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COLLEGE OF HEALTH SCIENCES

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ASSESSMENT OF BLOOD AND BLOOD COMPONENTS TRANSFUSION PRACTICES AND CHALLENGES EXPERIENCED BY HEALTHCARE WORKERS IN THE MEDICAL WARDS AT KENYATTA NATIONAL HOSPITAL

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H58/7126/2017

A PROPOSAL SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE MASTERS DEGREE OF MEDICINE IN INTERNAL MEDICINE

2021

DECLARATION

I hereby certify that this is my original work. All resources and materials used or quoted have been indicated and acknowledged by means of reference. This work has not been presented for award of a degree in any other institution.

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DEDICATION

This work is dedicated to my loving parents, Mr. and Mrs. Musyoka and my lovely son Ethan.

ACKNOWLEDGEMENT

I would like to thank my supervisors for their great support and guidance. I would also like to thank my classmates for the support you have accorded me during the study period. To the faculty, thank you for the support and knowledge impact. Not forgetting the patients and healthcare workers who agreed to take part in the study, without you it would not have been possible.

Above all, I thank God for seeing me through the process.

LIST OF ABBREVIATIONS

AABB	American Association of Blood Banks
AAGBI	Associations of Anesthetists of Great Britain and Ireland
ASA	American Society of Anaestheologists
BTU	Blood Transfusion Unit
CaO_2	Arterial oxygen content
PCA	College of American Pathologists
CCU	Critical care Unit
CPOE	Computerized Provider Order Entry
CJD	Creutzfedt Jakob Disease
DO_2	oxygen delivery
EO_2	Oxygen extraction
HER	Electronic Health Records
FFPs	Fresh Frozen Plasma
Hb	Hemoglobin
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
ICU	Intensive care unit
ICD 10	10^{th} revision of International Classification of Diseases
INR	International Normalized Ratio
NBTS	National Blood Transfusion Services
KNH	Kenyatta National Hospital

MLTs	Medical Laboratory Technologists
NHS	National Health Service
PI	Principal Investigator
PRCs	Packed Red Cells
RBCs	Red Blood Cells
RC	Randomized Controlled Trial
SCOM	Society of Critical Care Medicine
TRALI	Transfusion Related Acute Lung Injury
TTIs	Transfusion Transmissible Infections
USA	United States of America
VO_2	oxygen consumption
VNRD	Volunteer and Non-remunerated Donors
WHO	World Health Organization

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ABSTRACT

Background: Despite blood being lifesaving, it is not always available when needed. Prolonged turnaround time (TAT) and unavailability of blood and its components impact negatively on patient care. At the Kenyatta National Hospital (KNH) medical wards, the current practices of blood and blood components transfusion and the existing gaps and challenges had not been studied.

Objective: The main objective of this study was to determine the practices and document challenges associated with blood and blood components use in the medical wards at KNH.

Significance of the study: Results from the study have documented the current blood transfusion practices, existing gaps and challenges in the provision of blood transfusion services, and will inform blood transfusion policy formulation at KNH.

Methodology: This was a cross-sectional descriptive study carried out at the KNH medical wards and the blood transfusion unit (BTU) in KNH. Blood request forms of patients admitted in the medical wards and healthcare workers working in the medical wards and the BTU were enrolled in the study. A data collection sheet was used to obtain demographic, clinical and laboratory data from in-patient files. The units of blood components transfused and TAT were obtained from the in-patient file 7 days from the date of the request. An open-ended questionnaire was used to document the challenges experienced by healthcare workers.

Results: One hundred and thirty-eight blood request forms and 203 healthcare workers were enrolled in the study. Packed red cells were the most frequently requested blood component (29.0%). The transfusion rate was 8.7%. The top five clinical indications for blood and blood components were neoplasms, disorders of blood and blood forming organs, upper gastrointestinal bleeding, infections and chronic kidney disease, in that order. The mean TAT was 2.2 days (SD1.9). The unmet blood demand was 78.9%. Notably, 59.4% of the requests weren't issued with a single unit of blood. Unavailability and delays in getting blood for transfusion were the most frequently reported challenges by all healthcare workers.

Conclusion: The blood transfusion practices in the medical wards were comparable to standard practices in the world. However, the unmet blood demand in the medical wards was very high, with unavailability of blood being the most frequently cited challenge by all healthcare workers.

CHAPTER 1: INTRODUCTION AND PROBLEM STATEMENT

1.1: DEFINITION

Blood transfusion is the transfer of blood and blood components from one person (the donor) into the bloodstream of another person (the recipient).

Blood transfusion practices as defined by the World Health Organization (WHO) include appropriate testing, screening of donors, screening of donations, donation storage, compatibility testing, issuing of blood units for clinical use, use of supplied units appropriately or return if not used after issue and reporting of transfusion reactions. (1)

Blood components derived from whole blood are packed red cells (PRCs), fresh frozen plasma (FFPs), platelet concentrate and cryoprecipitate. Different components are indicated for different clinical conditions.

1.2: ORGANIZATION OF BLOOD TRANSFUSION SERVICES

Blood transfusion is an integral part of patient management both in the surgical and non-surgical disciplines of medicine.

This has led to the establishment of well-organized national blood transfusion services in most countries in the world with the assistance of WHO policy guidelines. Western countries have centralized blood services with 100% donations from Voluntary Non-Remunerated Donors (VNRD) in line with WHO advocacy. Countries in Sub Saharan Africa rely on family and hospital based-replacement donors contributing 75-80% of all blood donations (2).

The KNH Blood Transfusion Unit (BTU), located on the ground floor of the main hospital complex, relies heavily on patient sourced replacement donors. The BTU also receives blood from the National Blood Transfusion Services (NBTS) Centre. Once blood has been received at the BTU, it has to be screened for Human Immunodeficiency Syndrome (HIV), hepatitis B Virus (HBV), hepatitis C virus (HCV), and syphilis before it can be released for transfusion. The unit serves the accident and emergency unit, all in patient wards and outpatient clinics. Clinicians make blood requests from the different units by filling a blood request form which is then transported to the BTU together with a blood sample. Both clinicians and nursing officers may be required to check the availability of requested blood components by visiting the BTU. In 2018, according to

information obtained from the hospital's Health Records and Information Management department, 12,120 units were donated to the unit and 3,303 were received from NBTS and other sources. Utilization of these units cannot be established from the available data, hence the need to establish the various indications for blood transfusion and the met and unmet needs in the medical wards.

1.3: BLOOD TRANSFUSION PRACTICES

Selected blood transfusion practices were studied.

1.3.1: Transfusion rate

Medical patients are among the most transfused patients. A Danish study in 2008 showed a transfusion rate of 10% (3) amongst medical patients, which was very similar to another study in Uganda which showed a transfusion rate of 10.5%. A study in the KNH intensive care unit (ICU) in 2007 found the transfusion rate to be 21.26% (4).There is no local study documenting the transfusion rate in medical patients. This data will be useful in estimating blood requirements in the medical wards and planning.

1.3.2: Clinical indications for blood transfusion

Clinical indications for blood vary with epidemiological patterns and blood prescription practices of clinicians. A study done in Tanzania showed the mean HB at transfusion to be 6.7g/dl with malaria and maternal hemorrhage forming the bulk of the underlying cause of anemia (5). A study done at Moi Teaching and Referral Hospital in 2013 found the main indications for blood transfusion to be anemia, elective surgery and hemorrhage (6). Most of the studies that have been done before are hospital studies with little focus on the underlying medical conditions leading to blood transfusion. This study aims to establish the clinical indications for blood transfusions in KNH medical wards and compare them with other parts of the world.

1.3.3: Turnaround time and unmet blood demand

Turnaround time in blood transfusion is influenced by many factors, including availability of blood and adequate human resources to process and dispatch screened blood. In a study done in Tanzania in 2013 showed that 2.4% of blood demand was not met (7). A study done in the pediatric wards in KNH in 2006 showed that the average waiting time for blood was 38.4 hours (8). The notable shortage of blood available compromises the timing and sufficiency of blood units needed for

transfusion. Shortages of blood and blood components, as well as delays in blood transfusion, are linked to increased mortality, morbidity, and the use of blood booster products (9).

1.4: CHALLENGES OF BLOOD TRANSFUSION SERVICES

1.4.1: Cost of blood transfusion

The cost of collecting, screening, storing, equipment and staff time consumed in the transfusion process makes blood transfusion a costly service (10). In a study done in Zimbabwe in 2013, the cost of production of a unit of whole blood was US $118.42 (KSH 11842) and RBCs was US $130.94 (KSH 13094) (11). At KNH, the estimated cost of processing a unit of blood is estimated at KSH 7000-10000 (US $70-100).

Prolonged hospital stays while awaiting blood transfusion when not readily available raise the cost of health care, leading to the escalating cost of health care.

1.4.2: Blood safety

Health risks associated with blood transfusion include transfusion transmissible infections (TTIs) and non-infections transfusion reactions such as anaphylactic reactions, hemolytic transfusion reactions, febrile non-hemolytic transfusion reactions, Graft-versus-host disease and transfusion-related acute lung injury (TRALI).

Blood is routinely typed into A, B, O and rhesus blood groups. Despite correct ABO compatibility testing, hemolytic reactions may occur due to the presence of antibodies to minor blood groups like the Bombay, Kidd and Duffy blood groups.

1.4.3: Shortage of blood

Due to over reliance on hospital-based replacement donors, blood and blood components are not always available when needed, especially during emergencies. In a study done in Northern Nigeria between 1984 and 2006, there was a 4% increase in blood donations compared to an 11% increase in the number of patients. There is an increasing demand for blood and blood components with an un-matched increase in blood donations.(12)

1.5: PROBLEM STATEMENT

Unavailability and delays in blood transfusion have occasioned patient management in the medical wards at KNH. The delays lead to prolonged hospital stays contributing to the rising cost of health care in Kenya. There has been a rising demand for blood and blood components especially in the Oncology ward with the rising cases of cancer diagnosis. Despite this being a well-known problem, the current practice and existing gaps in blood transfusion have not been studied.

Appropriate use of blood and blood products could be the answer to meeting transfusion needs in developing countries where the rising demand for blood doesn't match the rise in blood donations. This is a conclusion reached by a World Health Organization (WHO) meeting of experts which established an interdependent relationship between population needs, current demand and current use of blood for transfusion. As the number of inappropriate transfusions decreases, the unmet blood demand decreases. (13)

How blood and blood components are utilized in the medical wards at KNH and associated challenges have not been studied. Establishing the requirements for blood and blood components and identifying gaps would go a long way in formulating policy on the use of this scarce commodity in the most effective way in the unit.

CHAPTER 2: LITERATURE REVIEW

2.1: TRANSFUSION RATE

Adult medical patients are among the most transfused patients worldwide. In a retrospective Danish study done in 2008 over a 5 month period, the transfusion rate was found to be 10%, coming second to the intensive care unit which had a transfusion rate of 37%.(3) In a one year retrospective study done in 2008 in Mbarara Teaching and Referral Hospital in Uganda showed a 10.5% transfusion rate of all in-patients. Medical patients formed 27% of all transfusions over the 1 year study period. (14) In a prospective observational descriptive study done in KNH ICU in 2007, the transfusion rate was found to be 21.26%.(4) This transfusion rate is in keeping with the Danish study where the transfusion rate in the critical unit was found to be higher compared to the general medical wards. Transfusion rate is used to estimate hospital blood requirements and is useful in formulating hospital transfusion policies.

2.2: CLINICAL INDICATIONS FOR BLOOD COMPONENTS TRANSFUSION

The WHO recommends that patients should receive the blood components based on the expected patient outcomes that need to be improved. (15) The practice of administering whole blood, yet the specific goal for the patient is targeting a certain insufficiency in the patient's blood constituents is discouraged. (16) There are four blood components that are often considered as transfusion products. These components include red blood cells, plasma, platelets, and cryoprecipitate. (17) The indications for each of these components, and the necessary precautions taken while administering each of these components are distinct, as presented in the subsequent subcategories.

2.2.1: Red Blood Cells

In general, roughly 100 million units of packed red blood cells are collected around the world. Unfortunately, over 60% of these units are available to high income countries, leaving developing countries, Kenya included, struggling for the lesser share for a high population. (18) The primary indications for packed red blood cells transfusion include patients with anemia, those with a hemoglobin level below 7-9 g/dl, or those unable to perform due to poor oxygen delivery to body tissues. (19) Those most likely to be transfused with packed red blood cells are patients with acute

sickle cell crisis, patients who have lost at least 30% of their blood volume and those patients presenting with symptomatic anemia. (16) In description, packed red blood cells are obtained by removing roughly 250mls of plasma from whole blood. The general understanding is that one unit of packed red blood cells should raise the hemoglobin level by 1 g/dl and the hematocrit by 3%. (20) In considering packed RBCs for transfusion, they should not be used for patients (especially children) with active blood loss, hemodynamic instability, or cyanotic heart disease. (19)

Red blood cells (RBCs) provide the means by which 98% of oxygen is transported throughout the body, with the remaining percentage being transported dissolved in plasma. In patients with anemia, the amount of hemoglobin (Hb) to which oxygen can be bound for transport is reduced. Transfusion with RBCs increases the oxygen carrying capacity and enables preservation of tissue perfusion.

