals /MBTS) in order to mitigate the challenge(s) mentioned above.
4. Who do you think is likely to transmitted Covid-19 through donating blood? Please explain
5. In view of COVID-19 , would you be afraid of contracting the disease through blood donation process?
6. .If you or your relative were to get a blood transfusion, what concerns would you regarding a transfusion during COVID-19 ? Please explain your answer.

Appendix 2g : Semi Structured Indepth Interview Guide - Family Replacement Blood Donors at QECH and MDH, Voluntary non-remunarated blood donors at MBTS (Chichewa Version)

Introduction of research by the interviewer to the interviewee and informed consent

[The interviewer will provide an overview of the research-intervention to the interviewee. She/he must also indicate the interest of the interview in capturing his/her impressions about management of obstetric hemorrhage and the role of blood transfusion. Before beginning the interview, the interviewer will review the Consent Form with the respondent and obtain written consent. Two copies must be signed, one for the interviewee and the other to the research principal investigator. We anticipate the interviews will last approximately 30-60 minutes.]

Questions and some supportive appointments

1. Mungatiuze kuti munapelekako magazi kwa wa chibale wanu kapena mzanu ku Chipatala kangati?(for family replacement blood donor)
2. Mungatiuze kuti munapelekako magazi kwa wa chibale wanu kapena mzanu ku Chipatala kangati?(for voluntary non-remunerated blood donor)
3. Pa nkhani ya mapezekedwe a magazi mzipatala m'Malawi , ndimavuto ati omwe mukuwaonapo ?
4. Dziko la Malawi liri mgulu la maiko omwe ali ndi chiwelengero chokwera cha imfa ya amayi oyembekezela mu chigawo chino cha Sub Saharan Africa. Kafukufuku waonetsa kuti , pazifukwa zomwe azimayi oyembekezera akutayira miyoyo yawo nthawi yomwe akuchira , kutaya magazi ndivuto lomwe likutenga miyoyo ya mbiri ya azimayi oyembekezerawa pa nthawi yomwe akuchira . Inu mukuganiza kuti boma lichitepo chiyani pothana ndi vuto laifa ya amayi kamba kotaya magazi nthawi yomwe akuchira ?
5. Titakupatsani mwayi oti mutiuzeko njira imodzi yomwe ingathandize kuti magazi adzipezeka mosavuta kwa a mayi omwe ataya magazi kwambiri nthawi yochira , inu mungatiuze njira iti ?
6. Titakupatsaniso mwayi oti mutiuzeko njira imodzi yomwe ingathandize kuti magazi adzipezeka mwa changu kwa a mayi omwe ataya magazi kwambiri nthawi yochira , inu mungatiuze njira iti ?
7. M'bale wanu atapita ku QECH/ MDH kuti akathandizidwe ndivuto lotaya magazi kwambiri pa nthawi yomwe akukachira , mungakhale ndimadandaulo ena alionse. Ngati mungakhale nawo , ndi madandaulo anji?
8. Boma linapatsa bungwe la Malawi Blood Transfusion Service lokha m'Malawi muno kuti lidzitolera magazi kwa ofuna kwa bwino ndikukapeleka magaziwa mzipatala zosiyana siyana . Inu maganizo anu ndiotani pa zaudindo umenewu omwe unapelekedwa kwa MBTS yokha ?
9. Akadaulo ena amalimbikitsa kuti anthu adzithabe kupeleka magazi monga momwe inu mumachitilamu. Inu maganizo anu ndiotani pa nkhani imeneyi.
10. Muli ndi china chili chonse chomwe mungatiuze chogutsana ndi nkhani yomwe takhala tikukambiranayi?

