QUALITY OF MEDICAL CARE AT THE EMERGENCY DEPARTMENTS OF BUNGOMA COUNTY PUBLIC HOSPITALS, KENYA

BY

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF MEDICINE IN FAMILY AND EMERGENCY MEDICINE

SCHOOL OF MEDICINE

MASENO UNIVERSITY

DECLARATION

Declaration by the student:

I declare that this thesis is my original work and has not been presented to any other university for the award of any degree.

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ACKNOWLEDGEMENT

I would like to thank the Almighty God for blessing me with good health and resources to pursue this degree. I acknowledge the immense role played by my committed supervisors, Professor Wilson Odero and Professor Ng'wena Magak, through the entire period of my study. I thank them for the mentorship, guidance and encouragement they provided from the proposal development stage to the final thesis report.

I am indebted to the participants, facility managers and health care workers at all the ten public hospital emergency/outpatient departments of Bungoma County for their co-operation and support during my data collection.

I salute my Family, Bertha, Azaziah and Amaliah for the support and sacrifices they gave me during my study period. I thank them for their financial, moral and spiritual support during my studies. I also appreciate my employer the Ministry of Health and the county government of Bungoma for the financial support and time they provided for me to undertake the course.

I acknowledge the Maseno University Department of Family Medicine and Community Health, School of Medicine lecturers, and Massachusetts General Hospital Global Health fellows for their guidance, mentorship and support offered during my studies.

God bless you all!

DEDICATION

I dedicate this thesis to my parents, my wife Bertha and my son Azaziah and daughter Amaliah for their unwavering support during my studies.

ABSTRACT

Quality medical care at emergency departments(EDs) is an international mandate. In Kenya the services are mainly offered in the outpatient departments whose quality of care has not been evaluated. This study investigated quality of care at EDs of public hospital in Bungoma County by evaluating availability of infrastructure, equipment, supplies and personnel. The study assessed processes, protocols and outcomes of care at the EDs. A cross-sectional study design was employed, with a sample of 10 ED in-charges and 398 patients. The participants were proportionately recruited from the EDs via probability proportional to size(PPS). Quality was assessed using the Donabedian model with structure assessed by evaluating availability of infrastructure, equipment, supplies and personnel for emergency care. Process was evaluated by measuring turnaround timelines, assessment of presence and utilization of triage systems, protocols and guidelines. Outcomes were measured using number of admissions, deaths, left without being seen, unplanned re-attendance, and patient service experience. Data were collected using WHO observation checklists and questionnaires then analyzed using descriptive and inferential statistics. Infrastructure availability was 42.0% with all EDs lacking resuscitation rooms and high dependency units. Imaging rooms were in 40% of the hospitals, blood banks in 50%, and running water in 70%. Equipment availability was 34.7% with oxygen source, pulse oximeter, point of care ultrasound and trauma cart being available in 10%. Regular maintenance of equipment was in 52.5% of the EDs. Availability of supplies for resuscitation was 52% with Supplies for airway management being the least (22%). Mean personnel availability was 47.5%, with doctors being the least available: only 2 hospitals had physicians and general surgeons. None of the hospitals had a triage system nor performed 12 lead EKG. The mean patient service experience was 76.1 %, with 49.5% rating overall care as good. 6.1% of patients were admitted, 0.9% left without being seen, 35.7% were unplanned re-attendants, 0.1% died. The mean time to clinician was 29.44 minutes, mean time to treatment was 99.5 minutes; mean total time at ED was 111.6 minutes. In conclusion the study showed that quality of care at the EDs in Bungoma County was affected by lack of adequate infrastructure, trained personnel, equipment, supplies and processes such of triage systems. This has contributed to prolonged turnaround time and high re-attendance rates. There is need for provision of adequate infrastructure, equipment, personnel and systems for emergency care in public hospitals EDs in Bungoma County to improve quality of care.

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ABBREVIATIONS

ACEP	American College of Emergency Physicians
ACLS	Advanced Cardiac Life Support
A&E	Accident and Emergency
AMI	Acute Myocardial Infarction
ANOVA	Analysis Of Variance
ATLS	Advanced Trauma Life Support
BLS	Basic Life Support
CDC	Centres for Disease Control
CPR	Cardiopulmonary resuscitation
CVD	Cerebral Vascular Disease
DHIS	Demographic Health Information Survey
ECG/EKG	Electrocardiogram
EDs	Emergency Departments
EEE	Essential Emergency Equipment
ENMOC	Essential Neonatal Maternal Obstetric Care
ENT	Ear Nose and Throat
ETAT	Emergency Triage And Treatment
GXM	Grouping and cross match
HDU	High Dependency Unit
HIV/AIDS	Human Immunodeficiency virus/acquired immunodeficiency syndrome
HRIO	Health Records Information Officer
I&D	Incision and Drainage
IFEM	International Federation of Emergency Medicine
IOM	Institute Of Medicine

JOOTRH	Jaramogi Oginga Odinga Teaching and Referral hospital
KEPH	Kenya Essential Health Package for Health
KIHBS	Kenya Integrated Household Budget Survey
KNH	Kenyatta National Hospital
KQMH	Kenya Quality Model for health
LMIC	Low and Middle Income countries
MOH	Ministry Of Health
MTRH	Moi Teaching and Referral Hospital
MUERC	Maseno University Ethics Review committee
MVA	Manual Vacuum Aspiration
NCD	Non Communicable Disease
PALS	Pediatric Advanced Life Support
PPE	Personnel Protective Equipment
PPS	Probability proportional to size
RBS	Random Blood Sugar
RCO	Registered Clinical Officer
SARAM	Service Assessment Readiness and Availability Mapping
SPO2	Oxygen Saturation
SPSS	Statistical Package for Social Sciences
T&RED	Treated and Released from the Emergency Department
UK	United Kingdom
WHO	World Health Organization

OPERATIONAL DEFINITIONS

A medical emergency – Is an acute injury or illness that poses an immediate risk to a person's life or long-term health.

Emergency: any patient with a condition presenting to the outpatient emergency unit without prior appointment

Emergency care-means inpatient and outpatient hospital services necessary to prevent the death or serious damage of health of the patient

Emergency department- Also known as an accident and emergency department, emergency room, or casualty department is a medical facility specializing in emergency medicine, acute care to patients who present without prior appointment; either by their own means or by that of an emergency medical system.

Emergency medical services- services that are needed to evaluate or stabilize an emergency medical condition that is found to exist.

Emergency room- denotes any entry point in a health care facility such as an emergency room, admission room, treatment room, Casualty room

Health care quality- The degree to which health care services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge

Outpatient- a patient who receives treatment at a hospital, as in an emergency room or clinic, but is not hospitalized

Outpatient department – a hospital department where healthcare professionals see outpatients, which consists of consultation rooms and support areas

Quality- Quality is defined as conforming to requirements

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CHAPTER ONE

INTRODUCTION

Globally, emergency care to outpatients is provided at emergency departments(ED) also called emergency rooms, accident and emergency departments or casualty departments. Emergency room denotes any entry point in a health care facility such as an emergency room, admission room, treatment room or casualty room. They specialize in emergency medicine, the acute care of patients who present without prior appointment; either by their own means or that of an emergency medical services.

Emergency in the context of this study were all patients who presented to the emergency departments without prior appointment. The patients presented with different medical conditions and in various states, some being stable and others unstable, they were then triaged and categorized as A/B/C or Priority 1/2/3/4/5as per the Canadian triage and acuity scale(Arafat, Al-Farhan, & Abu Khalil, 2016). Category 1 being unstable needing immediate resuscitation, category 2 were those who were emergent and were to be seen within 15 minutes and category 3 were urgent patients who could wait for over 30 minutes(J Murray Michael, 2003). It is on this basis that management was initiated

Emergency departments have existed for the past 50 years, having begun in Australia, Canada, New Zealand, United States and United Kingdom (UK). They emerged following World War II (Kellermann & Martinez, 2011)and accelerated through 1980's and 1990's. Worldwide they provide the hub of Emergency care systems with patients attending on ad-hoc basis, or being brought in by pre- hospital personnel. The patients are then resuscitated, assessed, admitted to the hospital or discharged as appropriate. The EDs are increasingly utilized by patients for accessible and timely service(Cowling et al., 2013)

In countries where emergency medicine is well established attention is now being paid to defining and assuring quality in emergency care. In the UK, there has been national implementation of mandatory standards, and external review by government and other bodies(Mason, 2011)and (Cowling et al., 2013). In countries where emergency medicine is developing there may be immense pressure on the emergency care systems combined with limited resources to support the system. The International Federation of Emergency Medicine (IFEM 2010), in London developed a framework for quality and safety within the emergency departments that would be applicable across the globe. This was to ensure that patients could receive the best possible care within the finite resources available(Lecky, Benger, Mason, Cameron, & Walsh, 2014)

According to IFEM guidelines, EDs are expected to have the right personnel, be properly equipped, comply with infection control measures, be spacious, and be able to recognize patients requiring immediate attention and offer prompt critical interventions with timely assessment, investigations and management of those with emergency conditions. They offer patient-centered service with emphasis to relief suffering with good communication and the overall experience of patients and those accompanying and or caring for them. They are expected to provide access to timely and appropriate emergency care. They are expected to continually monitor care to ensure quality is preserved at all times.

Emergency care in Kenya is generally underdeveloped with care being provided by non-physician personnel not trained in emergency medicine(B. Wachira & Martin, 2011). Emergency rooms at Outpatient departments in Kenya provide care to a huge number of patients seeking acute and emergency care daily. The departments are faced with an ever increasing burden of

trauma, chronic illness and communicable diseases, maternal and infant morbidly among other conditions. According to a recent study, the common cases seen in the EDs are trauma 24%, lower respiratory tract infection 10%, malaria 10%, peptic ulcer disease 5%, Urinary tract infection 5%, upper respiratory infection, typhoid 4%, hypertension 3%, acute asthmatic attack 3%, and gastroenteritis 3% (B. W. Wachira & Smith, 2013).

The promulgation of the Kenyan Constitution in 2010 provided the Kenyan populace with the right to access emergency medical care(Constitution, 2010). The services at the Kenyan emergency departments are based on provision of the Kenya Essential Package for Health (KEPH) (Flessa, Moeller, Ensor, & Hornetz, 2011). Little has been documented about the quality of emergency care at emergency departments at public hospitals in Bungoma County.

Quality of care at the emergency departments can be assessed based on the Donabedian model (Ayanian & Markel, 2016), which reviews structure, process and outcomes compared to a set of norms. The structure is based on infrastructure, equipment, and essential supplies (drugs and non-pharmaceuticals). The processes are based on triage, timeliness and ambulatory pathway reviews. The outcomes are assessed based on patients dead, discharged, referred or transferred.