A change in hemoglobin level doesn't always result in tissue perfusion changes. Physiological changes occur to counter mild to moderate changes in Hb. With adequate coronary circulation, cardiac output increases when arterial oxygen content (CaO2) decreases to maintain oxygen delivery (DO2).Dilatation of coronary vessels allows for increased coronary blood flow. Peripheral tissues alter oxygen extraction (EO2) by altering micro vascular blood flow, reducing oxygen consumption (VO2) in hypoxemic states. Tissues with high baseline EO2 are least able to compensate for hypoxemia. For example, the heart with an EO2 of 60%, compared to those with low baseline EO2 such as brain (30%), kidney (10%) and skin (10%) (21).

The need to provide greater workload to increase cardiac output and increased coronary blood flow makes cardiac function the determinant of the limit of anemia clinically tolerated by a given patient.

Hemoglobin level cannot be therefore be used independently to decide when to transfuse blood. The level at which to transfuse, especially in the non-bleeding patient remains an area of research.

A meta-analysis of 31 randomized controlled trials (RCT) in the United States of America (USA) between 1950-May 2016 comparing restrictive transfusion threshold (7-8g/dl) and liberal threshold (9-10g/dl) in hemodynamically stable patients demonstrated that restrictive practices were not associated with higher rates of adverse clinical outcomes, including 30-day mortality,

myocardial infarction, cerebrovascular accident, rebreeding, pneumonia, or thromboembolism (22).

In patients with acute coronary syndrome, the optimum transfusion trigger Hb remains an area of controversy. A meta-analysis of observational and RCTs in the USA demonstrated a higher all-cause mortality in patients with myocardial infarction who got blood transfusions compared to those who got no transfusion (23) (24). A survey carried out in 7 university teaching hospitals in 2014 over a week period found that 61% of PRCs were transfused in medical wards with the top indications being hematological disorders, gastrointestinal bleeding and critical care (25). In a study carried out across Tanzanian blood banks over a 3 month period in 2013, showed a mean Hb of 6.7($\pm$3.2) g/dl at request with malaria and maternal hemorrhage forming the bulk of the underlying cause.(5) In a retrospective study at Moi Teaching and Referral Hospital in Kenya over a 5 month period in 2013, analyzing documentation of the transfusion process, found that the main indications for transfusion were anemia, elective surgery and hemorrhage in that order, with whole blood being preferred to PRCs at 60.2%. (6).In the study done in KNH ICU in 2007, anemia was found to be the most common indication for blood transfusion at 54%, followed by post-operative blood transfusion, acute blood loss and obstetric hemorrhage in that order. The mean hemoglobin at transfusion in this study was 7.08g/dl ($\pm$1.48) (4). The underlying cause of anemia in both the studies done in Moi and KNH ICU were not explored as we did in this study. Apart from the study done in KNH, they were hospital based studies and didn't focus on the adult medical patients and we sought to fill that gap.

2.2.2: Plasma

Plasma for transfusion is available either as fresh frozen plasma or thawed plasma that is often stored at 1^{o}C to 6^{o}C for up to 24 hours. (26) The major difference between the two is that thawed plasma contains lower levels of factors V and VIII compared to fresh frozen plasma.(27) Fresh-frozen plasma is often used for correcting known congenital or acquired factor deficiencies. The patient is often considered for plasma transfusion in case the specific concentrates are unavailable. Fresh frozen plasma can also be used for reversing anticoagulant effects such as warfarin sodium anticoagulation. (16) Furthermore, plasma transfusion is also indicated for those patients with active bleeding and an International Normalized Ratio (INR) greater than 1.6. (15) Other

indications include acute disseminated intravascular coagulation with bleeding, and those patients diagnosed with thrombocytopenic purpura, especially with plasmapheresis.(28) In a retrospective cohort study (29) involving 115 patients, the use of fresh frozen plasma in managing coagulopathy among critically ill medical patients was proven to have no significant impact on length of hospital stay, hospital mortality and severity of illness. However, a retrospective cross-sectional study (30) which assessed the impact of blood transfusions on patient survival rates, transfusion was associated with improved patient survival rates. (30) may have differed from (29) given the former focused on all forms of transfusion with plasma transfusion representing just 16% of the total transfusion cases.

2.2.3: Platelets

Approximately 2.2 million platelet units are administered annually in the United States. (31) Unlike other blood transfusion products that retain viability for a long duration, platelets remain viable for only 5 days from the time they are extracted. (32) The short duration is linked to the fact that they are stored at room temperature, which puts the platelets at risk of bacteria growth. Platelets are often administered either prophylactically or in symptomatic management. For prophylaxis, platelet transfusion is preferred to reduce spontaneous bleeding among patients with thrombocytopenia following chemotherapy or due to undergoing hematopoietic progenitor cell transplantation. (31) In a prospective six month study done at the University of Minnesota, prophylactic platelet transfusion accounted for roughly 74% of all the cases of platelet transfusion. (33) All platelet transfusions during the study period were classified as prophylactic, prophylactic for surgery or planned invasive procedure or therapeutic for bleeding. In KNH, the indication for platelets had not been studied. Low doses of platelets are considered to be effective in reducing bleeding, but not preferred by many for the fact that the patients are expected to receive multiple transfusions. High dose platelet transfusion, although reduce the number of transfusions, are related to a high risk of transfusion related complications. (34) Those patients diagnosed with thrombotic thrombocytopenic purpura or heparin induced thrombocytopenia should not be considered for platelet transfusion since such an intervention would be ineffective in managing the problem. (16) The WHO recommends prophylactic platelet transfusion in thrombocytopenic patients to >10 x10 9 in non-bleeding and non-infected patients and 20 x 10 9 in infected or pyretic

patients. (1) The American Association of Blood Banks (AABB) provides recommendations on when to give prophylactic platelets to patients undergoing elective procedures. (31)

2.2.4: Cryoprecipitate

Cryoprecipitate is a leucodepleted plasma product containing concentrated factor VIII, von Willebrand factor, fibrinogen, factor XIII and fibronectin. (15) The product is arrived at through further processing of fresh-frozen plasma. Cryoprecipitate is stored at a temperature of -25^{o}C and only thawed to ambient temperature in readiness for use. (35) The quality of the product once thawed deteriorates in 4 hours and should not be refrigerated once thawed. These attributes of cryoprecipitate are critical towards ensuring that the recipient gets a viable product. (36) The medical indications for cryoprecipitate transfusion include patients with combined liver and renal failure with bleeding, in patients bleeding secondary to thrombolytic therapy, those with hypofibrinogenenemia (<100mg/dl) with active bleeding or prior to invasive procedure and factor XIII, factor VIII, and Von Willebrand factor replacement. However, desmopressin (DDAVP) and recombinant/virally inactivated preparations are preferred in Hemophilia A and Von Willebrand disease, while virally inactivated factor XIII protein is preferred in factor XIII deficiency.

2.3: FACTORS INFLUENCING BLOOD TRANSFUSION PRACTICES AND CHALLENGES

Guidelines from different medical agencies and associations such as the World Health organization, the American Association of Blood Banks (AABB), College of American Pathologists (CAP), American Society of Anesthesiologists (ASA), and Society of Critical Care Medicine (SCCM) have laid significant emphasis on the factors that promote safe blood transfusion practices.(37)

The challenges facing blood transfusion services vary depending on geographical region and countries' level of income, with developing countries facing greater challenges compared to developed countries.

2.3.1: Inadequate blood supply and delayed blood transfusions

The availability of the required blood volume and blood components in a blood bank for immediate access has a significant impact on the effectiveness and quality of blood transfusion practices. Out of the 100 million units collected annually, the low income countries share just 40%.(18) In another study, out of the 80 million units of blood donated annually, only 2 million units are donated in Sub-Saharan Africa.(38) The 2 million units are insufficient for the Sub—Saharan Africa population where demand for blood transfusion is high due to conditions such as maternal complications, malnutrition, infectious diseases, malaria, and bleeding complications following surgeries. This sharply contrasts with findings of a survey in the USA in 2015 which showed declining blood collection and transfusion, which could be attributed to use of laparoscopic surgery and implementation of patient blood management programs with emphasis on correct ordering and dosing of blood.(39) In a study done in Tanzania, 14.8% of blood units ordered in 2013 were not administered due to being unavailable or were documented as available but not issued .(7). The unmet blood demand in this study was found to be 2.4%. The notable shortage of blood units available compromises the timing and sufficiency of blood units needed for transfusion. Shortage of blood units or blood components for transfusion is associated with significant number of mortality and morbidity in addition to increasing use of blood booster products. (9)

Increased surgeries, as well as a lack of financial and resource availability, are other factors that may jeopardize effective and quality transfusion practices. Other factors affecting the decision to prescribe allogeneic blood for transfusion are institutional factors such as infrastructure, delivery channel, and emerging threats for transfusion. (40)

2.3.2: Blood Safety

There is an equivocal call for ensuring the blood and blood components for transfusion are adequately screened to reduce safety risks. Ensuring that blood is safe for the recipient is regarded as one of the primary factors that medical professionals must take to enhance the efficacy and effectiveness of transfusion as a medical intervention. The Society of Critical Care Medicine advocates for thorough assessment of patient history, current medical condition, patient (41) characteristics, and contraindications for transfusion before any decision to ascertain transfusion

decision. In reference to platelets transfusions, which have a high risk for bacterial growth, the risk of transfusion complications should be weighed against the risks imposed by the indications for transfusion.

There is emphasis on the importance of using restrictive transfusion practices, which are supported by evidence to be non-inferior in managing critical illness over liberal transfusion practices.(42) This argument on the importance of restrictive transfusion practices is supported by studies on the importance of transfusion in gastrointestinal bleeding, (41) critical illness, septic shock, and medical conditions requiring surgical interventions. (43) Overuse of transfusions, especially with whole blood or red blood cells transfusion, is one of the issues identified as a hindrance to quality blood transfusion practices. (42) Overuse of transfusion prescriptions increases the cost of care, increases the risks involved with transfusion due to an increase in transfusion episodes, and reduces the blood availability for other needy clients. However, in another study (44), caution is offered to ensure that overreliance or over implementation of restrictive transfusion policies may lead to unqualified withholding of transfusion opportunities. Screening of blood for TTIs in our set up is a set towards improving the safety of blood transfusion.

2.3.3: Inappropriate blood transfusions

Despite there being transfusion guidelines from different professional bodies, inappropriate transfusions still happen, with over-transfusion being more common. In a retrospective study done in Tanzania in 42 sites, studying 11,669 blood requests, 16.6% of the requests were found to be inappropriate. Tertiary hospitals contributed the highest percentage of 32.0% inappropriate requests. The ordering practices were also noted to be inappropriate, with the mean number of units ordered per patient being 1.6 despite the mean pre transfusion Hb being 3.7g/dl. This resulted in a sub optimal post transfusion Hb of 5.3g/dl against the recommended target of 7-8g/dl.(45) In a cross-sectional survey done in KNH pediatrics wards in 2006 over 4 months studying 413 transfusion episodes, only 21.0% of the blood transfusions were appropriate. This was against a set criteria of appropriate clinical indications, blood volume and an appropriate time interval of 36hrs. The most frequently unmet criteria was blood volume at 73.2%, clinical indication at 27.8%, and time interval at 34.4%. The most frequent clinical indications for transfusion were malaria, sickle cell disease and neonatal sepsis. The mean baseline hemoglobin was 6.4g/dl and the mean time interval to transfusion was 38.4 hrs. Reduction in inappropriate blood requests and use frees

up blood for use by more deserving patients. Training of healthcare workers has been shown to be an effective way of reducing inappropriate blood use. (46)

2.3.4: Knowledge of blood transfusion services

Improving the quality and effectiveness of transfusion practices was also influenced by progressive training and education on transfusion practices. On-job training among healthcare professionals such as nurses, physicians, and medical laboratory professionals was found to improve the outcome of transfusions by reducing the risks of complications, length of stay, hemolytic reactions, circulatory overload, and transmission of infections. (47) In a related study in a teaching hospital in Glasgow, extensive education was associated with a 19% reduction in blood transfusion cases, thereby improving transfusion practices. (46) In a cross-sectional online survey done in Switzerland in 2013 among residents and attending physicians assessing blood transfusion knowledge and practices in this group of health workers, only 39% of the respondents could define anemia correctly. (48) This demonstrates the actual knowledge gap on blood transfusion, which can have a negative impact on blood transfusion practices. In another study done in Mali among specialists, general practitioners, nurses and midwives, only 42.9% of the respondents had good basic knowledge of blood products, their indications and their potential risks.(49)