Tsopano ndikufusani mafuso okhudzana ndi Kolona

1. Kodi mukudziwapo chiyani za mlili wa kolona ?
2. Kodi mlili umenewu wakhudza bwanji ma pezekedwe a magazi mzipatala.
3. [ngati angayankhe kuti magazi akuchepa, funsani funso ili]. Mukuona ngati Boma , ma bungwe kapena anthu angapange chiyani kuti magazi apezeke okwanira mzipatala pa nthawi ya mliliyi.
4. Ndindani amene angapatsile mzake matenda akolona pomwe mukupeleka magazi? Chonde tafotokozani.
5. Nthawi ya mlili yi, muli ndi nkhawa yoti mungatenge matenda a korona podzela kupeleka magazi?
6. Inuyo kapena M'bale wanu atalandira magazi ,mungakhale ndi nkhawa in iliyonse yoti mutha kutenga matenda a kolona. Chonde tafotokozerani

Appendix 2h: Semi Structured Indepth Interview Guides - Blood Recipients at QECH, CMU and MDH (Chichewa Version)

Introduction of research by the interviewer to the interviewee and informed consent

[The interviewer will provide an overview of the research-intervention to the interviewee. She/he must also indicate the interest of the interview in capturing his/her impressions about management of obstetric hemorrhage and the role of blood transfusion. Before beginning the interview, the interviewer will review the Consent Form with the respondent and obtain written consent. Two copies must be signed, one for the interviewee and the other to the research principal investigator. We anticipate the interviews will last approximately 30-60 minutes.]

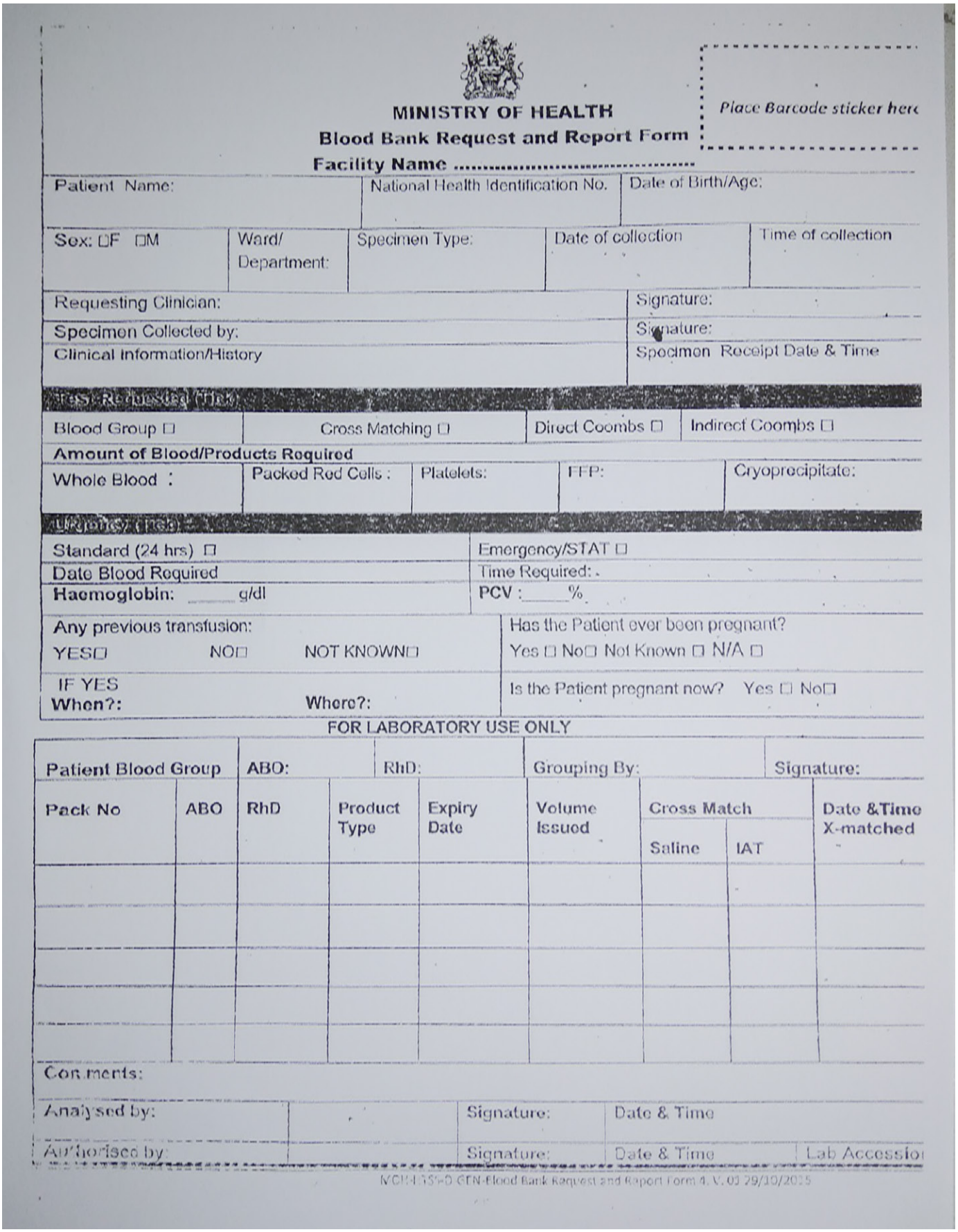
Questions and some supportive appointments (Chichewa)