There are no studies that have assessed quality of medical care at the public hospitals in Bungoma County. The availability of structure, process and outcomes of the care provided at the emergency departments in Bungoma County is unknown. The study therefore seeks to establish the state of quality of emergency care at the emergency departments of public hospitals in Bungoma County through assessing the environment in which the care is provided, the processes or actions at the ED and the outcome as measures of quality at the ED.

1.1 Statement of the problem

Every day millions of patients seek care at emergency departments with a variety of conditions without prior appointment. This unique feature of the emergency departments necessitates the EDs preparedness to be on a 24hour a day alert. However in Kenya most hospitals do not have designated emergency departments and emergency care is provided at the outpatient departments. Therefore, outpatient units offer both acute and chronic care at the same time. In this regard outpatient departments are not set up as emergency units but are required to offer this essential service. The level of structures and processes at these units as relates to emergency care are unknown. This significantly affects the outcomes of both the outpatient and inpatient units by impacting on the quality of life, disability and death. There are no studies that have assessed quality of care at the EDs in public hospitals in Bungoma County. Hence the patient service experience, service timelines, patient disposition within the Emergency rooms is unknown in this rural setup.

In 2013 the SARAM report found that the list available service in both the private and public hospital in Kenya was emergency care, with little emphasis placed on care provided. Access to emergency care in Kenya is not a major priority of the health care system with no norms and standards for emergency care. According to the data obtained from DHIS (January – March 2015), regarding Emergency departments in Kenya; there was a high re-visit rates and death within the EDs in Bungoma county. The county is mainly rural with no level 5 hospital with the third highest population among the counties in Kenya. The County has 10 level four hospitals at different levels of development, with two hospitals lying on the major highway. There is an increasing burden of infections, trauma and non-communicable diseases which are increasing utilizing of the meagre resources in the county.

1.2 Research objectives

1.2.1 General objective:

To assess the quality of emergency care to patients presenting at emergency departments at public hospitals in Bungoma County

1.2.2 Specific objectives:

1. To determine infrastructure available for emergency medical care at emergency departments of public hospitals in Bungoma county.
2. To determine availability of essential equipment, essential drugs, personnel, consumables and non-consumables supplies at the emergency departments of public hospitals in Bungoma County.
3. To assess the processes and protocols involved in provision of emergency care in the emergency departments of Bungoma county public hospitals.
4. To determine patients' perceptions on services provided at emergency departments in the public hospitals in Bungoma County.
5. To identify the medical conditions and outcomes at the emergency departments in public hospitals in Bungoma county

1.3 Research questions

- What infrastructure is available for provision of emergency care at the EDs at public hospitals in Bungoma County?
- What essential equipment, essential drugs, personnel, consumables, and non consumables supplies are available for emergency care at the EDs in public hospitals of Bungoma County?
- What processes and protocols are in place for provision of emergency care in the emergency department of Bungoma county public hospitals?

- What are the patient perceptions as regards service at emergency departments in hospitals in Bungoma County?
- What are the medical conditions and outcomes at the emergency departments in Bungoma County?

1.4 Justification of the study

Quality of care assessment at the Emergency Departments has become a key strategy to improving service and outcomes at the Emergency departments. In 2010, the International Federation of Emergency Medicine required all health facilities to ensure quality of Emergency care within the finite resources. In Kenya, emergency care is offered at the outpatient departments whose quality of care has not been studied. It is unknown as whether the structures and process within EDs meet the requisite norms and standards for Emergency care. According to the Service Readiness and Availability Mapping (SARAM) report in Kenya by the Ministry of Health in 2013, it was noted that little emphasis was placed on provision of quality emergency care to outpatients. The SARAM report noted that emergency services were least available in both the private and public facilities. There have been no studies on quality of care at the emergency units in the public hospitals in Bungoma County.

Bungoma County is largely a rural county with no major regional or national referral hospital. The county showed relatively worse emergency care indicators compared to other counties and the national average from the data obtained from DHIS 2015. According the DHIS report, the proportion of emergency visits at the OPD in the County was 51% as compared to the total visits. This was only higher than Mombasa and Nairobi and similar to Kiambu County. Bungoma County had a higher re-attendance rate at 49% in comparison to other counties; 3rd only to the city counties of Mombasa and Nairobi which had re-attendance rates of 57% and 58%

respectfully. According to the same data mortality among these patients was relatively high at 7.95% when compared to the national average of 3.98%.

This study aimed to assess the quality of medical care at the Emergency departments using the Donabedian model components of structure process and outcomes in a cross sectional study. This will help the county develop norms and standards for emergency care and improve its process and better its outcomes and hence improve patient experience. Through determining the resources available for emergency care at the EDs in Bungoma County, the county will improve in planning and budgeting for investments in the ED. The study will also help the County improve the ED process to improve efficiency in its service delivery.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Emergency departments have steadily evolved since their inception in 1950(Kellermann & Martinez, 2011), initially staffed with community physicians and unsupervised hospital staff. In the early 1960s, due to public demand for improved quality of care and response at EDs in the United States, hospitals developed full-time emergency services(Kellermann, Hsia, Yeh, & Morganti, 2013).Emergency departments and Emergency medicine does not exist as a specialty in many nations, and unfortunately, that approach remains detrimental to the patient with a time-sensitive emergency, as they may not receive appropriate initial care and can remain undifferentiated while being directed to the appropriate service(Lecky et al., 2014).

Evaluating quality of medical care at Emergency departments has increasingly become a concern in countries with established emergency departments(Kang, Bastian, & Riordan, 2017). The International Federation of Emergency Medicine set out measures to ensure quality and safety at emergency departments within the finite resources(Lecky et al., 2014).

Two models have largely been used in assessing for quality of care, the Donabedian model and the Institute of Medicine (IOM) model. The Donabedian model utilizes structure and process evaluation which has an impact on the outcomes. The institute of medicine considers six dimensions and assesses quality on the basis of these six parameters. The IOM dimensions are safety, effectiveness, efficiency, timeliness, patient centeredness and equitable service.

Developing countries have limited resources for health care service. A study in South Africa found that a majority of the population was served by an under-resourced public health service,

Central to the health crisis lies the country's so-called quadruple burden of disease, responsible for premature mortality and emergency department (ED) overcrowding. The country did also not have a triage system until recently(Bruijns, Wallis, & Burch, 2008).

In low-income and middle-income countries, where substantial barriers to care exist, and emergency care is often the primary access point to the health system, however, emergency care systems remain underdeveloped in these countries. The Disease Control Priorities Project estimates more than half of all deaths and about a third of all disability-adjusted life-years in low-income and middle-income countries could be addressed through pre-hospital and facility-based emergency care systems(Marsh & Rouhani, 2018)

In Kenya, a study noted that Africa has a high burden of disease and injury, hence an urgent need for emergency centers and physicians in Africa. The most common presentation for acute care in western Kenya was injury related. However, the severity of illness, lack of pre-hospital transportation, and lack of community mental health services provide significant challenges and opportunities for developing Emergency Centers in sub-Saharan Africa(House, Nyabera, Yusi, & Rusyniak, 2014).

2.2 Services offered at the emergency department

Round the clock, EDs worldwide play a crucial role in the delivery of health care treating patients with a wide array of health problems: ranging from stomach and chest pain to gunshot wounds and road traffic accidents (Kharbanda et al., 2013).World over EDs are focal points for acute, emergent and urgent care (Lange, Popp, & Erbguth, 2016). They care for acutely ill and injured people every day, managing children and adults with medical, surgical and obstetric emergencies ranging from injuries, infections, heart attacks, strokes, asthma and acute

complications of pregnancy(Hirshon et al., 2013).A recent study in the south west Victoria, Australasia, found that small rural facilities care for approximately 16% of all emergency patients: services offered included medical procedures e.g. wound care, intravenous cannulation, 12 lead ECG, venipuncture, urinalysis and orthopedic care (plaster and splint application and removal), critical care procedures including Endotracheal intubation, central line insertion, oxygen administration and cardiopulmonary resuscitation (Baker & Dawson, 2014). A study in the United States found that Indian health services EDs, varied widely in visit volume with many operating over capacity and most were not staffed by board – certified or prepared emergency physicians while most lacked access to specialty consultation and telemedicine capabilities.(Bernard, Hasegawa, Sullivan, & Camargo, 2017)

In the united states the emergency departments act as safety nets, and are required by federal law to serve all those who walk in, and open at hours when regular care is not available.(Weil, 2017). A similar study in Germany found that care in emergency departments is provided with an increasing tendency to patients of all ages presenting with varying primary symptoms, complaints, illnesses, and injury patterns(Zimmermann et al., 2016). EDs serve as a hub for pre-hospital emergency medical systems, an acute diagnostic and treatment center, a primary safety net, and a 24/7 portal for rapid inpatient admission. Approximately a quarter of all acute care outpatient visits in the United States occur in EDs, a proportion that has been growing since 2001(Schuur & Venkatesh, 2012).

Emergency departments collectively perform three main roles in England: they are an alternative to primary care services for first point of contact care; they are acute diagnostic and treatment

centers for patients who need immediate treatment; and they are also portals for emergency admission to hospital (Cowling, Soljak, Bell, & Majeed, 2014).

EDs are being used with increasing frequency to conduct complex diagnostic workups of patients, they also offer constructive role in preventing some hospital admissions, particularly those involving patients with an ambulatory care sensitive condition. Emergency departments serve a wider role of societal roles including: provision of life saving care to the critically ill and injured patients; facilitating assessment and management of patients who need non elective admission, performance of complex evaluations of high risk patients, provision of timely access to acute care to all patients presenting to the ED with wide range of presentations and concerns.(Morganti et al., 2013)

Most EDs have their own dedicated entrance, with patients presenting at any time and with any complaint. A key part of the operation of an emergency department is triage, which is the first stage the patient passes through; with staff dedicated to triage (Lecky et al., 2014).The use of doctor triage, rapid assessment, streaming and the co-location of a primary care clinician in the ED have all been shown to improve patient flow(Jarvis, 2016).After triage, patients are passed to another area of the department or hospital with their waiting time determined by their clinical need. Patients with evidently serious conditions, such as cardiac arrest, will bypass triage altogether and move straight to the appropriate part of the department(Viñuales, Monzón-Fernández, Viñuales, & Sanclemente, 2018)

The core mission of the EDs is stabilization of patients with potentially life threatening illnesses and injuries they are always prepared, to provide lifesaving emergency care to the afflicted individual or a community that has sustained a sudden mass casualty event. Its bulk activity is

devoted to managing unscheduled, high acuity visits by patients with acute undifferentiated complaints(DeLia & Cantor, 2009)

In Kenya the emergency departments offer the first portal of entry into the health care system to patients of all age groups and gender on a 24 hour basis. Most investigations performed were blood tests with 57% of the X-rays requested for trauma patients. They also offer prescriptions for common ailments and act as sources of admissions and consultations(B. W. Wachira, Wallis, & Geduld, 2012).A study at the KNH revealed care of increased burden of trauma and infections(Myers et al., 2016).