2.3.4: Health records management

The adoption of electronic health records (EHR) and computerized provider order entry (CPOE) have been associated with enhanced efficiency in ordering blood or blood components for transfusion. (42) (50) A study in critically ill patients (51) emphasized the importance of an immediate turnaround or expedited process between the time the patient is diagnosed for transfusion to the time the patient receives the total prescribed units of transfusion. A prompt response reduces the risk of further complications, especially in cases of emergencies such as shock or managing bleeding secondary to poor coagulation process. Apart from improved efficiency, CPOE comes with alert indicators that are tied to indications for transfusion, patient vital signs, blood cross matching reference, and other customized indicators. These alert systems help reduce complications related to blood transfusions, and reduce unnecessary transfusion

prescriptions. (42) Using CPOE in critical care reduced transfusion rates by approximately 16.5% in a study on blood transfusion services in critically ill patients. (52) A retrospective study done in Moi Teaching and Referral Hospital in 2013 showed that only 73.4% of the patients who got transfused had the product unit number documented in their files. (6)

2.3.5: Potential Transfusion Complications

Among the common transfusion complications, allergic reactions, febrile non-hemolytic reactions, sepsis, and cardiac overload top the list. Most of these complications can be avoided through a systematic and extra cautious process of screening the donor, the blood and validating the patient's details. (27) In 2004, 539 events were reported out of 3.4 million transfusions done that same year. (53) In a retrospective study done in four academic tertiary care hospitals in the USA over a 6 month period in 2014, out of the 4857 transfusion episodes reviewed, 1.1% of them were complicated by serious transfusion reactions. TRALI contributed 0.08%, anaphylactic reactions 0.02% and hypotensive episodes 0.02%. Under-reporting of transfusion reactions was observed at 50%. (54)

2.4: STUDY JUSTIFICATION

Unavailability of blood and blood components and delays in blood transfusions in the medical wards have been reported as a hindrance to timely management of patients and, at times, leading to preventable deaths. The transfusion rate and clinical indications for blood transfusion in the medical wards at KNH were unknown.

The magnitude of unmet blood demand and turnaround time had not been established before this study.

The various challenges experienced at different stages of the transfusion process by clinicians, nurses and laboratory medical technologists had also not been documented before this study.

2.5: STUDY SIGNIFICANCE

The documentation of the current blood transfusion practices and existing gaps will inform the formulation of KNH blood transfusion policy guidelines with the aim of improving patient management.

The challenges identified can be addressed by KNH management with the aim of reducing the length of patient hospital stay and improving patient outcomes.

2.6: SCOPE OF STUDY

This study was carried out in KNH BTU and medical wards in KNH. Blood request forms and inpatient files were scrutinized to obtain socio-demographic and clinical characteristics of patients for whom blood or blood components had been requested. The data obtained was used to calculate the transfusion rate, turnaround time and unmet blood demand. An open-ended questionnaire was used to establish the challenges faced by healthcare workers during the blood transfusion process.

2.7: CONCEPTUAL FRAMEWORK

2.7.1: Narrative

Transfusion rate is a dependent variable. It shows the proportion of patients who are likely to be transfused at each given time. It is dependent on clinicians' blood and blood component prescription practices and the availability of the components. The clinical indication for blood transfusion is an independent study variable. The clinical indication for blood transfusion determines the amount of blood and type of blood component to be requested. The availability of blood and blood components in the blood transfusion unit at the time of blood request determines whether the request will be met and when, hence influencing the dependent variables of turnaround time and met and unmet blood demand.

2.7.2: Schematic presentation of the conceptual framework

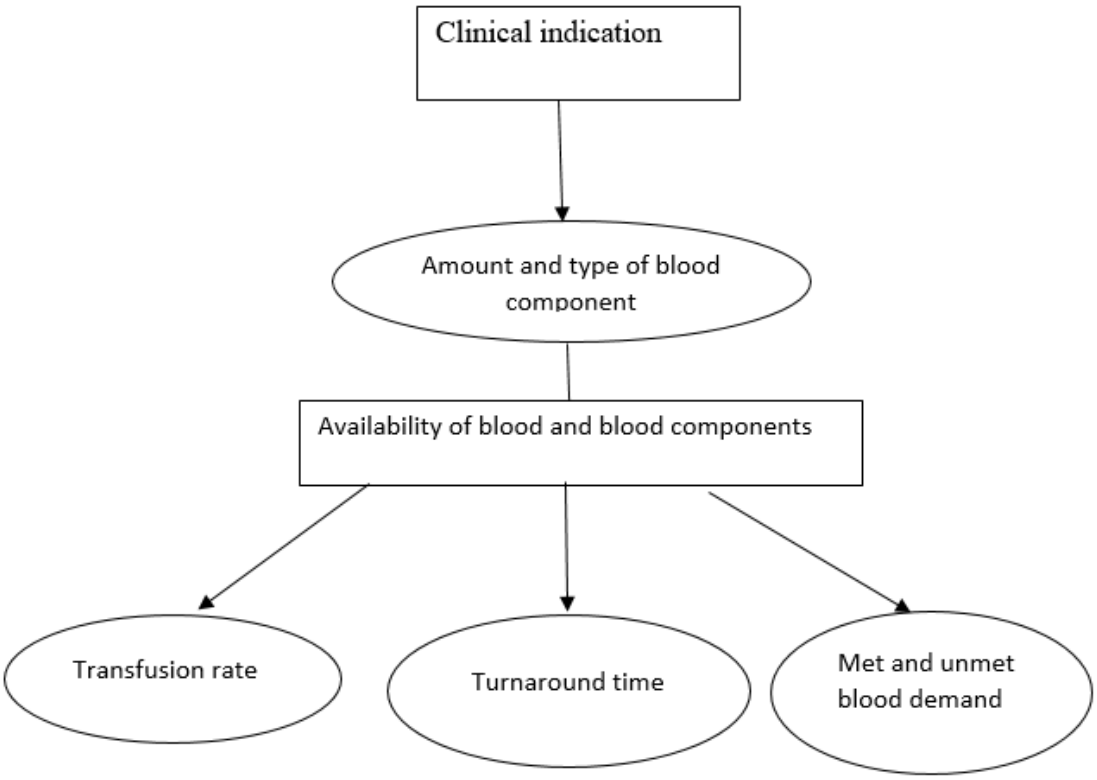


Figure 1: Schematic representation of the conceptual framework.

2.8: RESEARCH QUESTION

What are the blood transfusion practices and challenges experienced in the medical wards at KNH?

2.9: OBJECTIVES

2.9.1: BROAD OBJECTIVE

To determine the practices and challenges associated with blood and blood components use in the medical wards at KNH

2.9.2: SPECIFIC OBJECTIVES

1. To establish the transfusion rate in the medical wards at KNH
2. To document the clinical indications for blood and blood components requisition in the medical wards at KNH
3. To determine the turnaround time from requisition to transfusion in the medical wards at KNH
4. To determine the met and unmet blood demand in the medical wards at KNH
5. To document challenges encountered by healthcare workers in the blood transfusion process in the medical wards at KNH

CHAPTER 3: STUDY DESIGN AND METHODOLOGY

3.1: STUDY DESIGN

A cross sectional descriptive study on blood and blood components transfusion practices and challenges experienced by healthcare workers in the medical wards at KNH

3.2: STUDY SITE

The study was carried out at the Blood Transfusion Unit (BTU) at Kenyatta National Hospital (KNH) and all medical wards in KNH, located on the seventh and eighth floors of the KNH main hospital tower. KNH is a level 6 teaching and referral hospital located in the capital city of Kenya, Nairobi. The hospital has an inpatient capacity of 1800 beds, with 274 of these being medical beds. Nine out of the 274 medical beds are ICU beds serving the general medical wards. In the year 2018, a total number of 9,944 patients were admitted in the medical wards. All the general medical wards had a bed occupancy of more than 100% in the year 2018.

3.3: STUDY POPULATION

All blood request forms for patients admitted in the Medical Wards for whom blood or blood components had been requested from the BTU.

Internal medicine residents, medical officers, medical officer interns, and nursing officers working in the medical wards, and medical laboratory technologists working in the BTU were interviewed to document the challenges experienced during the provision of blood transfusion services.

3.4: CASE DEFINITION

A blood request form for a patient admitted in the medical ward for whom a request had been made for blood or blood components from the BTU.

Internal medicine residents, medical officers, medical officer interns and nursing officers working in the medical wards and medical laboratory technologists working in the BTU.

3.5: INCLUSION CRITERIA

Blood request forms of patients admitted in the medical wards who had blood requested for them who consented to participate in the study, allowing access to their inpatient file. Patients had to be admitted in the medical wards on the 7th and 8th floors during the study period.

Internal medicine residents, medical officers and medical officer interns, and nursing officers working in the medical wards, and medical laboratory technologists working in the BTU at KNH who consented to participate in the study. The healthcare workers participating in the study had to be involved in the blood transfusion process as part of their duties.

3.6: EXCLUSION CRITERIA

Blood request forms for patients who had blood transfusion on going at the time of arrival at KNH from another facility.

Blood request forms for patients who declined to consent

Blood request forms for patients whose inpatient files were missing.

3.7: SAMPLE SIZE DETERMINATION

The transfusion rate in medical wards in a study done in Denmark over a period of 5 months in 2008 was 10%.(3) Another study done in Uganda found a transfusion rate of 10.5% in all admitted patients.

The Fischer's formula below was used to calculate the sample size of blood requests to be studied in the study.

$$\mathbf{n = \frac{Z^2\, P\,(1 - P)}{I^2} = 138}$$

Where:

n = Sample size

Z = Normal deviation at the desired confidence interval In this case, it will be taken at 95%,

The Z value at 95% is 1.96.

P = Proportion of the population with the desired characteristic. The proportion of medical patients who were transfused was taken as 10%

I^2 = Degree of precision; will be taken to be 5%.

The census method was used to obtain data on challenges experienced by healthcare workers. We set out to interview all nursing officers, internal medicine residents, medical officers, and medical

officer interns working in KNH medical wards during the study. All 10 medical laboratory technologists working at the BTU were interviewed. There were 210 nursing officers, 70 internal medicine residents, 15 medical officers and 6 medical officer interns deployed in the medical wards. Out of these, 130 nursing officers, 54 internal medicine residents, 5 medical officers, 4 medical officer interns, and 10 medical laboratory technologists were interviewed.

3.8: SAMPLING METHOD

Blood request forms that met the inclusion criteria were enrolled in the study consecutively until the calculated sample size was achieved.

Healthcare workers who satisfied the inclusion criteria and consented to take part in the study were enrolled consecutively in the study.

3.9: RECRUITMENT

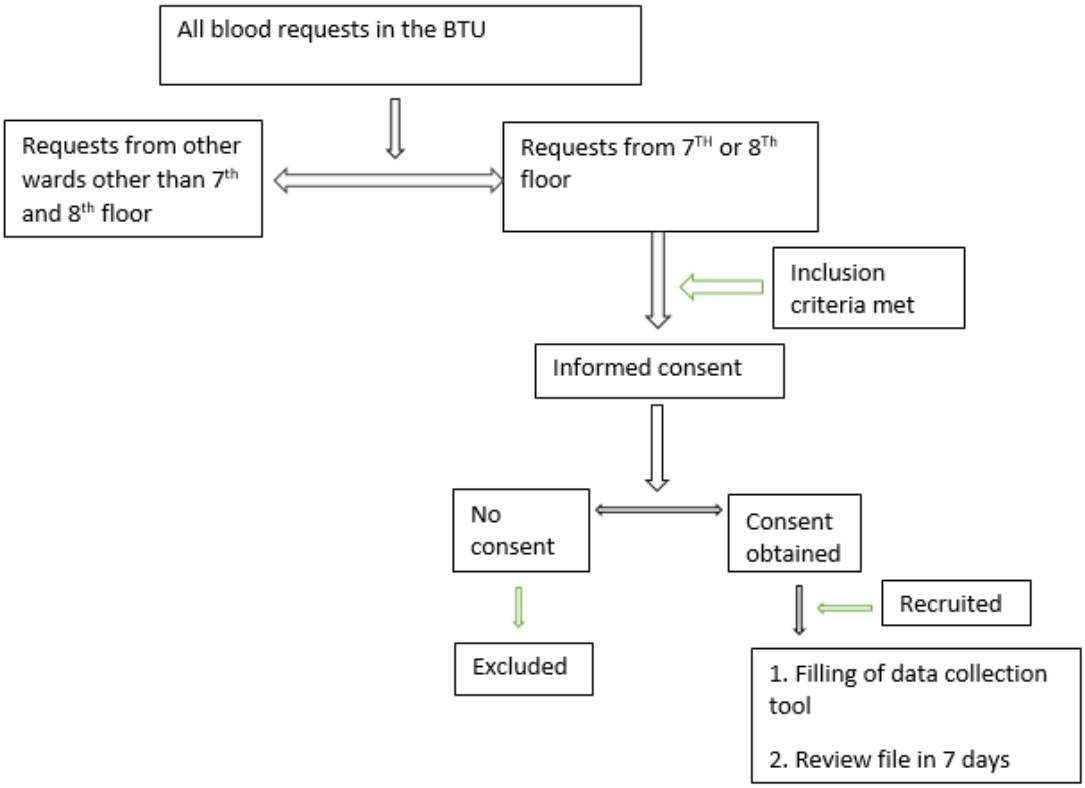
Study subjects were recruited from the BTU once a blood request was received for a patient admitted in a medical ward at the BTU. The principal investigator (PI) or the research assistant traced the patient to the medical ward using the information provided in the blood request form. Blood request forms of patients who met the inclusion criteria and gave informed consent to participate in the study were consecutively enrolled in the study.