1. Mungandiuze ngati munapelekako magazi ? Ngati munapelekako, munapelekako kangati ?
2. Mnchipatala muno ndinu mmodzi mwa anthu omwe alandilako magazi. Mungatiuze kuti mwalandila ma botolo angati? Munalandilako magazi kwina kuli konse kupatula ulendo uno ?
3. Pa nkhani ya mapezekedwe a magazi mzipatala m'Malawi , ndimavuto ati omwe mukuwaonapo ?
4. Munakumanako ndimavuto ena alionse ku mbali ya magazi kuti apezeke ? Ngati analipo , ndimavuto anji ?
5. Dziko la Malawi liri mgulu la maiko omwe ali ndi chiwelengero chokwera cha imfa ya amayi oyembekezela mu chigawo chino cha Sub Saharan Africa. Kafukufuku waonetsa kuti , pazifukwa zomwe azimayi oyembekezera akutayira miyoyo yawo nthawi yomwe akuchira , kutaya magazi ndivuto lomwe likutenga miyoyo ya mbiri ya azimayi oyembekezerawa pa nthawi yomwe akuchira . Inu mukuganiza kuti boma lichitepo chiyani pothana ndi vuto laifa ya amayi kamba kotaya magazi nthawi yomwe akuchira ?
6. Titakupatsani mwayi oti mutiuzeko njira imodzi yomwe ingathandize kuti magazi adzipezeka mosavuta kwa a mayi omwe ataya magazi kwambiri nthawi yochira , inu mungatiuze njira iti ?
7. Titakupatsaniso mwayi oti mutiuzeko njira imodzi yomwe ingathandize kuti magazi adzipezeka mwa changu kwa a mayi omwe ataya magazi kwambiri nthawi yochira , inu mungatiuze njira iti ?
8. M'bale wanu atapita ku QECH/ MDH kuti akathandizidwe ndivuto lotaya magazi kwambiri pa nthawi yomwe akukachira , mungakhale ndimadandaulo ena alionse. Ngati mungakhale nawo , ndi madandaulo anji?
9. Boma linapatsa bungwe la Malawi Blood Transfusion Service lokha m'Malawi muno kuti lidzitolera magazi kwa ofuna kwa bwino ndikukapeleka magaziwa mzipatala zosiyana siyana . Inu maganizo anu ndiotani pa zaudindo umenewu omwe unapelekedwa kwa MBTS yokha ?
10. Akadaulo ena amalimbikitsa kuti anthu adzithabe kupeleka magazi kwa able awo omwe ali mchipatala, Inu maganizo anu ndiotani pa nkhani imeneyi.
11. Muli ndi china chili chonse chomwe mungatiuze chogutsana ndi nkhani yomwe takhala tikukambiranayi?