2.3 Challenges of emergency care services in low and middle income countries

Pre-hospital care plays a crucial role in the delivery of quality emergency care. However, barriers to its provision exist in Africa which is a low resource set up. These barriers include culture/community, infrastructure, communication/coordination, transport, equipment and personnel. Lack of transportation was a common problem, e.g. Ambulances, with alternative means of transportation such as hired cars, and animal drawn carts utilized. Lack of skilled personnel was a key barrier, with majority of pre- hospital care being delivered by laypersons without formal training (Kironji et al., 2018).

A study by Nascimento et al (2019) noted that challenges of accessing reperfusion injury, which is a cornerstone of myocardial infarction treatment, in low and middle income countries included delays associated with patient education, late diagnosis and inadequate referral strategies, health infrastructure and insufficient funding. Some of the innovations developed to overcome this include the implementation of regional Myocardial infarction systems of care in LMIC, systematizing timely reperfusion strategies, access to intensive care; risk stratification and use of adjunctive medications have shown some successful strategies. Telemedicine support for remote

ECG, diagnosis and organization of referrals has proven to be useful, improving access to reperfusion even in pre-hospital settings. Organization of transport and referral hubs based on anticipated delays and development of Myocardial Infarction excellence centers have also resulted in better quality of care. Also, education of healthcare staff and task shifting may potentially widen access to optimal therapy (Nascimento, Brant, Marino, Passaglia, & Ribeiro, 2019). A study in Albania noted that the emergency services in Albania were staffed with inadequately trained personnel, who lack the equipment and protocols to meet the needs of the population (Latifi et al., 2016).

2.4 Donabedian model for assessing quality of emergency care

Quality of Emergency care at the emergency departments has been assessed using the Donabedian model assessing structure, process and outcome(Cameron, 2014). Structure implies those things available at the ED before the patient visits the ED; this includes the physical layout of the departments, equipment, laboratory, the staff, the protocols, clinical guidelines, and procedures. Processes are things that occur while the patient is at the ED while outcomes are those occur after patient leaves the ED including morbidity, mortality and quality of life (Graff, Stevens, Spaite, & Foody, 2002). Donabedian believed that structure measures have an effect on process measures which in turn affect outcome measures (Donabedian, 2005)

2.4.1 Emergency department structure

A WHO situational analysis tool to assess the availability of Emergency and Essential surgical care (EESC) at the level of individual health facilities was developed in 2007 (David A Spiegel, Abdullah, Price, Gosselin, & Bickler, 2013).The WHO tool contains minimum requirements for essential medical care; and minimum standards to improve quality and safety of emergency, surgery, trauma, obstetrics and anesthesia at first-referral level health-care facilities.

Emergency departments are expected to be properly equipped (monitoring equipment and supplies), have the right personnel appropriately trained and qualified to deliver emergency care, have appropriate size and numbers of rooms for resuscitation, majors and minor cases, waiting room area, triage and diagnostics and equipment maintained regularly (Lecky et al., 2014).

In Vietnam while assessing the status of resources for essential trauma care in Hanoi and KhanhHoa, a study found that resources for trauma care were mostly adequate at provincial and central hospitals. There were several deficiencies at the district hospitals and especially at commune health stations. These included low level of trauma related training and shortages of supplies and equipment. In many cases these shortages were of low-cost items (Son, Thu, Tu, & Mock, 2007).

Literature on the spatial distribution of emergency departments in Africa indicates that physical access to emergency hospital care provided by the public sector in Africa remains poor and varies substantially within and between countries (Ouma et al., 2018). Only 16 countries reached the international benchmark of more than 80% of their populations living within a 2-hour travel time of the nearest hospital.

A study in Ghana indicated inadequate availability of equipment, personnel and infrastructure necessary emergency care (Japiong et al., 2016). Other studies done in Sierra Leone showed similar patterns of lack of blood transfusion capabilities, stable electricity, cervical collars were not regularly present (Wong et al., 2014). Significant correlations between quality domains observed in this study suggest that Donabedian structure-process-outcome model is a valid model for evaluating trauma care. Trauma centers that perform well in terms of structure also

tend to perform well in terms of clinical processes, which in turn have a favorable influence on patient outcomes (Moore, Lavoie, Bourgeois, & Lapointe, 2015).

A study in South Africa identified eight barriers to emergency medical services which hinder delivery of quality emergency medical services leading to an increase in pediatric mortality and morbidity. These factors include access, communication, community education, equipment, infrastructure, staffing, training and triage (Anest et al., 2016).

In Kenya and other sub Saharan African countries (Ghana, Rwanda, Tanzania and Uganda), most studies have focused on workforce challenges, this study found that no surveyed hospital had enough infrastructure to follow minimum standards and practices that the WHO has deemed essential for provision of emergency and surgical care (Hsia, Mbembati, Macfarlane, & Kruk, 2012).

2.4.2 Emergency department process

Emergency department processes play a big role in determining outcomes. ED processes that support high quality care include specific triage instruments, and standard protocols for ED phase of management including common high risk presentations such as chest pain, head injury, sepsis, and major trauma with age specific modifications(Lecky et al., 2014). Some interventions at the emergency departments were underutilized e.g. the use of aspirin in patients with possible myocardial infarction(Magid et al., 2005).

The resuscitation of severely injured patients has evolved during the last decade. Patients are now surviving injuries that previously were thought to have certain mortality. Systems have been put in place that reflects the intensity of workload and severity of injury of patients presenting to deployed medical treatment facilities(Smith, Russell, & Horne, 2011).

The Accident and Emergency department could improve patient care processes by shortening waiting times, especially for laboratory results, triage, and seeing a doctor, particularly for older medicine patients(Banerjea & Carter, 2006). New Zealand has advocated for shorter stays at the emergency departments, they have done several quality studies and found that emergency department length of stay, ambulance offload time, time to decision maker, and time to referral or discharge were some of the indicators that were used to measure quality of acute care (Ardagh, 2015).

In Zanzibar a study found that designing simple processes like triage systems, establishment of an emergency room where the patients who required immediate care would be attended to, creating pathways so that patients could be managed in clinical pathways were some of the simple measures that improved care (Thomassen, Mann, Mbwana, & Brattebo, 2015). Another study in south Africa assessing the ability of the nurses in the nurse led triage system found that only 68.3% of the patients were assigned the correct category scores while using the south African triage scale (Goldstein et al., 2017). In central Africa a study found that pain management by nurses was inadequate, with cultural factors influencing how nurses managed pain at the emergency room (Rampanjato, Florence, Patrick, & Finucane, 2007).

2.4.3 Emergency department outcomes

Donabedian model considers outcome as the main output when measuring quality in the emergency department. It is a measure influenced by both structure and process. There are several studies have assessed patient perception as a measure of outcomes at the emergency departments. A study estimating quality at EDs showed that patients estimated quality of care at the emergency department as fairly good, but there were areas in need of improvement. A high percent of inadequate quality was related to the environment in the emergency department.

Service quality assessment have assumed increasing importance in the last two decades they are useful in identifying gaps in services being provided with ultimate aim of guaranteeing quality assurance. Client perception of service quality at the emergency departments is an important aspect of quality (Muntlin, Gunningberg, & Carlsson, 2006). Another study done in Randle General Hospital in Lagos Nigeria found major deficiencies were demonstrated in responsiveness and length of waiting time (Ogunnowo, Olufunlayo, & Sule, 2015).

Another study in Nigeria found a higher proportion of males among Accident and Emergency admissions in Ekiti State. About half of those cases were young adults (Ogunmola & Olamoyegun, 2014). NCDs, especially Cerebral Vascular Disease (CVD), were the most frequent cause of admission. The major cause of death was CVD, mainly stroke. Among Chronic Diseases, the leading cause of death was severe sepsis (Ogunmola & Olamoyegun, 2014). Some of the EDs are faced long length of stay within the ED and hence overcrowding (Forero, McCarthy, & Hillman, 2011).

In Kenyan EDs at the two national referral hospitals, five secondary level hospitals, and eight primary level hospitals found more than 20% of the patients received immediate treatment at the ED and discharged, 58% were investigated in the ED, while fewer than one in three patients admitted in or transferred to specialist care received treatment ant the ED (B. W. Wachira et al., 2012).

2.5 Categories of patients at emergency departments in Kenya

EDs in Kenya attend to a variety of cases for care without prior appointment. The cases include acute infections, trauma and various non communicable illnesses. A study done at the Moi Teaching and Referral Hospital (MTRH), found that the most common cases in the emergency department were patients presenting for acute care were injury related (20.2%), with blunt

trauma (accounting for 99% of trauma presenting to the ED), primarily from road traffic accidents (House et al., 2014). The second and third most common presenting illnesses were infectious diseases (11.7%) and mental health disorders (11.3%). (House et al., 2014)

A study at the Kenyatta National hospital found the most common triage chief complaints were head injury (4.1%), need for higher level of care (3.7%), abdominal pain (3.1%), injuries due to road traffic crashes (2.9%), and vaginal bleeding (2.8%). Leading diagnoses on admission were head injury (8.4%), cerebrovascular accident—hemorrhagic or ischemic (2.6%), femur fracture (2.6%), anemia (2.3%), and burns (2.3%). There were 557 deaths in the Accident and Emergency (2.7%), and 191 patients were deceased on arrival (0.9%)(Ekernas et al., 2016). An earlier study also showed that there is a high burden of pedestrians admitted at KNH from road traffic crashes (Japheths Ogendi, Odero, Mitullah, & Khayesi, 2013)

Another study at the same hospital (KNH) indicated thirty-five per cent of patients were diagnosed with NCDs, 24% with injuries and 16% with communicable diseases, maternal and neonatal conditions. Overall, head injury was the single most common final diagnosis and occurred in 32 (8%) patients. The most common patient-reported mechanism for head injury was road traffic accident (39%) (Justin Guy Myers et al., 2017).

At the then New Nyanza Provincial General Hospital, now Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH), a study found the most common category of patients seen were injuries which accounted for 41% of all the cases. 42% of which resulted from assaults, 28% from road traffic crashes, and 11% unspecified soft tissue injuries (Ogendi&Ayisi, 2011).