Healthcare workers were identified by their employment identification cards.

Internal medicine residents, medical officers, medical officer interns, and nursing officers were approached during official tea and lunch breaks in the medical wards and those who gave informed written consent to take part in the study were enrolled in the study.

Medical laboratory technologists were recruited at the BTU and those who gave informed consent to participate in the study were enrolled.

Figure 2: Flow chart showing the process of patient recruitment



3.10: DATA COLLECTION PROCEDURE

A data collection sheet was used to collect data (Appendix 4). The investigator and research assistant went through all blood requests in BTU and selected those requests from medical wards. Informed consent was obtained from patients who met the inclusion criteria before proceeding with further data collection. The investigator obtained the patients' in-patient files with the assistance of the ward staff. The following information was obtained from the inpatient file. Demographic data was obtained from the official hospital records available on the back of all inpatient files. Information about employment, marriage status, and level of education was obtained from the patients as it was missing in most of the in-patient files. The clinical diagnosis and reason for transfusion were obtained from the file. Where it was not clear, clarification was sought from the primary clinician. The baseline hemoglobin level and platelet count were taken to be the most recent total blood count report available in the in-patient file. The blood component requested, the number of units requested and the level of urgency were obtained from the blood request form.

The following information was obtained from the inpatient file within a 7 day period: patient's ABO group, blood component transfused, interval between requisition and transfusion of first unit of blood (turnaround time), number of units transfused, and any transfusion reaction documented. Patients who had not received any blood component after 7 days from the day of requisition were deemed to have not received any blood component. New requests made for patients already enrolled in the study within 7 days of the first request were not considered as new requests but were captured as re-orders. Patients who had another request for blood component made 7 days after the initial request were enrolled for the second time in the study but were captured as a second recruitment.

A self-administered open ended questionnaire (Appendix 5) was used to collect data from internal medicine residents, medical officers, medical officer interns, nursing officers, and medical laboratory technologists to document challenges encountered by healthcare workers during the transfusion process. Responses were restricted to two per question. They were enrolled in the study after the calculated sample size of blood requests had been achieved. The study's purpose was explained to them, and their informed consent was obtained. Those who consented were given the

self-administered open ended questionnaire to fill out. Each respondent could give up to two responses per question.

3.11: STUDY TOOLS

A data collection sheet (appendix 4) was used to collect data from blood request forms, inpatient files, and document transfusion status within a 7 day period.

A self-administered open-ended questionnaire (Appendix 5) was used to collect data on challenges experienced by healthcare workers during the blood transfusion process. The questionnaire was designed to capture all stages of the blood transfusion process and questions were directed to different cadres depending on the role they play at each stage.

3.12: DEFINITION OF STUDY VARIABLES

3.12.1: Transfusion rate

The transfusion rate was calculated by dividing the number of patients who received at least one unit of blood by the total number of in-patient admissions during the study period and expressed as a percentage.

3.12.2: Clinical indication

This is a medical diagnosis resulting in the need to transfuse a patient. This was obtained from the inpatient file and coded using the 10^{th} revision of the International Classification of Diseases (ICD 10).

3.12.3: Turnaround time

Turnaround time was the duration of time it took from the time a blood request form was received and recorded in BTU to the time the patient received the first unit of blood.

This was expressed in days.

3.12.4: Unmet blood demand

The difference between the number of requested blood units and the number of blood units transfused.

This was presented as a percentage of the requested units.

3.13 QUALITY ASSURANCE

The research assistant collecting data was adequately trained on the data collection process and the study tools by the principal investigator to be able to collect accurate data. The research assistant was a clinical officer working in KNH familiar with the blood transfusion process in KNH. The principal investigator worked together with the research assistant throughout the study period. The principal investigator went through all the filled data collection sheets at the end of each day and ascertained the completeness and accuracy of data collected.

3.14 DATA MANAGEMENT AND ANALYSIS

The data collected on the data collection sheets was coded, entered, and managed in a Microsoft Access database. Data cleaning was done at the conclusion of data entry. Data analysis was performed using the SPSS Chicago Illinois Version 21.0

The study population was defined using clinical and socio-demographic characteristics. The transfusion rate was calculated by dividing the number of patients who got at least one unit of blood or blood component by the total number of in-patient admissions during the study period. Continuous variables were presented as proportions. Turnaround time was expressed as the duration of time (days) it took from the time the blood request form was received and recorded in BTU to the time the patient received the first unit of blood. Results-presentation was done using tables and figures where appropriate.

Data collected on challenges experienced by healthcare workers using an open-ended questionnaire (Appendix 5) was entered and recoded using ATLAS.ti into different thematic areas. ATLAS.ti allows a challenge that might have been described using different words by different respondents to be identified as an identical theme. The different themes identified were coded and presented as frequencies. Analysis was done at each step of blood transfusion and per cadre.

3.16: ETHICAL CONSIDERATIONS

Permission and approval was obtained from the Department of Clinical Medicine and Therapeutics of the University of Nairobi and the Kenyatta National Hospital Research and Ethics Committee before carrying out the study.

Permission was also sought from the KNH administration through the department of laboratory services and the department of Internal Medicine to carry out this study once ethical approval was obtained.

The aim of the study was explained to all patients for whom blood requests had been made in simple terms and informed written consent was obtained. Study participants were free to withdraw consent at any point during the study period without victimization.

Patients' confidentiality was maintained by assigning codes to the data collection sheets and computerized data.

Data collection forms were stored in a secure place only accessible to the principal investigator.

The data collected was not used for any other purpose apart from meeting the objectives of this study.

3.17: STUDY FEASIBILITY

Approximately 50 blood requests are received at the BTU every day. Approximately a fifth of these are from the medical wards. Recruitment was done every day until the minimum sample size was reached. It took 25 days to reach the study sample for the patients.

The PI set out to recruit all healthcare workers working in the medical wards, which took longer than expected because of the coronavirus pandemic, which made person to person interaction limited. An online questionnaire was used to collect data after obtaining consent. This was done in the months of May, June and July 2020.

The principal investigator funded the entire study.

3.18: STUDY DURATION

The study was carried out from 8th March to 30th July, 2020. The patient related data was collected from 8th March to 1st of April, 2020. The healthcare workers' data was collected from May to July, 2020.

CHAPTER FOUR: RESULTS

4.1: PATIENT DATA

Between 8th March, 2020 and the 1st of April, 2020, one hundred and forty three blood requests were made from the medical wards. The in-patient files of 2 of the patients could not be traced, one patient was discharged on the same day the blood component request was made and 2 patients declined to give consent to participate in the study. These 5 blood requests were excluded from the study. In total, 143 blood request forms were recruited, with 138 being enrolled in the study. Blood requests re-enrolled for the second time after an elapse of 7 days were 18.1% (25).

Sixty percent (60.1%) of the requests were not issued with any blood or component as requested.

STUDY FLOW CHART

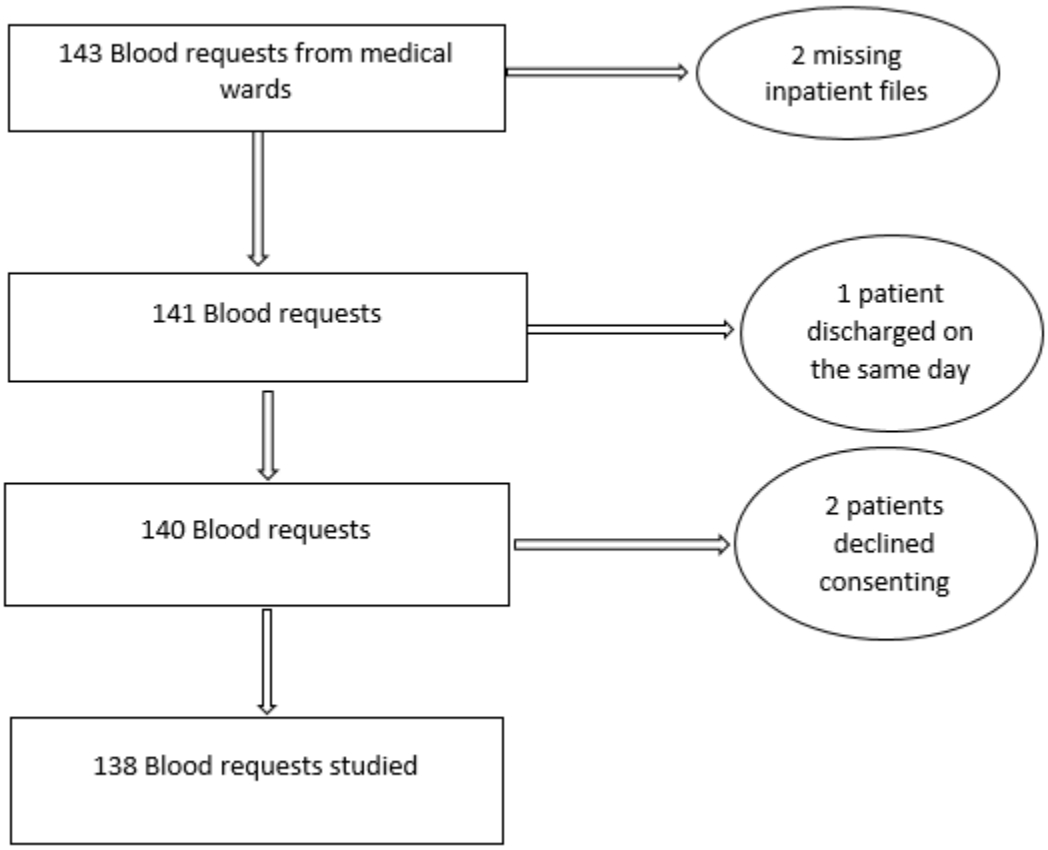


Figure 3: Study flow chart

4.1.2: Social demographic characteristics

Forty seven percent (47.8%) of the blood requests were for patients aged between the ages of 18-44, with 55.1 % being female. The majority (91.3%) of the patients had attained at least primary level of education and 97.1% were Christians, with 2.9% being Muslims. Students comprised 12% of the study population.

Table 1: Patient socio-demographic characteristics

Characteristics	Frequency(N)	Percent (%)
Age		
<18	12	8.7
18-44	66	47.8
45-64	43	31.2
≥65	17	12.3
Gender		
Male	62	44.9
Female	76	55.1
Education		
None	12	8.7
Primary	58	42.0
Secondary	55	39.9
Tertiary	13	9.4
Employment		
Employed	59	42.8
Unemployed	62	44.9
Student	17	12.3
Religion		
Christian	134	97.1
Muslim	4	2.9

4.1.3: Patients' clinical and laboratory characteristics

The baseline mean haemoglobin level and platelet concentrate were 6.8g/dl (2.7-15.6) SD 2.0 and 9,000 per microliter (4,000-18,000) SD 5, 657 respectively.

Blood requests from patients with blood group O accounted for 57.2%, with groups A, B, and AB representing 26.1%, 15.2%, and 1.4% respectively. Ninety two percent of the patients were rhesus positive.

Forty two percent (42.8%), of the requests had no urgency status indicated on the blood request form. Fifty six percent (56.5%) were indicated to be urgent while 0.7% (1) had a desperate indication.

Sixty five percent (65.2%) of the requests did not have a specification for a blood component. Component distribution was as follows; packed red cells-29.0%, platelet concentrates-5.8%, cryoprecipitate-0%, and Fresh frozen plasma-0%.

Ward 8C (oncology) had the highest number of blood requests at 35.5%, with 8A and 8B having the least with 7.2%, each.

No blood transfusion reaction was documented in the patients' files or reported to the blood transfusion unit from the medical wards during the study period.