Tsopano ndikufusani zokhudzana ndi Matenda a kolona:

1. Kodi mukudziwapo chiyani za mlili wa kolona ?
2. Munasintha china chilichonse pa ndondomeko ya ku sikelo kapena chinachilinse chokhudzana ndi kochilira?
3. Kodi mlili umenewu wakhudza bwanji ma pezekedwe a magazi mzipatala.
4. [ngati angayankhe kuti magazi akuchepa, funsani funso ili]. Mukuona ngati Boma , ma bungwe kapena anthu angapange chiyani kuti magazi apezeke okwanira mzipatala pa nthawi ya mliliyi.
5. Inuyo kapena M'bale wanu atalandira magazi ,mungakhale ndi nkhawa in iliyonse yoti mutha kutenga matenda a kolona. Chonde tafotokozerani

APPENDIX 3: BLOOD BANK REQUEST AND REPORT FORM



MINISTRY OF HEALTH

Blood Bank Request and Report Form

Place Barcode sticker here

Facility Name .....

Patient Name:	National Health Identification No.	Date of Birth/Age:

Sex: ☐F ☐M	Ward/ Department:	Specimen Type:	Date of collection	Time of collection

Requesting Clinician:	Signature:
Specimen Collected by:	Signature:
Clinical Information/History	Specimen Receipt Date & Time

Tests Requested (Tick)

Blood Group ☐	Cross Matching ☐	Direct Coombs ☐	Indirect Coombs ☐

Amount of Blood/Products Required

Whole Blood :	Packed Red Cells :	Platelets:	FFP:	Cryoprecipitate:

Urgency (Tick)

Standard (24 hrs) ☐	Emergency/STAT ☐
Date Blood Required	Time Required:
Haemoglobin: ____g/dl	**PCV :** ____%

Any previous transfusion: YES☐ NO☐ NOT KNOWN☐	Has the Patient ever been pregnant? Yes ☐ No☐ Not Known ☐ N/A ☐
IF YES **When?:** **Where?:**	Is the Patient pregnant now? Yes ☐ No☐

FOR LABORATORY USE ONLY

Patient Blood Group	ABO:	RhD:	Grouping By:	Signature:

Pack No	ABO	RhD	Product Type	Expiry Date	Volume Issued	Cross Match		Date &Time X-matched
						Saline	IAT	

Comments:

Analysed by:		Signature:	Date & Time	
Authorised by:		Signature:	Date & Time	Lab Accessio

MOH-LTSH-0 GEN-Blood Bank Request and Report Form 4, V. 03 29/10/2015

Appendix 4: Laboratory daily blood and reagents stock updates form

		Blood and Blood Products						
		WBa1	WBp2	RCSa3	RCSp4	PLT5	CRO6	FFP7
A+	8AM							
	12PM							
	4PM							
B+	8 AM							
	12PM							
	4PM							
AB+	8AM							
	12PM							
	4PM							
0+	8AM							
	12PM							
	4PM							
A-	8 AM							
	12PM							
	4PM							
B-	8AM							
	12PM							
	4PM							
AB-	8AM							
	12PM							
	4PM							
O-	8AM							
	12PM							
	4PM							

REAGENTS: (a) All Group and Crossmatching reagents avalaible ? YES _____ NO_____

(b) If answer to (a)is NO , list reagent (s) which is out of stock._____

KEY:

1WBa Whole Blood Adult Unit
2WBp Whole Blood Paediatric Unit
3RCSa Red Cell Suspension Adult Unit
4RCSp Red Cell Suspension Paediatric Unit
5PLT Platelet Unit
6CRYO Cryoprecipitate
7FFP Fresh Frozen Plasma

Appendix 5: Hospital Laboratory Blood Request and Issue Form

DATE	STUDY ID1	Time Registered	Time xmatched	Time Collected	Blood Product2	Quantity	Ward

1Those request which are not in the study will not have any STUDY ID and the space will be marked 0.