2.6 State and quality of emergency department services in Kenya

One of the major services offered by emergency departments in Kenya is care to trauma survivors. Trauma is a major cause of death and disability worldwide of which more than 90% occur in low- and middle-income countries such as Kenya. A study in Kenya found that hospitals had a large volume of trauma, but due to the lack of intensive care units, specialized trauma units, and auxiliary services, such as orthopedics and neurosurgery, the hospitals had a limited ability to provide definitive care for injured patients in critical condition. Additionally, organizational capabilities, such as trauma registries, trauma-specific training, and quality improvement programs were lacking(Wesson et al., 2013).

Kenyan health care services are organized in 4 tiers: Tier one which is the community, Tier 2 primary care levels-health centers and dispensaries, Tier 3 County hospitals and county referral hospitals and at Tier 4 -National level or national referral facilities. The facilities offer care as per KEPH with little sophistication in the delivery of emergency care as is true of most African nations.

The Emergency Centres that do exist are largely staffed by non-physician personnel with no specific training in Emergency Medicine. This demands the investment of resources, as the development of a more advanced system of emergency care has been shown to reduce morbidity and mortality(B. Wachira & Martin, 2011)

A study at the Kenyatta National Hospital estimated the characteristics of the A&E population at a tertiary centre in Kenya and highlighted the triple burden of disease. The findings emphasized the need for further development of emergency care resources and training to better address patient needs in resource-limited settings, such as KNH (Justin Guy Myers et al., 2017).

According to article 43-2 of the Kenyan Constitution 2010, a person shall not be denied emergency medical treatment. Studies have indicated that Kenya has no trained emergency medicine specialists in its public sector, no organized national emergency or trauma care system. As a result of these shortcomings Kenya falls within the "underdeveloped" category with regards to its capability in emergency care (B. Wachira & Martin, 2011).

Emergency departments in Kenya are staffed by Clinical officers who provide most of the country's emergency care, yet lack specific training in prioritization, resuscitation and stabilization (B. Wachira & Martin, 2011). A study done in western Kenya found that no lower level facilities and 30% of higher level facilities reported having a defined, organized approach to trauma. 43% of higher level facilities had access to an anesthetist (Burke et al., 2014). The majority of lower level facilities had suture and wound care supplies and gloves but typically lacked other basic trauma supplies. For cardiac care, 50% of higher level facilities had morphine, but a minority had functioning ECG, sublingual nitroglycerine or a defibrillator. Only 20% of lower level facilities had glucometers, and only 33% of higher level facilities could care for diabetic emergencies. No facilities had sepsis clinical guidelines.

2.7 Level of emergency preparedness

Quality of emergency care at emergency departments depends on structure, process and outcomes. It depends on input in resources both physical and human resource, also on processes on how the facility is set up to provide care to the patients. The World health organization has checklist and tool for monitoring readiness form service delivery(O'Neill, Takane, Sheffel, Abou-Zahr, & Boerma, 2013). The list has essential supplies and consumables necessary for service delivery. A study evaluating the quality of surgery at hospitals providing internship

training in Kenya found each to have at least one surgeon consultant, basic drugs were not always available (gentamycin, morphine and pethidine in 50%, injectable anti-staphylococcal penicillin in 5% of hospitals), and fewer than 50% had resources to provide oxygen(Mwinga et al., 2015).

Another study found emergency and urgent care capacity in a resource-limited setting, an assessment of health facilities in western Kenya, the study identified significant widespread gaps in current emergency care capabilities, particularly in identifying and appropriately caring for victims of trauma, AMI, diabetic emergencies and sepsis(Burke et al., 2014).

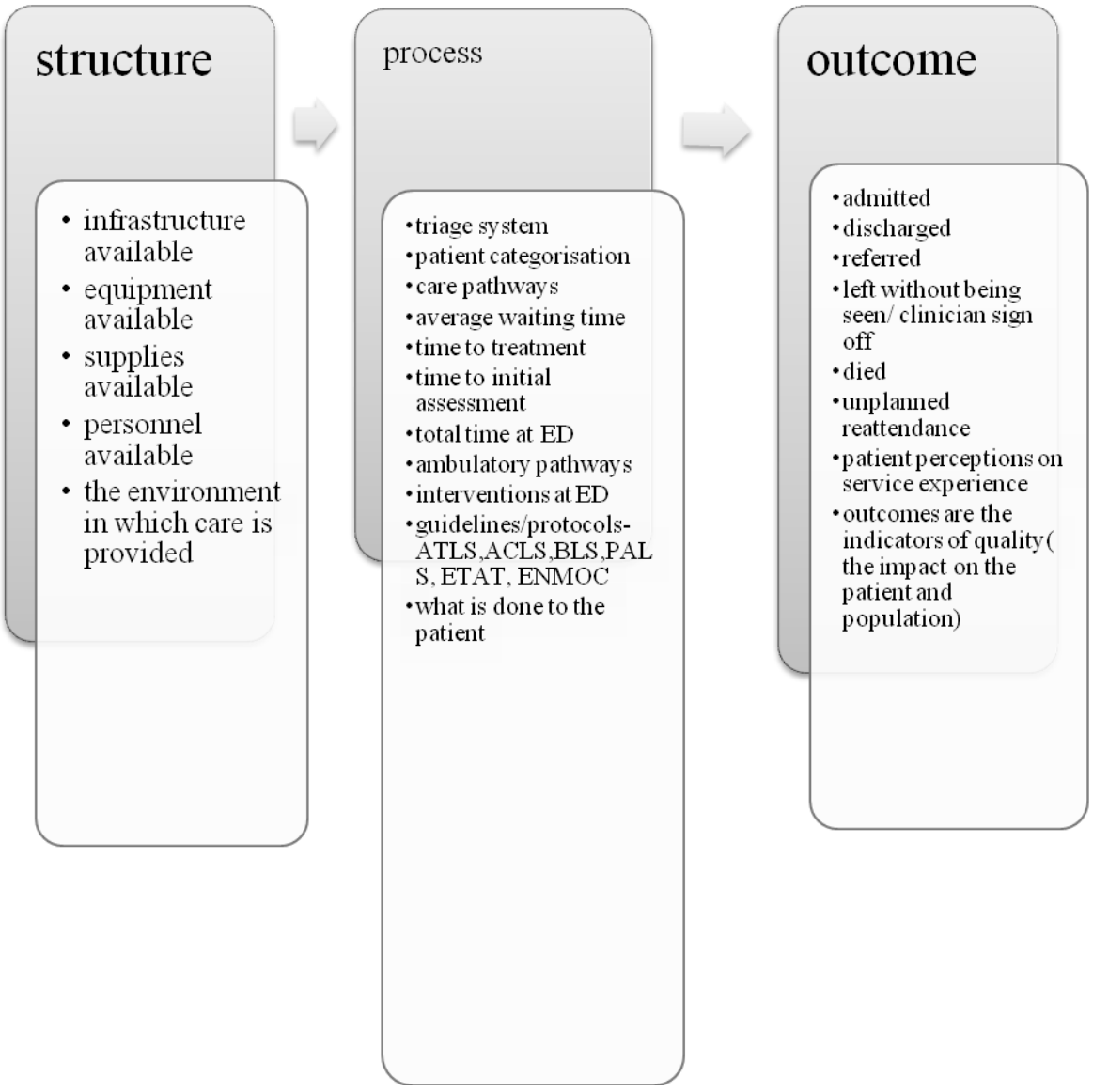
2.8 Summary

There are no studies that have assessed quality of medical care at the public hospitals in Bungoma County. The availability of structure, process and outcomes of the care provided at the emergency departments in Bungoma County is unknown. It will be important to establish the state of quality of emergency care at the emergency departments of public hospitals in Bungoma County through assessing the environment in which the care is provided, the processes or actions at the ED and the outcome as measures of quality at the ED.

2.9 Conceptual framework

The conceptual framework utilizes the Donabedian model to assess quality at the emergency department in public hospitals in Bungoma County. It measures structure and process and its effects on the outcomes at the emergency department. With outcomes being a measure of how well the EDs are functioning. As shown below in Figure 1

Figure 1 Conceptual framework for quality (Donabedian model)



CHAPTER THREE

METHODOLOGY

3.1 Introduction

This Chapter presents how the research was conducted and the procedures and processes that were used to achieve the purpose of the study. It outlines the study setting, study design, sample size calculation, sampling techniques, data collection process, data analysis and ethical procedures.

3.2 Study area

The study was carried out in Bungoma County, Western Kenya. It has an area of 2206.9km^2(852.1 square miles) and population of 1,905,430 (2009 population census) with a growth rate of 4.3%. It borders internationally with Uganda and locally with the counties of Busia, Kakamega, and Trans-Nzoia. Its geographical coordinates are 0^o 34’ 0” North 34^o 34’ 0” East. The county has 219 health facilities distributed in10 Sub-counties, with 1 county referral hospital, 1 county hospital, 8 sub county hospitals, 1 mission hospital, 11 nursing homes, 18health centers, 127dispensaries and 52private clinics, Table1

The Bungoma county health indicators included a doctor to population ratio of 6 per100, 000, nurse to population ratio 32 per 100,000, and clinical officer to patient ratio of 11 per 100,000.Children fully immunized under the vaccination program were 72.5%, while in 2011 9% of the population was underweight and 24.4% of the population was stunted. The population of people living with HIV/AIDS on care was 13,670.As regards to maternal health services: contraceptive use was 53.9%; the proportion of delivery in health facilities was 40.8% while only 14.7% of women had qualified medical assistance during birth.

The social indicators in Bungoma county showed Poverty rate levels based on KIHBS (2009) being 52.9% with an urban population of 21.7% and literacy level at 60.5%. Social amenities available to the population in the county: Access to infrastructure, improved water (% of households 2009) was 88.9%, improved sanitation (% of households 2009) 96.6%.