Table 2: Patient baseline laboratory levels

Characteristics	**Mean**	**SD**	**Median**	**IQR**	**Min**	**Max**
Pre HB levels *(N=131)*	6.8	2.0	6.4	5.5 – 7.4	2.7	15.6
Pre Platelets *(N=8)*	9,000	5,657	7,000	4,000-14,000	4,000	18,000

Table 3: Patient clinical and laboratory characteristics

Characteristics	Frequency (N)	Percent (%)
Blood group		
A	36	26.1
AB	2	1.4
B	21	15.2
O	79	57.2
Rhesus		
Positive	127	92.0
Negative	11	8.0
Urgency		
Urgent	78	56.5
Desperate	1	0.7
Not indicated	59	42.8
Component requested		
Not indicated	90	65.2
Platelets	8	5.8
PRCS	40	29.0
Hematinic use		
Yes	47	34.1
No	87	63.0
Not indicated	4	2.9

Table 4: Blood component requests distribution by ward

Ward	Frequency (N)	Percent (%)
7A	12	8.7
7B	19	13.8
7D	27	19.6
8A	10	7.2
8B	10	7.2
8C	49	35.5
8D	11	8.0

4.1.4: Transfusion rate in the medical wards

This section sought to establish the transfusion rate in the medical wards at Kenyatta National Hospital.

Out of the 138 blood requests, 53 patients (38.4%) got at least 1 unit of blood.

During the study period, 610 patients were admitted to the study wards, giving a transfusion rate of 8.7% in the medical wards at KNH.

4.1.5: Clinical indications for blood and blood components request

This section sought to document the clinical indications for blood and blood components requisition in the medical wards at Kenyatta National Hospital.

The clinical indications for blood and blood component requisition were as follows; neoplasms-52.2% (72), diseases of blood and blood forming organs-11.6% (16), diseases of the digestive system-10.9% (15), infectious diseases and parasitic infections-10.1% (14),diseases of genitourinary system-8.7% (12), endocrine, nutritional and metabolic diseases-2.9% (4), injury and poisoning-1.4% (2), diseases of musculoskeletal and connective tissue 0.7% (1) and diseases of nervous system-0.7%(1). Tuberculosis, leishmaniasis and malaria were the commonest infectious diseases, while upper gastrointestinal bleeding represented most of the cases in the

digestive system class. Chronic kidney disease formed the bulk of cases in the genitourinary category.

Seven out of the 8 platelet concentrate requests were made for patients with leukemia, while one was for a patient with aplastic anemia.

Table 5: Clinical indications for blood request

ICD 10	**Frequency (N)**	**Percent (%)**
C00-D49-Neoplasms	72	52.2
D50-D89-Diseases of the blood and blood-forming organs	16	11.6
K00-K95-Diseases of the digestive system	15	10.9
A00-B99-Certain infectious and parasitic diseases	14	10.1
N00-N99-Diseases of the genitourinary system	12	8.7
E00-E89-Endocrine,nutritional and metabolic diseases	4	2.9
S00-T88-Injury and poisoning	2	1.4
M00-M99-Diseases of musculoskeletal and connective tissue	1	0.7
G00-G99-Diseases of nervous system	1	0.7
I00-I99-Diseases of the circulatory system	1	0.7

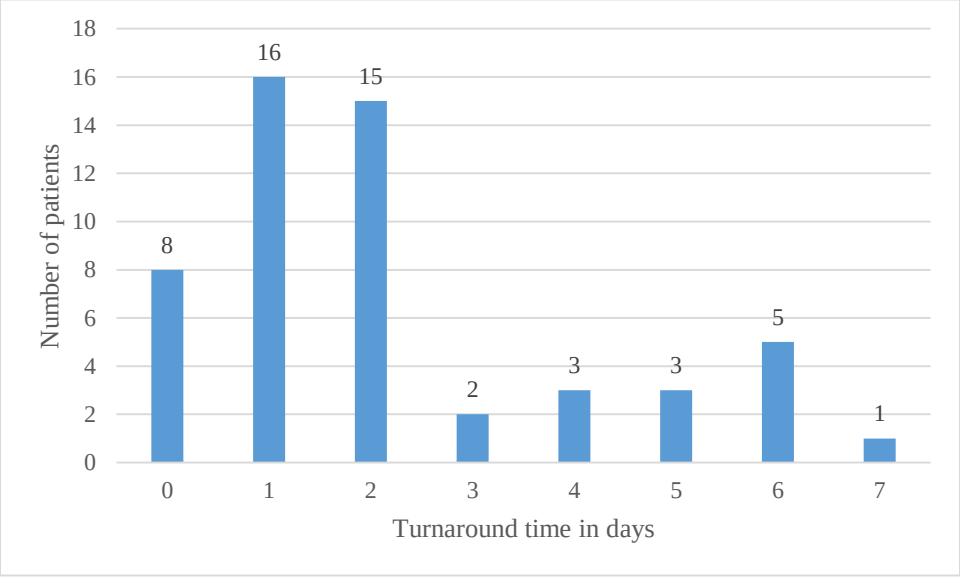
4.1.6: Turnaround time

This section sought to determine the turnaround time in days from requisition to transfusion of the first unit of blood or blood component requested in the medical wards at Kenyatta National Hospital. It took an average of 2.2 days (0-7) SD 1.9 for patients to receive the first unit of blood. The median turnaround time was 2 days, with a range of 0 to 7 days.

Table 6: Turnaround time in days.

	Mean	SD	Median	IQR	Min	Max
Interval days	2.2	1.9	2.0	1.0 – 3.0	0	7

Figure 4: Graphical presentation of turnaround time



4.1.6.1: Turnaround time in relation to blood group

In respect to blood groups, patients with blood group A had the longest mean turnaround time of 2.5 days, while groups O, B, and AB had a mean turnaround time of 2.1, 1.9, and 1 day respectively.

Table 7: Turnaround time in relation to patient blood group

Blood group	Frequency (N=53)	Mean of Days	SD
A	17	2.5	2.4
AB	1	1.0	.
B	9	1.9	1.8
O	26	2.1	1.6

4.1.6.2: Turnaround time in relation to clinical indication for transfusion

Patients who had infectious and parasitic diseases as the indication for blood transfusion had the longest mean turnaround time of 3.3 days (SD 2.6), while patients with malignancy had the least 1.5 days (SD1.5). The mean turnaround for the other clinical indications was as follows; diseases of the digestive system-3.1 days, diseases of the genitourinary system-2.5 days, and diseases of the blood and blood-forming organs-2.1 days.

Table 8: Turnaround time in relation to clinical indication for blood requisition

ICD10	Frequency (N=53)	Mean of Days	SD
A00-B99	7	3.3	2.6
C00-D49	26	1.5	1.5
D50-D89	8	2.1	1.6
K00-K95	7	3.1	2.6
N00-N99	4	2.5	1.7

4.1.7: Met and unmet blood demand in the medical wards

We sought to determine the met and unmet blood demand in the medical wards at Kenyatta National Hospital.

During the study period, 398 units of blood and blood components were requested. Ninety units of blood and blood components were transfused. However, 6 of the units were transfused to patients whose blood requests didn't specify the number of units requested. This gives a met blood demand of 21.1% and an unmet blood demand of 78.9%.

Only 6.5% (9) of the requests were met fully, while 60.1% (83) of the requests were not issued with any blood or its components. Twenty nine percent (40) of the requests were partially met while 4.3% (6) didn't have the number of units requested specified.

The mean number of blood component units requested was 3.0 (1.0-7.0) SD 1.1 and the mean number of units transfused was 0.7 (0-5.0) SD 1.0.

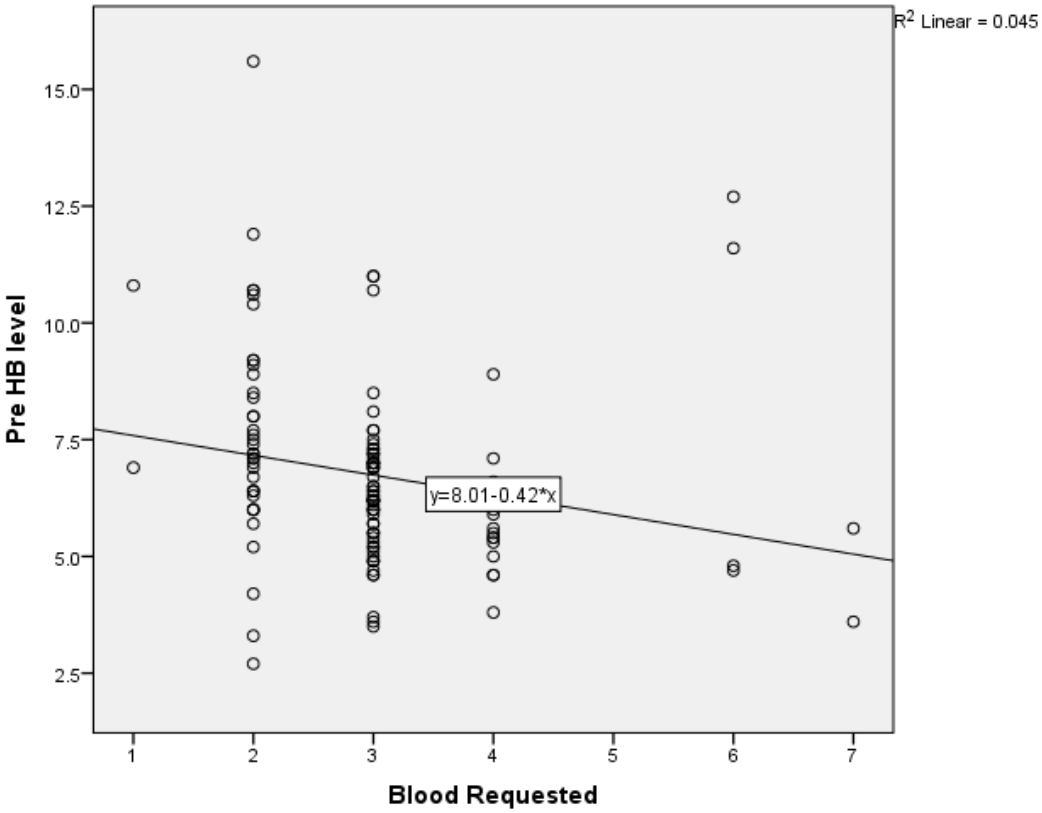
Table 9: Analysis of requested and transfused units

	Mean	**SD**	**Median**	**IQR**	**Min**	**Max**
Requested	3.0	1.1	3.0	2.0 – 3.0	1.0	7.0
Transfused	0.7	1.0	0.0	0.0 – 1.0	0.0	5.0

4.1.7.1: Relationship between baseline haemoglobin and the number of blood units requested

The Pearson correlation coefficient was carried out to test the relationship between the baseline haemoglobin level and the number of blood components units requested. An inverse relation was established though weak r=-0.211 (P =0.018).

Figure 5: Correlation between blood requested and baseline level



The correlation between baseline haemoglobin level and blood requested is weak (r=-0.211)

4.2: CHALLENGES ENCOUNTERED BY HEALTHCARE WORKERS

Between June and July 2020, one hundred and thirty nursing officers, 54 residents, 5 medical officers, 4 medical officer interns, and 10 medical laboratory technologists were recruited into the study.

HEALTHCARE WORKERS FLOW CHART

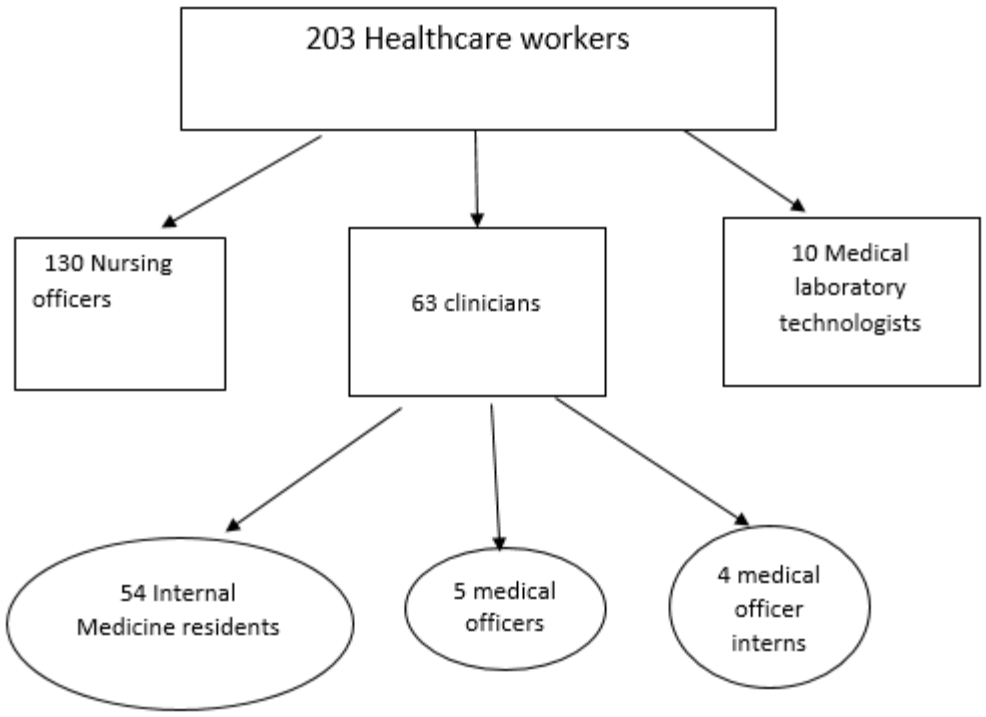


Figure 6: Healthcare workers recruitment flow chart

4.2.1: Healthcare workers' socio-demographic characteristics

Fifty three percent (53.7%) of the respondents were between the ages of 18-34 years, while 10.3% were 50 years and above. Forty eight percent (48.3%) of the respondents had worked for 5-10 years, with 61.6% being female.