2 Blood product to include blood group e.g WBa , A+

Appendix 6: Maternity Units Transfusion Tracking Form

STUDY ID	Diagnosis	Time Unit requested	Time Sample Collected	Time sample registered	Time Unit xmatched	Unit ID	Time Unit Collected	Time Unit transfused	Outcome/ comments

Appendix 7: Blood Bank Staff Tracking Form

QECH LABORATORY BLOODBANK SECTION					MBTS LABORATORY		
DATE	Technicians	Student Technicians	Laboratory Assistants	Laboratory Attendants	Technicians	Laboratory Assistants	Laboratory Attendants

Appendix 8: Maternity Units Staff Tracking Form

MATERNITY						POST NATAL				
DATE	Qualified Nurse Midwife	Students Nurses	Qualified Clinicians	Student Clinicians	Ward Attendants	Qualified Nurse Midwife	Students Nurses	Qualified Clinicians	Student Clinicians	Ward Attendants

Appendix 9: Quantitative Data Master Questionnaire

Instruction: Other than the source of data specified , you may also use data from the following : Laboratory daily blood and reagents stock updates form (Appendix 4), QECH laborartory blood request and issue form (Appendix 5) , Chatinkha transfusion tracking form (Appendix 6) , Blood bank staff tracking form (Appendix 7) , Chatinkha Unit Staff tracking form (Appendix 8).

DATA TO BE EXTRACTED FROM BLOOD BANK REQUEST AND REPORT FORM

Patient's Study ID:_____

Parity:_____

Date of Birth /Age:_____

Sex:_____

Ward / Department:_____

Specimen type:_____

Date of collection:_____

Time of collection:_____

Requesting clinician (cadre):_____

Specimen collected by (cadre):_____

Clinical information / diagnosis/indication:_____

Specimen Receipt Date and Time:_____

Test requested (Blood group , Cross Matching , Direct Coombs , Indirect Coombs):_____

Amount of blood / blood products required (Wholeblood /Packed Red Cells/ Platelets / FFP / Cryoprecipitate):_____

Urgency (standard within 24hrs_Date blood required / Haemoglobin level_____

Urgency (Emergency/STAT_time blood required / Haemoglobin level_____

Any previous transfusion (YES /NO)_____

Blood group_____Is the blood available at (a) QECH Lab_Yes/No (b) MBTS Lab_ Yes/No

Time unit was crossmatched and indicated ready for collection from the QECH laboratory:_____

DATA TO BE EXTRACTED FROM OBSTETRIC PATIENT CHARTS

Indication for blood or blood products_____

Risk factors_____

Lowest Haemoglobin_____

Cause of obstetric hemorrhage_____

Type of birth_____

Other management actions taken uterotonics(YES /NO) , balloon tamponade (YES /NO) , NASG (YES /NO), C section (YES / NO) , hysterectomy (YES / NO) , B Lynch (YES/NO)

Date_____ and time of transfusion_____

Time of start of transfusion_____

Time of completion of transfusion_____

Patient vital signs (a) before starting transfusion_____

(b) within blood transfusion_____

(c) after transfusion _____

Patient outcome after transfusion_____

Any transfusion reaction ?

Hb after transfusion

Discharge hgb_____ day_____ time_____,

USE PATIENT CHART AND BLOOD BANK REQUEST AND REPORT FORM (Indicate YES or NO)

1. Was the patient's clinical need for blood assessed?
2. Was the patient or guardian informed about the proposed transfusion treatment. Was this recorded ? Was blood transfusion consent form signed . Were indications for transfusion recorded in the patient's notes?
3. Was the product transfused that what was requested. Was it right quantity ?
4. Check if at least 3 identifiers used on request form (YES if at least 3 were indicated , No if less than 3)
5. Observe how blood is transported between laboratory and wards / identify any possible causes of delays/record time taken between blood reaching the ward and patient getting transfused.
6. Check if there are proper storage containers (refrigerator or validated blood cold chain box) in the ward
7. During prospective study, check that blood was available at the QECH laboratory and the MBTS at the time of request.
8. Record length of stay in hospital
9. Check if there any protocols on blood transfusion, if yes check if they are addressing issue of access.