Only two hospitals, namely Bungoma county referral hospital and Webuye County hospitals had casualty departments which attend mainly to those with injuries, the rest of the patients were seen at the outpatient units. The proportion of patients seen per facility at the ED is summarized in table 2

Table 1 Bungoma County facility distribution by Sub County

Sub county /number of:	County referral hospitals	Sub county hospitals	Health centers	Dispensary	Faith based hospital	Nursing homes	Private clinics	**Total**
Kanduyi	1		2	16		6	24	**49**
Kimilili		1	1	10		2	3	**17**
Webuye East			1	10		2	9	**22**
Tongaren		1	2	17		1	3	**24**
Mt.Elgon		1	3	10			1	**15**
Cheptais		1	2	11			5	**19**
Sirisia		1	1	14			1	**17**
Webuye west		2	1	13	1		1	**18**
Bumula		1	2	13				**16**
Kabuchai		1	3	13			5	**22**
TOTAL	**1**	**9**	**18**	**127**	**1**	**11**	**52**	**219**

Table 2 Number of patients seen at each of the Bungoma hospitals EDs January- March 2015-DHIS

Hospital	No seen in a 3-month period
Bungoma county referral hospital	36,760
Webuye county hospital	17 626
Kimilili Sub-county hospital	17,282
Chwele sub county hospital	8,884
Cheptais sub county hospital	4,414
Mt.Elgon sub county Hospital	5,886
Sirisia sub county hospital	3,756
Naitiri sub county hospital	2,614
Bumula Sub county hospital	5,468
Bokoli Sub county hospital	3,614
Friends Lugulu Mission hospital	5,587
Total new patients seen	**94265**
Total facility deaths for year 2015	**2837**

3.3 Selection of study area

Bungoma County was sampled purposively because it is largely a rural county with no major regional or national referral hospital. The county showed relatively worse emergency care indicators compared to other counties and the national average from the data obtained from DHIS 2015. According the DHIS 2015, its proportion of new cases/ emergency visit at the emergency units was 51% as compared to the total visits. This was only higher than Mombasa

and Nairobi and similar to Kiambu County. Bungoma County had a higher re-attendance rate at 49% in comparison to other counties 3rd only to the city counties of Mombasa and Nairobi which had re-attendance rates of 57% and 58% respectfully. According to the same data mortality among these patients was relatively high at 7.95% when compared to the national average of 3.98%. It is on this basis that the area was purposively selected.

3.4 Study design

The study employed a cross-sectional study design. This study design was chosen because it enabled the investigator to look at structure, processes and outcomes at a particular point in time with various parameters collected at the same point in time providing a snap shot of the status. Data collected on structure, processes and outcomes at the emergency units formed the basis of evaluating quality of care. Hospital in-charge introduced the investigator to the Outpatient emergency unit in-charge of sampled emergency units who were interviewed to assess structure, processes and outcomes at the EDs via a structured questionnaire (Appendix 4). Structure and processes were also assessed via an observational tool (appendix 5) administered by the investigator. Outcomes were assessed by review of primary (Hospital records) and secondary data (using DHIS) of the sampled units; data on patient experience of care were collected using questionnaires (appendix 6) administered to sampled patients who received service at the Emergency units. Definition of Emergency in the context of the study was all patients who presented to the outpatient emergency departments without prior appointment. The patients were treated and stabilized at the emergency unit. Once they had completed the ED process and were stable, exit interviews or patient questionnaire were administered. Timelines at the ED were assessed by a time sequence card (appendix 7) attached to the patient care documents and time at each stage filled in by the health care provider.

The clinical indicators that were used as a measure of quality in this study included proportion of unplanned re-attendants, proportion of patients who left before being seen by a clinician, percentage of those who left before clinician sign off, total time spent at the ED, time to clinician, time to initial treatment, proportion of patients who were management as per clinical guidelines, proportion of patients with non traumatic chest pain or syncope who had an ECG done, proportion of patients with non traumatic chest pain who were treated with aspirin and patient service experience.

3.5 Study population

The study population consisted of in-charges of the 10 emergency departments and patients attending outpatient/emergency departments at the 10 public hospitals in Bungoma County (Bungoma county referral hospital, Kimilili Sub county hospital, Webuye county hospital, Bumula sub county hospital, Chwele sub county hospital, Bokoli sub county hospital, Cheptais Sub county hospital, Mt. Elgon Sub county hospital, Naitiri Sub county hospital, Sirisia Sub county hospital).

3.6 Sample size calculation

Using the Cochran equation (1963:75) formula for sample size calculation, the sample size was computed as follows:

Equation

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where

$n_0$is the sample size,

Z^2 is the abscissa of the normal curve that cuts off an area α at the tail ends. The value for Z is found in statistical tables which contain the area under the normal curve e.g. Z = 1.96 for 95% level of confidence

(1- α) Equals the desired confidence level, e.g. 95%);

e is the desired level of precision (0.5),

P=the population proportion (assumed to be .50 since this would provide the maximum sample size)

q is 1-p

Hence sample of 94,265 for the hospitals will be:

$$n_0 = \frac{Z^2 pq}{(e)^2} = \frac{(1.96)^2\ (0.5)(0.5)}{(0.05)^2} = 385$$

A sample size of 385 ED patients was proportionately (via probability proportionate to size) distributed among the 10 hospitals studied Bungoma County.

Hospital participant sample = number of new patients seen at the emergency unit in the quarter divided by total number of patients seen at emergency units in all public hospitals in Bungoma county within the quarter multiplied by calculated sample size above (385)

An extra 5% of the respondents were interviewed to cater for then non respondent rate, and proportionately distributed among the 10 EDs.

3.7 Sampling methods

Purposive sampling was used to select Bungoma County because of its location, population size, facility distribution and geographical variations in a county that is largely rural and its pattern of worse emergency care indicators as per data from DHIS January to March 2015. A census sample of all the 10 public hospital emergency departments in charges was then obtained. The study included all the 10 emergency/outpatient departments in charges at public hospitals

Bungoma County via census sampling method. A total of 385participants obtained from the sample calculation was proportionately distributed via probability proportional to size method in the 10 hospitals as listed: Bungoma County referral hospital 134, Webuye Sub County hospital 64, Kimilili Sub County hospital 63, Mount Elgon Sub County hospital 20, Sirisia Sub County hospital 14, Chwele Sub County hospital 32, Bokoli Sub County hospital 13, Bumula Sub County hospital 20, Naitiri Sub County hospital 9, and Cheptais Sub County hospital 16. Then all consecutive patients presenting to the 10 emergency outpatient units were enrolled at each facility until the desired samples as per the hospital unit were reached. An Extra 5% of the patient service experience respondents were interviewed to cater for the non response and non completion rate.

3.8 Data collection tools and procedure

3.8.1 Data collection tools

The data was collected using investigator administered questionnaires, observational checklists and time sequence cards. A WHO adopted observational tool [Appendix 3] was used to collect data for study of specific objective 2 which was to determine availability of essential supplies and equipment in the ED. The checklist also assessed objective 3 by reviewing the presence of evidence based guidelines and protocols. A WHO adopted questionnaire (Appendix 2) collected data on availability of infrastructure, personnel, equipment, process and outcomes. This was in line with meeting objective 1,2,3,4 and 5. This tool based on the WHO norms and standards on infrastructure, staffing, equipment and consumables to assess state of structure and processes. The WHO adopted questionnaire was used to collect data on availability of structure (infrastructure, personnel, equipment, supplies), process (triage system, care pathways,

procedures and interventions done at the ED) and Outcomes (number admitted, referred, discharged, left without being seen/ clinician sign off, and unplanned re-attendance).

A patient service experience questionnaire (Appendix 4) was used to assess the patient service experience or perception of the service offered at the ED assessing objective 4. The time sequence tool [Appendix 5] collected data on the timelines (total time spent at registration, time to clinician, total time spent at clinician, total time spent at the laboratory, total time spent at triage, total time spent at the ED, time to initial treatment, total time spent at pharmacy). This tool was used to assess the processes and protocols for objective 3, and was used to collect data at all the 10 public hospital EDs in Bungoma County.

3.8.2 Data collection procedure

The process of data collection started by getting clearance from the school of graduate studies and Maseno university ethics and review committee approvals followed by an elaborate entry process into the county. The permission to collect data in the county was obtained at the county director of health and all the medical superintendents of the 10 public hospitals. The medical superintendent then introduced the investigator to the ED in charges, to whom a WHO adopted questionnaire assessing the ED structure, process and outcomes was administered following informed consent. The investigator then carried out observations using a WHO adopted checklist to confirm availability of supplies and equipment necessary during resuscitation. Data on patient experiences was collected after informed consent had been obtained from all the sampled participants. The time sequence/turnaround time questionnaire was given at registration and patient allowed to move with it at all the service area points. The service providers were the required to fill in the time they saw the patient. The study material was the decoded and entries made into an electronic format and the research materials.

3.9 Inclusion criteria

Patients seeking outpatient emergency care presenting without a prior appointment; Children or minors below 18 years were included voluntarily following request for surrogate informed consent or assent from the caretakers, guardians. The guardians were after giving consent requested to respond to the questionnaire.

3.10 Exclusion criteria

All Patients attending scheduled outpatient clinics, prisoners and mentally ill patients were excluded.

3.11 Data analysis and presentation

Data were analyzed using both the descriptive and inferential statistics. As for the descriptive statistics mean and mode were used to analyze data on availability of infrastructure, personnel, supplies, essential emergency equipment, emergency procedures and interventions within the ED. While inferential statistics i.e. linear regression, ANOVA were used with a p-value of <0.05 considered to be the level of statistical significance. The inferential statistics analysed the relationships between structure process and patient experiences, timelines and patient service experience. Statistical Package for Social Sciences (SPSS) version 20 was used. The data on patient experience was analyzed based on the 8 Picker Institute principles of patient centered care(Leonardsen et al., 2017). These include respect for patient's values, preferences and expressed needs; coordination and integration of care; information and education; physical comfort; continuity and transition; access to care; emotional support and alleviation of fear and anxiety; and involvement of family and friends.

3.12 Ethical considerations

Ethical clearance for the study was sought from the Maseno University Ethics Review Committee (MUERC) (appendix 7) prior to data collection with approval from the Maseno University School of Graduate Studies (appendix 8). Permission to conduct the study was sought from the County Health Department and the respective hospitals. All eligible research participants voluntarily gave informed consent before participating in the study. The participants were free to withdraw consent at any point. Confidentiality of the participants was maintained; their names or any other identifying information were not recorded.

An entry process was strictly followed by seeking clearance to carry out research at the county health offices and hospital administration to enable data be collected from the facilities.

Once ethical clearance was granted by MUERC; letters requesting for permission to carry out research at the facilities were sent to the chief officer of health Bungoma County, county director of health, all the sub county medical officers of health and all the medical superintendents of all the sub counties and public hospitals in Bungoma County. Courtesy call was made at the above offices for introduction and request for permission.

3.13 Potential risks and benefits of the study to participants

There were no risks or harm to the participants. There was no direct financial benefit to participants; any benefits accrued from this study will improve quality of care delivered at the hospitals. From the study results, norms and standards for emergency care can be developed; all these have potential beneficial to patients.

3.14 Ensuring privacy of data

The data collected were coded and electronically stored through password protection and encryption. The principal investigator was responsible for maintaining privacy and

confidentiality. Only the principal investigator had access to the passwords. Manually collected data were filed and stored under lock and key by the principal investigator. The data were also de-identified (without identifiers), kept confidentially and used only for the purpose of this study and not shared with third parties.