Table 10: Social Demographic Characteristics

Characteristics	**Frequency (N)**	**Percent (%)**
Age		
18-34	109	53.7
35-49	73	36.0
>=50	21	10.3
Gender		
Male	78	38.4
Female	125	61.6
Cadre		
Internal Medicine Registrar	54(77.1%)	26.6
Medical Officer	5(33.3%)	2.5
Medical Officer Intern	4(80%)	2.0
Nursing Officer	130(62%)	64.0
Lab Technologist	10(100%)	4.9
Duration		
<5 years	50	24.6
5-10 years	98	48.3
11-20 years	32	15.8
>20 years	23	11.3

4.2.2: Challenges experienced by medical laboratory technologists.

Screening of donors is a key activity undertaken by medical laboratory technologists (MLTs). Some of the challenges experienced by this team include: falsified information from donors (70%); inadequate space at the BTU to accommodate the donors during screening and bleeding time (20%); and language barriers as a cause of ineffective communication reported by 10% of the MLTs.

Safe blood obtained from donations must be screened for TTIs. The issues experienced at this stage range from: inadequate blood testing kits and indeterminate test results reported by 40% and 20% respectively; poor quality of blood samples and machine breakdown at 10% respectively.

Appropriate use of blood requires requisitions by the clinicians for various indications and challenges experienced by the MLTs include: incompletely filled blood request forms (90%), poor quality of blood specimens (30%); falsified information on the request forms (10%) and frequent re-ordering of blood increasing the workload (10%). Poor quality of specimens leads to rejections due to sample clotting, incorrect labelling of blood and insufficient sample draws.

Blood is voluntarily given and matching supply against demand is complex. There is a huge deficit in the country as well as in the Kenyatta National hospital. This was picked out by 70% of MLTs, making allocation to patients a dilemma. This is further complicated by incompletely filled blood request forms (50%). Due to this deficit, the hospital relies on replacement donors (20%) supported by a lean workforce (10%).

While all attempts are made to avail blood, failure or delay in picking up ready blood for transfusion was reported by 100%. When dispatched, poor documentation is experienced by 30%, with 10% reporting inadequate storage space for prepared blood and blood components.

To reduce blood wastage, unused blood or its components should be returned for safe storage at the lab. Unfortunately, this is not the case and was reported by 80% of the respondents. Any blood administered should also be investigated for blood transfusion reactions when applicable, but 20% of the MLTs reported a lack of capacity to do investigations when such reactions occur.

Table 11: Challenges experienced by medical laboratory technologists

Stage of blood transfusion	Challenges reported	Frequency (N/10**)**	Percentage
Screening donated blood	Inadequate blood testing kits	4	40
	Indeterminate results	2	20
	Poor quality samples	1	10
	Machine breakdown	1	10
Receiving blood requests	Incompletely filled out blood request	9	90
	forms	3	30
	Poor quality of blood specimens	1	10
	Falsified information on the request		
	forms	1	10
	Frequent re-ordering of blood		
Assigning of blood	Inadequate blood to meet demand	7	70
	Incompletely filled out blood request	5	50
	forms	2	20
	Lack of replacement donors	1	10
	Too much work load		
Hemovigilance	Return of blood when already spoilt	8	80
	Inability to investigate causes of	2	20
	reactions		

4.2.3: Challenges experienced by internal medicine registrars, medical officers, and medical officer interns (clinicians)

Blood samples for grouping and cross matching must be delivered to the BTU on time, but delays in doing so were reported by 15.9%. Moreover, lack of blood request forms, and poor communication between staff in the wards and those in the BTU were reported by 7.9% and 3.2% of clinicians respectively.

Due to inadequate blood supply, delayed blood transfusions were reported by 69.9%. This is complicated by the lack of clear procedures for following of blood (28.6%), lost blood request forms (14.3%) and the unavailability of replacement blood donors (11.1%). The little blood donated is frequently diverted for emergency procedures, as reported by 11.1%.

Patients who succeeded in getting blood may develop some blood transfusion reactions, as highlighted by 39%, with 25.4% of the respondents indicating inadequate reporting, monitoring, and documentation of the reactions. Technical problems experienced by the clinical team include: poor intravenous access and clotting of blood during a transfusion episode at 12.5% and 9.5% respectively.

Those who require additional blood or its components delays were reported by 28.6% of the respondents. Delayed transfusion reactions were reported by 12.7% and poor post-transfusion monitoring of clients was reported by 6.3%. Another 1.6% admitted that they didn't know how to manage transfusion reactions when they occurred.

Table 12: Challenges experienced by clinicians (Registrars, Medical Officers, and Medical Officer Interns)

Stage of blood transfusion	Challenges reported	Frequency (N/63)	%
Ordering of blood	Delay in transporting blood samples to lab	10	15.9
	Lack of blood request forms	5	7.9
	Loss of blood samples	3	3.2
	Poor communication	2	3.2
Duration between request and transfusion	Delay in getting blood	27	42.9
	Poor outline of follow up procedures	18	28.6
	Unavailability of blood	17	27.0
	Misplaced blood request forms/blood samples	9	14.3
	Delay/Unavailability of replacement donors	7	11.1
	Diversion of blood for emergencies	7	11.1
During blood transfusion	Blood transfusion reactions	24	39
	Inadequate monitoring and documentation	16	25.4
	Poor Intravenous access	8	12.7
	Clotting of blood during transfusion	6	9.5
Post transfusion	Delay getting additional blood units	18	28.6
	Post transfusion reaction	8	12.7
	Inadequate monitoring post transfusion	4	6.3
	Lack of medication to respond to reactions	1	1.6

4.2.4: Challenges experienced by nursing officers

Blood collection from BTU requires verification using blood request forms that require retrieval and with unavailability of blood, this has to be done repeatedly. Retrieval of requests being time consuming was reported by 50% of the nurses and 40 % reporting unavailability of blood. This was reported by 50% and 40% of the nurses respectively. More challenges at this phase were: uncooperative BTU staff (20%); loss of blood samples and blood request forms (18.5%); delay in getting blood (13.1%); lack of effective communication between BTU and the wards (9.2%); lack of replacement donors (5.3%) and inadequate staff to follow-up blood (3.8%).

Close patient monitoring during transfusion is to ensure smooth and uncomplicated outcomes are achieved. Poor intravenous access leading to clotting and haemolysis of blood during transfusion and blood transfusion reactions were reported by 57.7% and 26.2% respectively. Lack of blood transfusion monitoring charts and blood pressure monitoring machines, inadequate staff to monitor the blood transfusion episodes and lack of transfusion instructions were reported by 17.0%, 10.0% and 1.5% respectively.

Post blood transfusion reactions were reported by 41.5% of the respondents, with 3.8% of the nurses reporting a lack of a protocol to manage them. When required, delays in getting additional units of blood, delays in getting post transfusion laboratory results, difficulty tracing blood request forms post transfusion and poor documentation of previous transfusion reactions in patients' files were reported by 9.2%, 7.7%, 3.8% and 1.5% of the nurses respectively.

Table 13: Challenges experienced by Nursing Officers

Stage of blood transfusion	Challenges reported	Frequency (N/130)	%
Duration between request and Transfusion	Unavailability of blood	65	50.0
	Difficulty retrieving request forms	52	40.0
	Uncooperative staff at BTU	26	20.0
	Loss of blood samples and request forms	24	18.5
	Delay in getting blood	17	13.1
	Lack of communication from BTU	12	9.2
	Lack of replacement donors	7	5.3
	Inadequate staff to follow-up blood	5	3.8
Blood transfusion	Poor Intravenous access	75	57.7
	Transfusion reactions	34	26.2
	Inadequate BP machines, monitoring charts, and blood giving sets	22	17.0
	Inadequate monitoring due to inadequate staff	13	10.0
	Lack of transfusion instructions	2	1.5
Post blood transfusion	Transfusion reactions	54	41.5
	Delay getting additional units	12	9.2
	Delay in getting repeat tests after transfusion	10	7.7
	Lack of protocol on how to respond to transfusion reactions	5	3.8
	Difficulty tracing request forms after transfusion	5	3.8
	Poor documentation of previous transfusions	2	1.5

CHAPTER FIVE: DISCUSSION

Blood transfusion remains an important part of patient management, especially in the medical wards. This study sought to explore the transfusion practices in this group of patients and the challenges faced by healthcare workers involved in the blood transfusion process.

5.1: BLOOD TRANSFUSION PRACTICES

The study found the transfusion rate at KNH medical wards to be 8.7%. This was lower compared to a study done in Uganda with a transfusion rate of 10.5% among patients admitted in Medical wards (14). Similarly, a study done in Denmark had a transfusion rate of 10% (3). This underscores the integral part blood transfusion plays in the management of medical patients across the world. The lower transfusion rate at KNH could be attributed to lack of blood to meet all blood requests.

The critical disease entities requiring blood and its components based on the ICD 10 coding are: neoplasms (52.2%); diseases of the blood and blood-forming organs (11.6%); diseases of the gastrointestinal system (upper GIT bleeding) (10.9%); infectious diseases (10.1%) and diseases of the genitourinary system (chronic kidney disease) (8.7%). Among the neoplastic diseases, leukemia (acute and chronic) and lymphomas formed 58.3% of the blood requests, while Kaposi's sarcoma, multiple myeloma, and gastric carcinoma took up 8.3%, 6.9%, and 5.65% respectively. Diseases of the blood and blood-forming organs requiring blood and its components were mainly aplastic anemia (31.3%) and sickle cell disease (25%). The most common cause of upper GIT bleeding was bleeding esophageal varices, which accounted for 40% of cases. Tuberculosis (35.7%), leishmaniasis (28.6%) and malaria (14.3%) were the main infectious diseases requiring blood and its components.

These findings are comparable broadly with the results of surveys undertaken in seven tertiary hospitals in Europe in 2014 that found hematological conditions (30.0%), gastrointestinal bleeding (7%), critical care (4.4%) and non-hematological cancers (4.2%) to be the leading consumers of packed red cells for medical patients (25). In Africa, most states struggle with infectious diseases, though there are non-infectious diseases that require blood. A study done in Tanzania in 2018 found malaria (9.5%), HIV-related anemia (13.9%), and tuberculosis (1.3%), to be the leading infections, while cancer (6.8%), chronic kidney disease (2.3%) and sickle cell disease (1.0%) were among the non-communicable diseases. (45). Comparatively, a study done in KNH in the pediatric population found malaria (30.8%) and neonatal sepsis (43.0%) required more packed red cells,

while sickle cell disease (6.5%) topped the list of NCDs (8). Differences in geographical locations and epidemiological patterns could explain the variability observed in these studies.

Thrombocytopenia is the commonest indication for platelet concentrate transfusions. 87.5% (7) of the requests made were for oncology related complications with a mean platelet count of 9,000 (4,000-18,000) SD 5,657. This is consistent with a study done in the USA which showed that platelet concentrates were most frequently (48.2%) transfused in thrombocytopenic patients in the oncology wards (33). The mean baseline platelet count warranting platelet concentrate request of 9,000 at KNH, is in keeping with the American Association of Blood Banks 2015 recommendation of a transfusion threshold of <10,000 for platelet transfusion. (55)

While the majority of the requests were urgent, it took a cumulative mean of 2.2 days (0-7) SD 1.9 for patients to receive the first unit of blood. This is against a set laboratory turnaround time of two hours. This turnaround time is subject to availability of blood at the time of blood request. A study done in the pediatrics department in KNH in 2006 found that it took an average of 1.6 days for patients to receive blood (8). A retrospective study done at Moi Teaching and referral hospital in 2013 found that 89.4% of the patients transfused received blood within 24 hours (6). Patients with infectious diseases had the highest mean (3.3) and those with neoplasms had the shortest mean (1.5). Patients' blood groups also didn't significantly affect the turnaround time. Despite the mean turnaround time in this study being 2.2 hours, it should be taken in the context that, 59.4% of all the blood requests didn't receive a single unit of blood. This means that the requests that were met, did so within a reasonable time, but the majority didn't receive any blood transfusion within seven days.

The blood requests analyzed were for either a single blood unit or multiple requests for the same patient based on the needs. This gave a cumulative number of blood units required during the study period. The requests were categorized as either met (given all the requested blood units), partially met (issued with less than requested units) or unmet (not issued the blood units). During the study period, 78.9% of the total number of blood components requested were not met. The reason for not transfusing was not documented, though it was associated with unavailability of blood.