Appendix 10: Confidentiality agreement for Investigators

Confidentiality Agreement: APPHC Blood Access

I, _____, will at all times maintain the confidentiality of any patient names, diagnoses, lab results, or other personal information that I may see as part of this project. At no time will I disclose the names of patients that I may see in the interview or records review processes. These data collection methods will be performed in a private location to the extent feasible.

Study Team Member Name: _____

Study Team Member Signature: _____ Date: _____

Witness Name: _____

Witness Signature: _____ Date: _____

Findings and dissemination:

Inadequate blood supply remains a major challenge contributing to delayed access of blood transfusion for obstetric patients, especially those with postpartum hemorrhage. There is need to design an intervention which will attract an increased number of people to donate blood. Despite challenges in the blood supply, at least 85% of the 761 obstetric clients in these two institutions who had blood requested received at least 1 unit of blood. There were also challenges identified at the institutional level such as transport with long distance from Mulanje to the MBTS office and communication between the institution laboratory and the maternity ward.

During the study period, obstetric hemorrhage was the leading cause of the 20 and 8 maternal deaths occurring at QECH and MDH respectively, constituting 60% of deaths at QECH and 100% at MDH.

Currently, the results have been disseminated at the APPHC Task Force meeting and the National Committee of Confidential Enquiry into Maternal Death quarterly meeting. Feedback dissemination meetings were also done at QECH This study has resulted in reactivation of the Hospital Transfusion Committee at QECH, strengthening of HTC at the MDH, and repairing of the faulty phone extensions at both MDH and QECH labor wards.

This work is part of the Advancing Postpartum Hemorrhage Care (APPHC) partnership supported by USAID and led by the Breakthrough RESEARCH Project and the Health Evaluation and Applied Research Development (HEARD) Project. The APPHC partnership generates and tests solutions to address key implementation barriers for PPH prevention and treatment and contributes to the effective implementation of interventions, strategies, and innovations for PPH in Madagascar and Malawi.
https://iscollab.org/advancing-postpartum-hemorrhage-care/

Suggested citation:
USAID's Health Evaluation and Applied Research Development and Breakthrough RESEARCH. 2021. "Title in sentence case," *APPHC Programmatic Research Brief*. Washington DC: URC and Population Council.

Breakthrough RESEARCH
Population Council

4301 Connecticut Ave., NW
Suite 280
Washington, DC 20008
+1 202 237 9400
breakthroughactionandresearch.org
BreakthroughResearch@popcouncil.org

USAID's Health Evaluation and Applied Research Development
URC

5404 Wisconsin Ave
Suite 800
Chevy Chase, MD 20815
www.heardproject.org
heard@urc-chs.com

This document is made possible by the generous support of the American people through the **United States Agency for International Development (USAID)** under cooperative agreements Breakthrough RESEARCH (AID-OAA-A-17-00018) and USAID's Health Evaluation and Applied Research Development Project (HEARD) (AID-OAA-A-17-00002). The contents of this document are the sole responsibility of Breakthrough RESEARCH, Population Council, and University Research Co., LLC and do not necessarily reflect the views of USAID or the United States Government.

USAID's Health Evaluation and Applied Research Development (HEARD) project leverages a global partnership of more than 30 institutions to generate, synthesize, and use evidence to improve the implementation of policies and programs related to USAID priority areas, and crucial for improving health and development in low and middle-income countries.

Breakthrough RESEARCH catalyzes SBC by conducting state-of-the-art research and evaluation and promoting evidence-based solutions to improve health and development programs around the world. Breakthrough RESEARCH is a consortium led by the Population Council in partnership with Avenir Health, ideas42, Institute for Reproductive Health at Georgetown University, Population Reference Bureau, and Tulane University.