3.15 Protection of vulnerable populations

Some of the vulnerable participants in the study included minors/children less than 18 years, pregnant women, neonates, HIV/AIDS patients and terminally ill subjects.

Children or minors below 18 years were included voluntarily following request for surrogate informed consent or assent from the caretakers, guardians.

3.16 Limitation of the study

The study was limited to studying public hospitals only leaving out dispensaries, health centers, nursing homes and Faith-based and private hospitals. Therefore, the findings cannot be generalized to this other levels of health care.

The second limitation in this study was the use of retrospective data through access of secondary data at hospitals to evaluate outcomes, the data may be incomplete. However, this was invaluable as it helped identify the gaps in documentation pointing towards quality of care at the emergency units.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the results of this study. It is divided into the following sections: section 4.1 describes the social demographic characteristics of the respondents (ED in charges), section 4.2 describes the structure at the ED by presenting the infrastructure, essential equipment, maintenance of the essential emergency equipment, essential supplies for emergency care, staffing, and staff training on emergency care in the emergency departments at public hospitals in Bungoma county. Section 4.3 outlines the process at the ED involved in providing emergency care by presenting the emergency care interventions possible, presence of emergency care guidelines, time spent at the ED and emergency procedures at the ED. Section 4.4 describes the outcomes at the ED by stating the demographic characteristics of the respondents to patient service experience or perception of care at the ED, presenting the results of the patient service experience of care at the ED, reliability and internal consistency of the patient service experience questionnaire used to determine the patient service experience, linear regression analysis results of the relationship between structure and process with patient experience. It also presents a three-month outcome of patients at the EDs.

4.2 Social-demographic Characteristics of the ED in charges

A total of ten ED in-charges participated in filling the hospital questionnaire assessing hospital structure, process and outcome. All the 10 public hospitals in the County participated, and completed all the questionnaires administered. The distribution of 10 respondents by gender comprised female 7(70%) and male 3(30%). The distribution by cadre was composed of nurses 2(20%), clinical officers 8(80%) and none of the in-charges was a medical officer. Of the two

nurse ED in-charges, one had a Bachelor of Science degree in nursing and the other a diploma in community health nursing while all the clinical officers ED in-charges were holders of a diploma in Clinical Medicine and Surgery. On distribution as per years worked at the ED: worked for up to 1 year was 1(10%), those who had worked at the ED for more than 1 year up to 3years 5(50%), worked for more than 3 years up to 5 years was 2(20%), while those who had worked at the ED for more than 5 years was 2(20%). This is shown in table 3.

Table 3 Demographics of ED in-charges (N=10)

CATEGORY N=10	CHARACTERISTICS	(%)
Participant cadre	Nurses	2 (20)
	Registered clinical officer	8 (80)
Participant gender	Male	7 (70)
	Female	3 (30)
Qualification	Bachelor of science in nursing	1 (10)
	Diploma in clinical medicine	8 (80)
	Diploma in community health nursing	1 (10)
Years worked at the ED	Up to 1 year	1(10)
	More than 1 year up to 3 years	5(50)
	More than 3 years up to 5 years	2(20)
	More than 5 years	2(20)

4.3 Structure at the emergency department

The structure at the EDs was assessed by evaluation of availability of infrastructure, essential emergency equipment, and maintenance of the essential emergency equipment, essential supplies for emergency care, staffing and staff training on emergency care.

4.3.1 Infrastructure availability

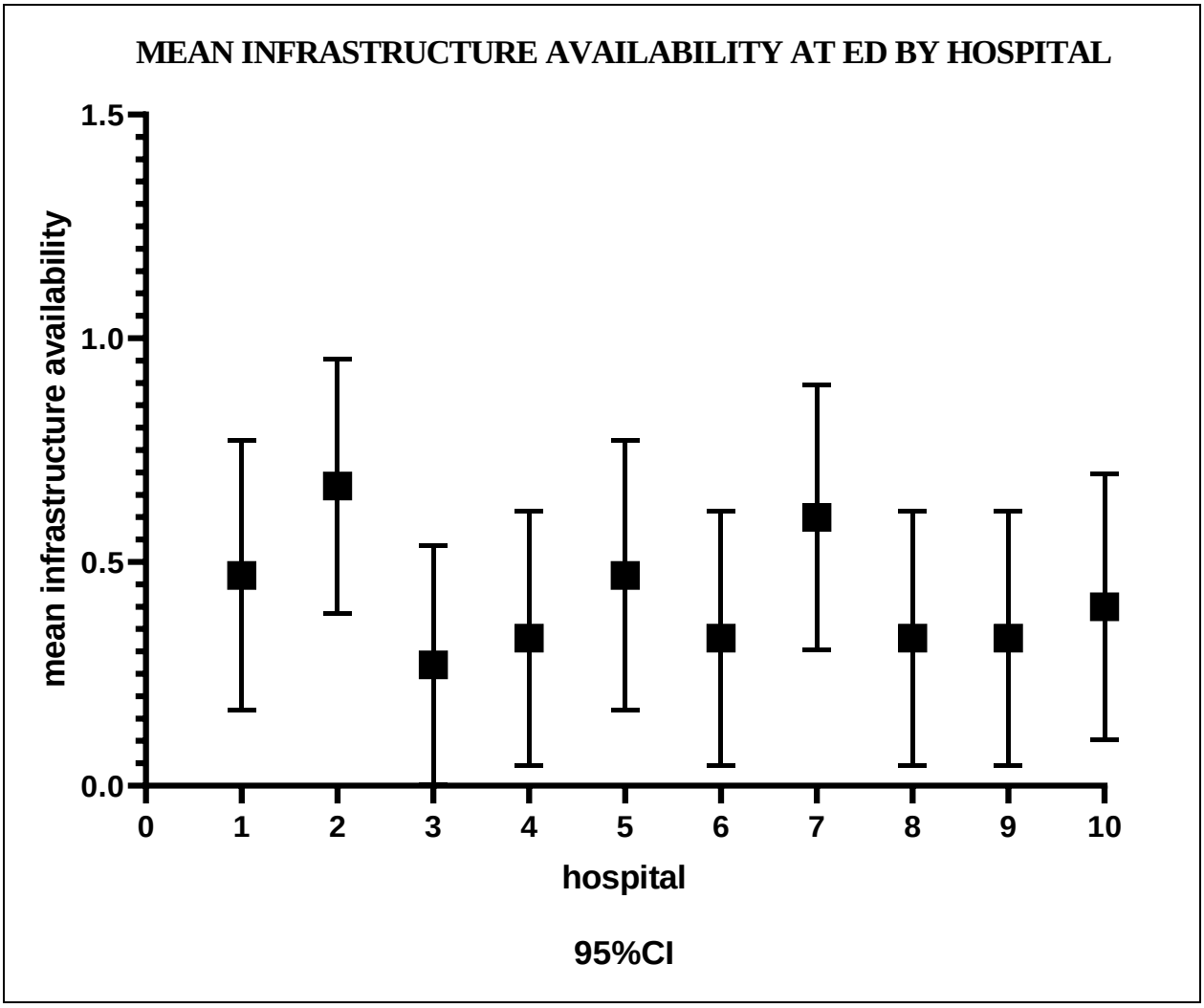
Infrastructure at the EDs was measured with a questionnaire adopted from WHO norms for minimum requirements for the first referral hospital for emergency care. On average the emergency care infrastructure availability at the EDs was at 42%. All the hospitals offered emergency care to outpatients at the outpatient departments; all had laboratories, waiting bays and electricity /operational power generator present. Triaging areas, procedure rooms and running water were available in 7(70%) of the EDs while blood banks were present in 5(50%).The radiology and imaging units were found in 4(40%) of the hospitals in the public hospitals. The observation room with beds was in 2(20%) and resuscitation areas in 1(10%) of the EDs. No emergency department had areas designated to provide category 1, 2 or 3 care or High dependency units present as shown in Table 4.

Table 4 Mean Infrastructure Availability for Emergency care at the EDs

CATEGORY N=10	**Hospital (%)**
Designated emergency care area	**0 (0)**
Waiting bay	**10 (100)**
Triage area	**7(70)**
Resuscitation area	**1 (10)**
Priority areas 1,2,3 and High Dependency Unit	**0 (0)**
Procedure room	**7(70)**
Laboratory	**10 (100)**
Imaging and radiology	**4(40)**
Observation room with beds	**2(20)**
Running water	**7(70)**
Electricity/operational power generator	**10(100)**
Blood bank	**5(50)**

Of the 10 public hospitals in the county only 2 hospitals (Webuye county hospital and Bungoma county referral hospital) had above average (more than 50%) of the infrastructure necessary for emergency care at the ED. This is as shown in the graph in Figure 2

Figure 2 Mean infrastructure availability by hospital



4.3.2 Availability of essential emergency equipment

Essential emergency equipment availability at the ED was reviewed at hospitals using the WHO tool for minimal requirements for the essential emergency equipment for the first referral hospital. On average the essential emergency equipment availability was at 34.7% in the 10 emergency departments. There was an essential emergency equipment list present at 6(60%) of the emergency departments in public hospitals of Bungoma county while the emergency cart or tray was available in 5(50%) of the EDs. The nebulizer, functional anesthesia machine and a