Based on these findings, unmet blood demand of 78.9% is extremely high compared to 2.4% from a Tanzania study in 2013. (7) The mean baseline hemoglobin in this study was 6.8 g/dl (2.7-15.6) SD 2.0, which is comparable to the mean baseline hemoglobin in the Tanzanian study of 7g/dl.

The mean number of units ordered was 1.3 and 3 units respectively. A unit of packed red cell raises the hemoglobin concentration by 1g/dl with a post-transfusion target Hb of 10g/dl in the study site. Despite similar baseline Hb levels, fewer units were ordered in Tanzania, pointing to a lower transfusion target, though the reason could not be established in that study. A transfusion target of 10g/dl like in this study is widely accepted, though there is no strong evidence to support this practice. Most professional bodies recommend consideration of patients' hemodynamic status, age, and co-morbities to determine the target Hb.

Notably, 8.7% (12) of the blood requests were made for patients with a baseline Hb of > 10g/dl with 1.4% (2) of the patients getting PRCs transfused. HIV, rheumatic heart disease, aplastic anemia, mediastina mass, acute lymphocytic leukemia, pancreatic cancer, breast cancer, acute myeloid leukemia, Kaposi sarcoma, colorectal cancer, deep venous thrombosis, and cervical cancer were among the indications for these requests. These requests didn't have valid documented indication for transfusion indicated. This can be attributed to a lack of adequate information by some clinicians, leading to over utilization of already limited resources.

Unavailability of blood and blood components in the BTU, high target hemoglobin of 10 g/dl and inappropriate blood requests for patients with Hb of >10g/dl are some of the reasons that could explain the high unmet blood demand in this study.

Delayed supply of blood led to longer hospital stays and increased costs of healthcare. This was evident in this study, whereby 25 blood requests were repeat requests after 7 days.

5.2: CHALLENGES EXPERIENCED BY HEALTHCARE WORKERS

The blood transfusion process starts from the time of screening donors to the post transfusion monitoring of the blood recipient. Different challenges are encountered at different stages by different healthcare workers at each stage, which in turn influence the transfusion experience of patients too.

Seventy percent of medical laboratory technologists (MLT) reported falsified information as a challenge during screening of blood donors. KNH BTU sources most of its blood from family and hospital-based replacement donors, and this puts pressure on relatives to donate blood for their sick family members. A review of blood transfusion services in Sub-Saharan Africa done in 2018 showed that blood from replacement donors and remunerated donors has higher risks of

transmissible infections which can be attributed to giving wrong information during the screening process (2). This leads to wastage of resources screening blood which ends up being discarded. Limited space and crowding were also reported as a challenge given the timing of the study during the COVID 19 pandemic. Lack of adequate infrastructure, technology and inconsistent laboratory supplies for screening blood have been identified as an important gap in sub-Saharan Africa and from our findings, it's not any different. (2)

Incompletely filled blood request forms were reported by 90% of the MLTs as a challenge to how blood requests are made. This was also evident in the first part of the study, whereby 65.2% of all requests made didn't have the blood component required specified. Some of the requests had falsified information about baseline hemoglobin and platelet levels, which makes it hard for the MLTs to allocate blood to patients in dire need of blood. Lack of training of clinicians on blood transfusion practices upon employment or start of training is the likely reason for incomplete and incorrect blood requests.

Unavailability of blood and blood components was reported as a challenge by all cadres; MLTS (70%), nursing officers (50%) and clinicians (27%) increasing the turnaround time and some patients not getting transfused at all. This was evident in our study, whereby 78.9% of blood components requested were not met. The cumulative mean turnaround time of 2.2 days (52.8 hours) is comparable to 1.6 days (38.7 hours) turnaround time in a study done in KNH in the pediatrics wards in 2013. Unavailability of blood is a documented challenge in Sub-Saharan Africa, where countries are unable to collect the recommended units of blood equivalent to 1-2% of the total population (38). Lack of adequate financial support and policy framework in Sub-Saharan Africa are some of the challenges cited as hindering the establishment of blood transfusion services backed by repeat volunteer non-remunerated blood donors (VNRDs). Blood transfusion services backed by NRBDs are more responsive to patients' needs, especially during emergency situations. This is from a review of published data on blood transfusion services done in Sub-Saharan Africa in 2018. (2) Due to the ongoing Covid-19 pandemic during the study period, blood donations from the then closed secondary schools were not available to supplement blood from replacement donors and this could have further contributed to the lack of blood and blood components.

Poor communication between all the cadres came out as one of the challenges, as reported by all cadres, MLTs (10%), nursing officers (9.2%) and clinicians (3.2%). Ninety percent of MLTs reported the failure of healthcare workers in the wards to collect blood components when ready and failure to document when they picked up blood for transfusion. The nursing officers, on the other hand, reported that the MLTs failed to communicate about the availability of blood and had a negative attitude toward them.

The lack of well-outlined procedures on how to follow up blood requests with nursing officers and clinicians often being required to manually retrieve the blood request forms to request for blood at the BTU was cited as time-consuming and tedious. This may lead to prolonged waiting times when ward staff are overwhelmed by other duties and are unable to follow up on blood requests. Use of electronic health record systems to guide prescription, ordering, and management of blood services has been shown to improve transfusion practices and efficiency in utilization of blood (52). This eliminates the need for the already overburdened healthcare workforce to physically follow up blood in the BTU.

Blood transfusion reactions were reported as a concern during transfusion by all cadres: MLTs (20%), nursing officers (26.2%) and clinicians (39%) with a lack of knowledge and clear protocols on how to respond and report blood transfusion reactions standing out. This may pose a serious danger to patients whose lives might be in danger. During the study period, none was reported or documented. Lack of knowledge among healthcare workers about blood transfusion medicine was also found in a study in Mali, where 49% of healthcare workers lacked basic knowledge about blood transfusion. (49) In an audit conducted in Glasgow after the formulation of policy guidelines to inform blood transfusion, followed by an audit, on-the-job training of healthcare workers on the blood transfusion process was shown to improve blood transfusion practices (46).

Lack of intravenous access was raised as a challenge by nursing staff (57.7%), resulting in clotting and hemolysis of blood components during transfusion. This can lead to wastage of blood, as noted by MLTs who reported a high incidence (80%) of return of blood and its components when already unfit for transfusion due to hemolysis and clotting.

Inadequate monitoring and documentation of the blood transfusion episode was highlighted by 10% of nursing officers. Inadequate staff and unavailability of blood monitoring charts were

reported as the underlying causes. During the study period, inpatients' files didn't have evidence of transfusion and we had to rely on the BTU blood dispatch records, nursing care records, and patients' verbal reports. This was also established in a study done in Moi teaching and referral hospital whereby, only 73.4% of all patients transfused had pack numbers of products transfused documented and only 27.9% had vital signs documented (6). Documentation in current medical practice cannot be over emphasized. Lack of adequate staff was reported as the reason for proper documentation of the transfusion process. Other challenges experienced post transfusion were a long waiting period before additional units could be transfused and difficulty tracing blood request forms leading to repeat requests and grouping and cross matching.

This study is the first one to explore the challenges of blood transfusion as perceived by healthcare workers, provides insight and can be used to address them to improve blood transfusion services in KNH.

CHAPTER SIX: CONCLUSION AND RECOMENDATIONS

6.1: CONCLUSION

There was a low blood transfusion rate in KNH medical wards at 8.7%.

Neoplasms and diseases of the blood and blood-forming organs were the main clinical indications for blood requests in KNH medical wards.

The turnaround time was 2.2 days with a high unmet blood demand of 78.9% with only 9 of the requests being met fully.

Unavailability of blood and blood components was reported across all cadres as the main challenge faced in the blood transfusion process.

6.2: RECOMMENDATIONS

KNH needs to establish blood donor sourcing programs to supplement the patient-sourced donor replacement program, which is not responsive to patient needs, especially in emergencies. This will reduce the waiting times and meet the unmet demand.

Formulation of an institutional blood transfusion standard operating procedures (SOPs) for blood request and administration with training will lead to standardization of transfusion practices amongst healthcare workers with efficient utilization of blood and its components.

6.3: STUDY LIMITATIONS

Convenient sampling was used, and hence, the results of this study may not be generalizable to the general population.

An open-ended questionnaire was used to document challenges experienced by healthcare workers. Diverse responses were generated and posed a challenge of grouping the responses into related challenges, which might have distorted the challenge as described by different healthcare workers. To overcome this challenge, all responses were analyzed and presented as frequencies and a narrative to capture all challenges as reported by healthcare workers.

This study was carried out during the COVID 19 pandemic when there were restrictions on free movement in and out of Nairobi, which could have affected the ability of patients to source for

replacement donors. However, relatives of patients admitted in the wards were given passes to enable them to travel to the hospital, reducing the effect of the prevailing conditions on the study results.

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APPENDICES

APPENDIX 1: PARTICIPANT INFORMATION AND CONSENT FORM

ASSESSMENT OF BLOOD AND BLOOD COMPONENT TRANSFUSION PRACTICES AND CHALLENGES EXPERIENCED BY HEALTHCARE WORKERS IN THE MEDICAL WARDS AT KENYATTA NATIONAL HOSPITAL

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Co-Investigators:

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Dr. Kibet Shikuku**-UoN**

Dr. Marybeth Maritim**-UoN**

Introduction

I would like to tell you about a study being conducted by the above listed researchers. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'. Once you understand and agree to be in the study, I will request you to sign your name on this form. You should understand the general principles which apply to all participants in medical research:

i) Your decision to participate is entirely voluntary.

ii) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal.

iii) Refusal to participate in the research will not affect the services you are entitled to in this health facility or other facilities.

We will give you a copy of this form for your records.

May I continue?

YES NO

This study has approval by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol number P885/11/2019

WHAT IS THE STUDY ABOUT?

Blood transfusion forms an important part of managing patients with anemia and trauma patients. Blood demand exceeds supply and is not always available when needed. Delays in blood transfusion can impact negatively on patient outcomes and lead to long hospital stays awaiting blood, which in turn increases the cost of health care. The common indications for blood transfusion and existing gaps in our medical wards are not known. Establishing the current practices and gaps will inform the practice of blood transfusion, leading to efficient use of blood and ultimately improved patient quality of care. Recommendation from the study results can be used to formulate policy on blood transfusion in the medical wards and improvement of service delivery.

Your participation in this study is voluntary. Should you accept to participate, this is what the study entails:

Socio-demographic data e.g. age, employment status, gender, level of education and religion will be obtained from your inpatient file. The principal investigator will also use your inpatient file to establish the current diagnosis during this admission, reason for transfusion, your current hemoglobin level, type and units of blood component requested and review your inpatient file after 7 days to establish whether the blood component requested is transfused and duration taken to meet the request. Your name will not be included in the study data collection sheet.

This will take about 10 minutes of your time.

Benefits

Findings from this study can be used to formulate blood transfusion practices to improve the quality of blood transfusion services and service delivery. Your primary physician will be informed of any findings that are relevant to your medical care. Participants will not receive any monetary compensation for taking part in the study.

Risks

Your participation in this study has minimal risk. Your participation to this entails allowing the investigator access to your in-patient file only.

Confidentiality

All the information provided will remain strictly confidential. The filled study proforma, questionnaires and signed consent forms shall be kept in a lockable cabinet which will be accessible to the principal investigator only.

Participation

You will be required to sign a consent form if you agree to participate in the study. Might you want to withdraw from the study you are allowed to do so at any point without giving any reason and you shall not face any consequences.

If you do not agree to participate, there will be no consequences whatsoever and your medical care will continue as usual, including availing of blood for transfusion without any discrimination.

Questions about the research

Thank you for taking your time to read this information. If you have any questions on the study kindly contact me (principal investigator) on this telephone number 0726533033

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke.

CONSENT FORM (STATEMENT OF CONSENT)

Participant's statement

I have read this consent form or had the information read to me. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

I understand that all efforts will be made to keep information regarding my personal identity confidential.

By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

I agree to participate in this research study:	**Yes**	**No**

Participant signature / Thumb stamp

Date

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name **Date**

Signature:

Role in the study: Principal investigator

Contact information:

Dr. Lillian Nthenya Musyoka

Telephone number: **0726533033**

KIAMBATANISHO CHA 2: FOMU YA HABARI KWA WANAOSHIRIKI NA IDHINI UTAFITI KUHUSU JINSI ZOEZI LA KUONGEZEWA DAMU LINAFANYIKA NA CHANGAMOTO WANAZOPATA WAHUDUMU WA AFYA KATIKA KATA YA MATIBABU HOSIPITALI KUU YA KENYATTA

Mtafiti mkuu

Dr**.** Lillian Nthenya Musyoka- **UoN**

Watafiti wenza

Prof. S.M. Bhatt - **UoN**

Dr. Kibet Shikuku- **UoN**

Dr. Marybeth Maritim- **UoN**

Utangulizi:

Madhumuni ya kauli hii ni kukujulisha. Ningependa kukufahamisha kuhusu utafiti huu unaofanywa na watafiti ambao wametajwa hapo juu. Umuhimu wa fomu hii ni kukujulisha yale unatakiwa kujua kabla ya kuamua kushiriki au kutoshiriki katika utafiti huu. Unaweza kuuliza maswali yoyote kuhusu umuhimu wa utafiti huu, faida na hasara zake kama zipo, haki zako ikiwa utajitolea kushiriki na chochote ambacho hujaelewa.

Utakapoelewa utahitajika kutia sahihi kwenye fomu hii.

Unapaswa kuelewa kuwa;

i. Haifai kulazimishwa kushiriki ila kwa uamuzi wako mwenyewe.
ii. Unaweza kujitoa kwenye utafiti huu wakati wowote ule bila kutoa sababu.
iii. Matibabu yako yataendelea kama kawaida hata utakapo kataa kushiriki katika utafiti huu.

Tutakupatia fomu nyingine ili uweze kuiweka.

Je, niendelee?

Ndio La

Utafiti huu umeidhinishwa na KNH- University of Nairobi ethics &Research committee protocol no. P885/11/2019

Utafiti huu unahusu nini?

Kuongeza kwa damu ni moja wapo ya matibabu yanayo pewa wagonjwa ambao kiwango cha damu kwa mwili kime pungua au baada ya Anjali.Kwa wakati mwingine damu haipatikani na hivyo kusababisha kuchelewa kwa matibabu na wagonjwa kusubiri sana kwa wadi na kuongezea gharama ya matibabu. Matokeo ya uchunguzi huu yatasaidia kuboresha huduma za kuongezea damu.

Iwapo utakubali kuendelea na zoezi hili,mtafiti atapata takwimu za kijamii kama vile umri, kauli ya ajira, kiwango cha juu cha elimu na dini kutoka kwa faili yako. Jina lako na nambari yako ya usajili hospitalini hazitatajwa katika horodha ya utafiti.

Mtafiti ataangalia faili yako ya hospital kubaini sababu ya kuongezewa damu, haina ya damu ilioagizwa, kiasi cha damu kilichoagizwa na kanieneo ya damu .Mtafiti atafuatilia matibabu yako kwa muda husiozidi siku saba kubaini muda utakaochukuliwa kabla ya kupata damu na kulinganisha kiwango kilichoagizwa na kile utakachoongezewa.

Haya yote yatachukua muda wa dakika kumi.

Faida

Maarifa yatakayotokana na utafititi huu yanaweza kuboresha matibabu ya wagonjwa siku zijazo.Matokeo yatawasilishwa kwa daktari wako na rufaa mwafaka itafanyika iwapo kuna haja.Washiriki hawatapata fidia yoyote ya kifedha kwa kushiriki katika utafiti huu.

Hatari

Ushiriki wako katika utafiti huu una hatari chache.Utaweza kuhisi kwamba unasumbuliwa utakapokua unajibu maswali kuhusu maisha yako ya kibinafsi**.**

Usiri

Habari zote utakazotoa zitabaki kua ni siri. Fomu zitakazotumika kwenya utafiti huu zitahifadhiwa kwenye kabati maalum linaloweza kufikiwa tu na mtafiti mkuu.

Kushiriki

Kushiriki kwa utafiti huu ni kwa hiari na uko na uhuru wa kujitoa katika hatua yoyote ama kukataa kushiriki bila ya maonevu.

Maswali kuhusu utafiti

Kama una maswali yoyote tafadhali wasiliana nami kwa nambari hii ya simu: 0726533033

Iwapo kuna maswali zaidi kuhusu haki zako kama mshiriki kwenye utafiti huu, wasiliana na karani/mwenyekiti KNH- Chuo kikuu cha Nairobi Ethics &Research committee nambari; Ext 44102.

Fomu ya idhini

Nimesoma fomu hii. Nimepata fursa ya kujadili utafitii huu. Maswali yangu yamejibiwa kwa lugha ninayoielewa. Nimeelewa faida na hatari zinazotokana na utafiti huu. Nimeelewa kuwa kushiriki kwangu sio kwa lazima na ninaweza kujitoa wakati wowote ule.

Nakubali kushiriki kwenye utafiti huu. Naelewa kua juhudi zimewekwa kuhakikishwa habari nitakazozitoa zitakua ni siri.

Kwa kutia sahihi sijapoteza haki zangu kama muhusika.

Nakubali kushiriki katika utafiti huu **Ndio** **La**

Sahihi ya mshirika /alama ya kidole_____

Tarehe

Kauli ya utafiti

Mimi niliyetia sahihi kwenye karatasi hii nimeeleza kwa kina mambo yote ambayo mshiriki aliyetajwa hapo juu anapaswa kuelewa na amekubali kushiriki katika utafiti huu bila kulazimishwa.

Jina la mtafiti_____ tarehe_____

Sahihi

Jukumu kwenye utafiti Mtafiti Mkuu

Kwa maelezo zaidi wasiliana na

Dr. Lillian Nthenya Musyoka

Nambari ya simu: 0726533033

APPENDIX 3: HEALTHCARE WORKERS INFORMATION AND CONSENT FORM

ASSESSMENT OF BLOOD AND BLOOD COMPONENT TRANSFUSION PRACTICES AND CHALLENGES EXPERIENCED BY HEALTHCARE WORKERS IN THE MEDICAL WARDS AT KENYATTA NATIONAL HOSPITAL

Principal Investigator:

Dr. Lillian Nthenya Musyoka **–UoN**

Co-Investigators:

Prof. S.M. Bhatt **- UoN**

Dr. Kibet Shikuku **- UoN**

Dr. Marybeth Maritim **- UoN**

Introduction

This is a study being conducted by the above researchers to assess the practice of blood and blood components transfusion and challenges experienced by healthcare workers in the medical wards at KNH. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be a participant in the study. Feel free to ask any questions about the purpose of the research, what happens if you participate in the study, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When we have answered all your questions to your satisfaction, you may decide to be in the study or not. This process is called 'informed consent'. Once you understand and agree to be in the study, I will request you to sign your name on this form. You should understand the general principles which apply to all participants in medical research:

iv) Your decision to participate is entirely voluntary.

v) You may withdraw from the study at any time without necessarily giving a reason for your withdrawal.

vi) Refusal to participate in the research will not affect the services you are entitled to in this health facility or other facilities.

We will give you a copy of this form for your records.

May I continue?

YES NO

This study has been approved by The Kenyatta National Hospital-University of Nairobi Ethics and Research Committee protocol number P88/11/2019.

WHAT IS THE STUDY ABOUT?

Blood transfusion forms an important part of managing patients with anemia and trauma patients. Blood demand exceeds supply and is not always available when needed. Delays in blood transfusion can impact negatively on patient outcomes and lead to long hospital stays awaiting blood, which in turn increases the cost of health care. The common indications for blood transfusion and existing gaps in our medical wards are not known. Establishing the current practices and gaps will inform the practice of blood transfusion leading to efficient use of blood and ultimately improved patient quality of care. Recommendation from the study results can be used to formulate policy on blood transfusion in the medical wards and improvement of service delivery.

Your participation in this study is voluntary. Should you accept to participate, this is what the study entails:

You will be provided with an open-ended self-administered questionnaire .The questionnaire has questions pertaining your age, gender, duration of service and questions on challenges experienced at different stages of blood transfusion depending on your cadre. Your name will not be included in the study data collection sheet.

This will take about 15 minutes of your time.

Benefits

Findings from this study can be used to formulate blood transfusion policy to improve quality of blood transfusion services and service delivery. Participants will not receive any monetary compensation for taking part in the study.

Risks

Your participation in this study has minimal risk.

Confidentiality

All the information provided will remain strictly confidential. The filled questionnaires and signed consent forms shall be kept in a lockable cabinet which will be accessible to the principal investigator only.

Participation

You will be required to sign a consent form if you agree to participate in the study. Might you want to withdraw from the study you are allowed to do so at any point without giving any reason and you shall not face any consequences.

Questions about the research

Thank you for taking your time to read this information. If you have any questions on the study kindly contact me (principal investigator) on this telephone number 0726533033

For more information about your rights as a research participant you may contact the Secretary/Chairperson, Kenyatta National Hospital-University of Nairobi Ethics and Research Committee Telephone No. 2726300 Ext. 44102 email uonknh_erc@uonbi.ac.ke.

CONSENT FORM (STATEMENT OF CONSENT)

Participant's statement

I have read this consent form or had the information read to me. I have had my questions answered in a language that I understand. The risks and benefits have been explained to me. I understand that my participation in this study is voluntary and that I may choose to withdraw any time. I freely agree to participate in this research study.

I understand that all efforts will be made to keep information regarding my personal identity confidential.

By signing this consent form, I have not given up any of the legal rights that I have as a participant in a research study.

I agree to participate in this research study:	Yes	No

Participant signature / Thumb stamp

Date__

Researcher's statement

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has willingly and freely given his/her consent.

Researcher's Name **Date**

Signature:

Role in the study: Principal investigator

Contact information:

Dr. Lillian Nthenya Musyoka

Telephone number: **0726533033**

APPENDIX 4: DATA COLLECTION SHEET

Tick where applicable

Demographic data

1. Patients age in years

<18 ☐

18-44 ☐

45-64 ☐

>65 ☐

2. Patient's gender?

Male ☐

Female ☐

3. Level of education

None ☐

Primary ☐

Secondary ☐

Tertiary ☐

4. Employment status

Employed ☐

Unemployed ☐

5. Religion

Catholic ☐

Protestant ☐

Muslim ☐

Hindu ☐

Others (specify) ☐

Clinical characteristics of study participants

1. Code ☐

2. Ward

7A ☐ 8A ☐

7B ☐ 8B ☐

7C ☐ 8C (oncology) ☐

7D ☐ 8D ☐

CCU ☐

3. Clinical diagnosis (ICD 10 Code)

Chronic anemia	
Upper GIT bleeding	
Renal disease	
Sickle cell anemia	
Malignancy	
Others(specify)	

4. Component requested

Whole blood ☐

Red blood cells ☐

Fresh frozen plasma ☐

Platelets ☐

Cryoprecipitate ☐

5. ABO Blood group

A ☐

AB ☐

B ☐

O ☐

6. Rhesus

Positive ☐

Negative ☐

7. Pre transfusion hemoglobin level ☐

8. Pre transfusion platelet count (for platelet concentrate requests) ☐

9. Urgency as indicated on requisition card

Desperate ☐

Urgent ☐

Non-urgent ☐

Reserve for operations ☐

Group only ☐

10. Patient on hematinic

Yes ☐ No ☐

11. Time interval between requisition and transfusion

Date of request ☐

Date of transfusion ☐

Interval (days) ☐

12. Units of blood and components requested versus transfused

Requested ☐

Transfused ☐

Deficit ☐

13 Transfusion reaction reported

YES ☐

NO ☐

APPENDIX 5: HEALTHCARE WORKERS QUESTIONNAIRE

1. How old are you?

18-34 years ☐

35-49 years ☐

>50 years ☐

2. What is your gender?

Male ☐

Female ☐

3. Cadre

Internal Medicine registrar ☐

Medical officer ☐

Medical officer intern ☐

Nursing officer ☐

Laboratory technologist ☐

4. Duration of service

<5 years ☐

5-10 years ☐

11-20 years ☐

>20 years ☐

Internal medicine registrars/Medical officers/Medical officer interns

5. What challenges do you experience when ordering blood and blood components?

a)

b)

6. Once blood and blood components have been ordered and the patient is awaiting transfusion, what challenges are experienced at this stage?

a)

b)

7. During the blood transfusion episode, what challenges do you encounter?

a)

b)

8. What challenges do you experience post-transfusion of patients?

a)

b)

Nursing officers

9. Once a blood sample for grouping and cross-matching has been taken to the BTU, as the primary nurse you may be required to follow up with BTU to ensure blood is available to the patient for transfusion. What challenges are encountered at this stage?

a)

b)

10. What challenges do you experience during a blood transfusion episode?

a)

b)

11. During the post blood transfusion period, what challenges do you encounter?

a)

b)

Medical Laboratory technologists

12. What challenges do you experience when screening blood donors?

a)

b)

13. What challenges do you experience when screening donated blood for transmissible transfusion infections?

a)

b)

14. What problems do you have with how blood requests are made from medical wards?

a)

b)

15. Once blood requests have been grouped, what challenges do you have assigning blood and blood components to different patients?

a)

b)

16. What challenges do you experience once blood is ready for collection for transfusion?

a)

b)

17. What challenges do you experience once blood and blood components have been released from BTU for transfusion?

a)

b)

Thank you for taking your time to fill in the questionnaire.