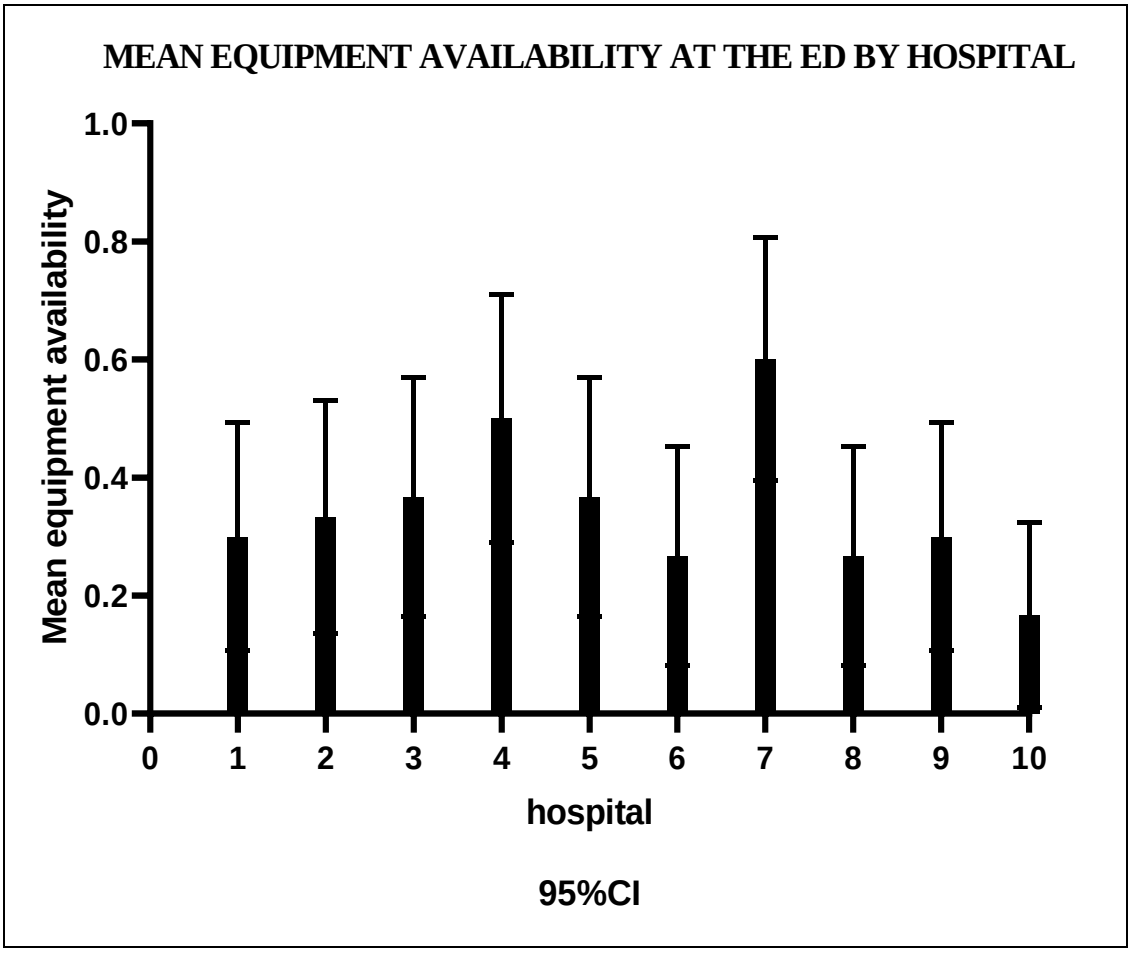
functional x-ray machine were present in 4(40%) of the hospitals. The points of care ultrasound, oxygen cylinder or concentrator, functional pulse oximeter and trauma cart or tray were available in only one (10%) of the EDs. The Electrocardiogram machine was not present at any of the EDs as shown in Table 5.

Table 5 Availability of essential emergency equipment

CATEGORY N=10 /	**Hospital (%)**
O_2 source + tubing and mask	**1 (10)**
Emergency cart/tray	**5 (50)**
Trauma cart / tray	**1 (10)**
Functional pulse ox meter	**1 (10)**
Electrocardiogram machine	**0 (0)**
Point of care ultrasound machine	**1(10)**
Presence of nebulizer	**4(40)**
Functional anesthesia machine	**4 (40)**
Functional X-ray machine	**4 (40)**
Essential equipment list	**6 (60)**

On the essential emergency equipment availability by hospital only 2 out of the 10 hospital were found to have an above average (above 50%) availability of the essential emergency equipment necessary for emergency care at the EDs. The hospitals were Webuye County hospital and Chwele Sub County hospitals as shown in the bar graph figure 3.

Figure 3 Mean equipment Availability at the ED by hospital



4.3.3 Maintenance of essential emergency equipment

Maintenance of essential emergency equipment at the ED was assessed using a tool adopted from the WHO recommendations. The mean ability to maintain EEE at the 10 public hospital EDs in Bungoma County was 52.5%. Essential emergency equipment were reported to be in working order at only 4 (40%) of the hospitals (Bungoma county referral hospital, Kimilili sub county hospital, Chwele sub county hospital and Webuye county hospital). The access to repair within the hospital was available in 8(80%) of the hospitals. This was assessed by availability of the biomedical engineers, supplies for spare parts and tool box for maintenance of the equipment. On the other hand access to repair of equipment outside the health facility was present in 7(70%)

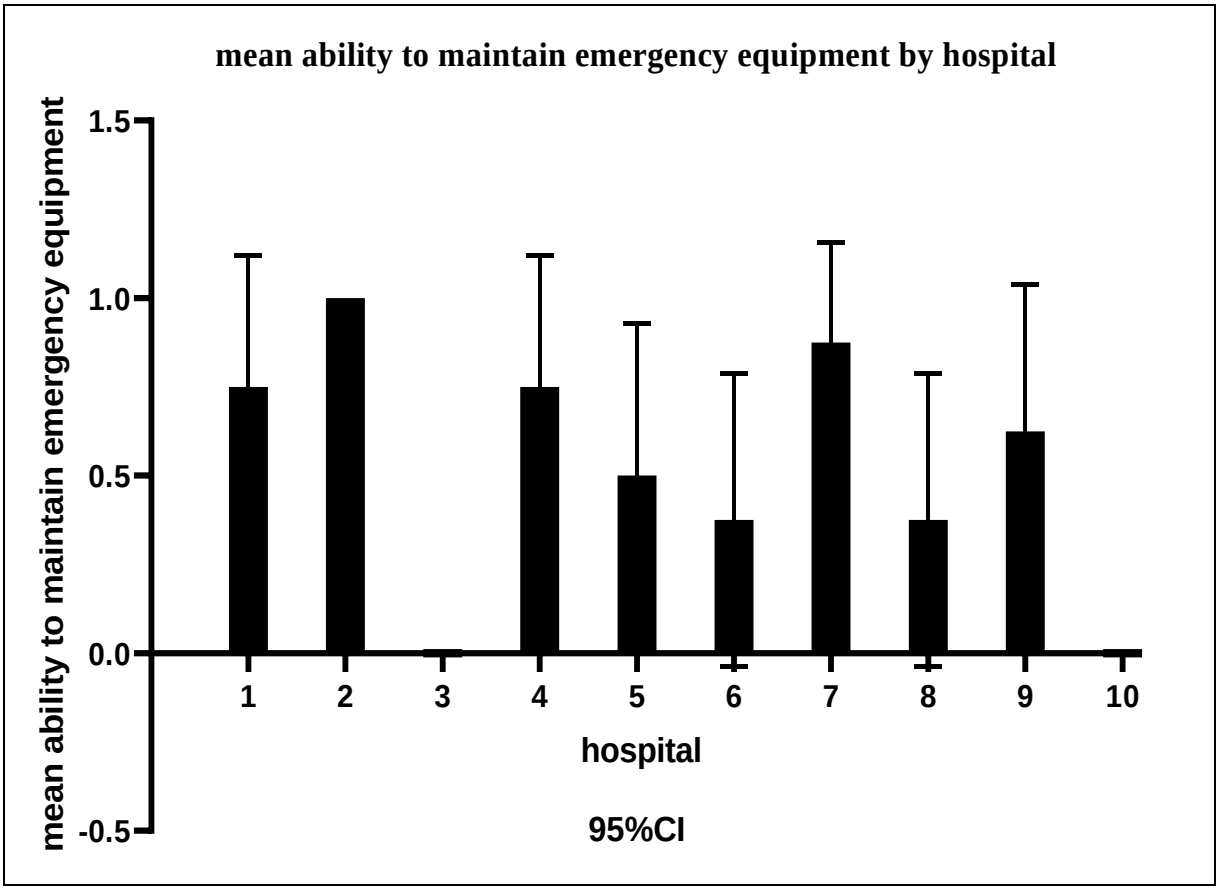
of the hospitals in case emergency medical equipment failed. Information on supply, repair and spare parts was available at 1 (10%) of the hospitals (Bungoma County Referral Hospital) while agreement with supplier on maintenance of the emergency equipment was available at 5 (50%) of the hospitals. Training of health care workers on emergency equipment use was done at 3 (30%) of the hospitals as shown in Table 6 and Figure 4

Table 6 Mean Ability to maintain emergency equipment

CATEGORY N=10	Hospital (%)
Emergency equipment in working order	**4 (40)**
Access to repair incase equipment fails	**8 (80)**
Access to repair within health facility	**8 (80)**
Access to repair outside the facility	**7 (70)**
Information on supply, repair, and spare parts available	**1 (10)**
Agreement with supplier on maintenance	**5 (50)**
Training of HCW on equipment use	**3 (30)**

Most of the hospitals (60%) had an above average ability to maintain the essential emergency equipment. The hospital with the above 50% ability to maintain the essential emergency equipment were Kimilili sub county hospital, Bungoma county referral hospital, Chwele sub county hospital, Mt. Elgon sub county hospital, Webuye county hospital and Cheptais sub county hospital as shown in the bar graph in Figure 4.

Figure 4 Mean Ability to maintain Emergency Equipment at the ED by Hospital



4.3.4 Essential Emergency supplies at the ED

An observation checklist adopted from the WHO list for assessing availability of essential supplies necessary for emergency care at the first referral hospital was used to assess the availability of essential supplies at the ED. The overall essential supply for emergency care at the EDs in Bungoma County was at 52%. Six hospitals (Kimilili, Bungoma, Bumula, Chwele, Naitiri and Webuye) were found to have an above average (more than 50%) availability of the emergency supplies. The most available were diagnostic sets at (90%), safety tools and supplies at (73%). The supplies necessary for circulatory resuscitation were at (60%), while supplies for breathing resuscitation was at (50%).Of all the supplies, the least available were emergency care guidelines (17%) and supplies for airway management (22%) as shown in Table 7.

Table 7 Mean availability of essential supplies for emergency care

Hospital/supplies availability N=10(%)	KIMILILI	BUNGOMA	BUMULA	CHWELE	MT.ELGON	NAITIRI	WEBUYE	BOKOLI	CHEPTAIS	SIRISIA	ALL HOSPITALS
Supplies for airway management[1]	31	15	31	39	8	8	38	0	23	25	22
Supplies Breathing [2]	67	67	67	67	67	33	67	0	0	67	50
Supplies of circulation[3]	46	61	62	69	62	69	85	46	62	38	60
Diagnostic set equipment[4]	100	67	100	100	67	100	100	67	100	100	90
Guidelines availability[5]	33	17	50	33	0	17	17	0	0	0	17
Safety tools and supplies[6]	90	70	90	90	70	80	80	50	50	60	73
% overall availability of supplies for resuscitation	61	50	67	66	46	51	66	27	39	48	52

[1]*Oxgygen source &tubing,suction pump with catheter,adult and peads oropharyngeal airway, nasogastric tube,adult&peadsmagill forceps, adult and peads Endotracheal tubes,adult and peads laryngoscopes with blades, cricothyroidotomy set.*

[2]*Adult and peadsbag amp, valve and mask, chest insertion equipment*

[3] *Scapel , retractor, scissors, artery forceps, vaginal speculum,IVFsets,IVcannulars and scalp veins , disposable syringes and needles,tourniquet,sutures, splints for arm and leg, Foleys catheter and infuser bags*

[4] *Stethoscope, BP machine, Thermometer*

[5] *Inventory list for equipment and supplies, ATLS,ACLS, BLS,ENMONC and ETAT*

[6] *Sterile and examination gloves,sterilizer, light source,sharps disposal container,waste disposal container,facemask,eye protection goggles,protective gown/apron,soap*

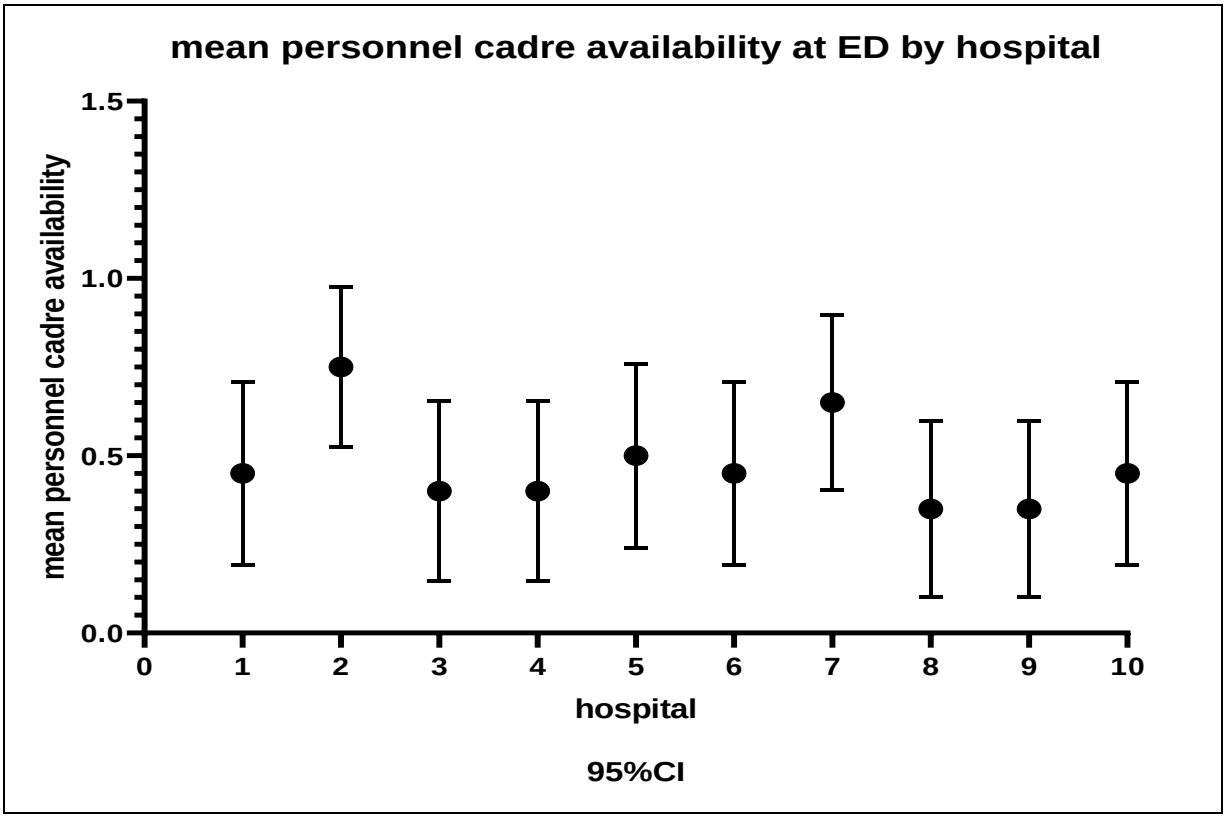
4.3.5 Emergency Department staffing

At the 10 facilities studied, no list of extra personnel to contact in case of a disaster was found. The overall personnel availability by cadre in the county was 47.5% of all the categories of personnel. All the hospitals had laboratory personnel, general nurses, pharmacy personnel, health records officers, drivers and casuals. Medical officers were present at 8(80%) of the hospitals and available at the ED when called. Anesthetist were found at 5(50%), radiographers were at 4(40%) of the hospitals while internist physicians, general surgeons and Sonographers were at 2(20%) of the hospitals. Only Bungoma county referral hospital had a pediatrician. There were no Emergency physicians, orthopedic surgeons, emergency nurses and radiologists in the county as shown in table 8. Figure 5 show that none of the facilities in the county had an aggregate emergency department staffing above 50%. The Bungoma county referral hospital the highest at 47.2%

Table 8 Mean Emergency department staffing categories available

Category N=10	Hospital (%)
List of extra personnel for disaster times	0 (0)
Emergency physicians	0 (0)
Medical officer	8 (80)
Internist physician	2 (20)
General surgeon	2 (20)
Orthopedic surgeon	0 (0)
Radiologist	0 (0)
Pediatrician	1 (10)
Radiographer	4 (40)
Sonographers	2 (20)
Anesthetist	5 (50)
General nurses	10 (100)
Laboratory personnel	10 (100)
Pharmacist/pharmaceutical personnel	10 (100)
Health records and information officer	10 (100)
Emergency nurses	0 (0)
Casuals	10 (100)
Drivers	10 (100)

Figure 5 Mean personnel cadre availability at ED by hospital



The aggregate number of staff available for emergency care at the emergency departments in public hospitals in Bungoma County was 320 personnel. The most common cadre was registered clinical officers (74), general nurses (46), laboratory technologists (40) and casual workers (39). The least available staff cadre was doctors (both general medical officers and specialists), radiographers, sonographers, and pharmacists. Webuye county hospital, Kimilili sub county hospital, Bungoma county referral hospital had the highest number of staff deployed at the EDs at 61, 53 and 42 respectively. The three hospitals had the highest variety in the different categories of the cadre necessary for emergency care. The distribution of staff available at the emergency departments in the EDs at public hospitals in Bungoma County is as presented in Table 9.

Table 9 Staff distribution by cadre at the ED

Cadre/ Hospital	Kenya n norms	Kimilili	Bungoma	Bumula	Chwele	Mt.Elgon	Naitiri	Webuye	Bokoli	Cheptais	Sirisia	Total
Physician	2	0	1	0	0	0	0	1	0	0	0	2
General surgeon	2	0	2	0	0	0	0	1	0	0	0	3
Anesthesiologist	2	0	1	0	0	0	0	0	0	0	0	1
Pediatrician	2	0	1	0	0	0	0	0	0	0	0	1
Medical Officer	16	3	2	2	1	2	2	2	0	0	2	16
General Nurses	30	10	3	3	5	5	4	11	1	2	2	46
Radiographer	6	0	3	0	0	1	0	4	0	0	1	9
Sonographers	1	0	1	0	0	0	0	1	0	0	0	2
Pharmacist	4	3	5	2	1	1	0	3	0	0	2	17
Pharm. tech	8	1	0	1	1	2	2	2	1	3	1	14
Drivers	8	4	5	2	2	3	3	4	1	2	2	28
Casuals	25	10	2	6	4	4	2	4	1	2	4	39
RCO	30	10	9	4	4	12	9	11	5	4	6	74
RCO anesthetist	6	1	4	0	0	0	1	4	0	0	0	10
HRIO	8	3	2	2	1	2	2	3	0	1	2	18
Lab technologist	15	8	1	3	5	2	5	10	1	2	3	40
Total		53	42	25	24	34	30	61	10	16	25	320

4.3.6 Training of Staff at the emergency department

Based on the responses from the ED in-charges we establish the training status of the staff at the ED on Training on the basis of staff having undergone the training in ACLS, ATLS, ETAT, BLS and ENMOC. Of the 320 staff deployed at the EDs, only 84(26.3%) had trained in any of the emergency care courses. Training of staff at all the 10 EDs was below average (less than 50%)

ranging from as low as 8% at Sirisia sub county hospital to 36.0% at Bumula Sub county hospital. Of the staff who had trained, 41(12.8%) were in ENMOC, BLS 27(8.4%), ACLS 9(2.8%), ETAT 4(1.3%) and ATLS 4(1.3%) as shown in Table 10.

Table 10 ED staff training in Emergency care courses

Hospital	No of staff at ED	ACLS trained	BLS trained	ENMOC Trained	ETAT trained	ATLS trained	Total trained	% trained in emergency courses
Kimilili	53	1	1	6	1	0	9	17.0
Bungoma	42	1	9	0	1	2	13	31.0
Bumula	25	0	4	3	2	0	9	36.0
Chwele	24	1	2	5	0	0	8	33.3
Mt.Elgon	34	0	1	5	0	0	6	17.6
Naitiri	30	2	2	6	0	0	10	33.3
Webuye	61	4	7	9	0	1	21	34.4
Bokoli	10	0	0	2	0	0	2	20.0
Cheptais	16	0	1	3	0	0	4	25.0
,Sirisia	25	0	0	2	0	0	2	8.0
Total	320	9	27	41	4	3	84	26.3
%Trained by course		2.8	8.4	12.8	1.3	0.9		26.3

On the distribution of the trained according to the cadres, the registered clinical officers and nurses at 40 and 25 number trained were the cadre with the most training. Majority of the personnel across the cadres had no training in the emergency care courses as shown in table 11

Table 11 Frequency distribution of training by cadre

Cadre/ emergency course	Number present	ATLS	ACLS	ETAT	ENMOC	BLS
Physician	2	0	1	0	0	1
General surgeon	3	3	0	0	0	1
Anesthesiologist	1	0	1	0	0	1
Pediatrician	1	0	0	1	0	0
General Nurses	46	0	1	2	16	4
Radiographer	9	0	0	0	0	0
Sonographer	2	0	0	0	0	0
Medical Officer	16	0	0	0	0	0
Pharmacist	17	0	0	0	0	0
Pharm. Tech	14	0	0	0	0	0
Drivers	28	0	0	0	0	8
Casuals	39	0	0	0	0	0
Clinical officers	74	0	2	1	25	2
Anesthetist	10	0	4	0	0	10
HRIO	18	0	0	0	0	0
Lab technologist	40	0	0	0	0	0
Total	320	3	9	4	41	27

4.4 Process

To assess process, data on presence of triage system, utilization of emergency care pathways/ interventions such as performing 12 lead EKG for non-traumatic chest pain and syncope, administration of aspirin for patients with non-traumatic chest pain, evaluating patients vital signs in suspected pneumonia, performance of routine laboratory tests, keeping medical records, and having a policy on staff training on emergency care courses.

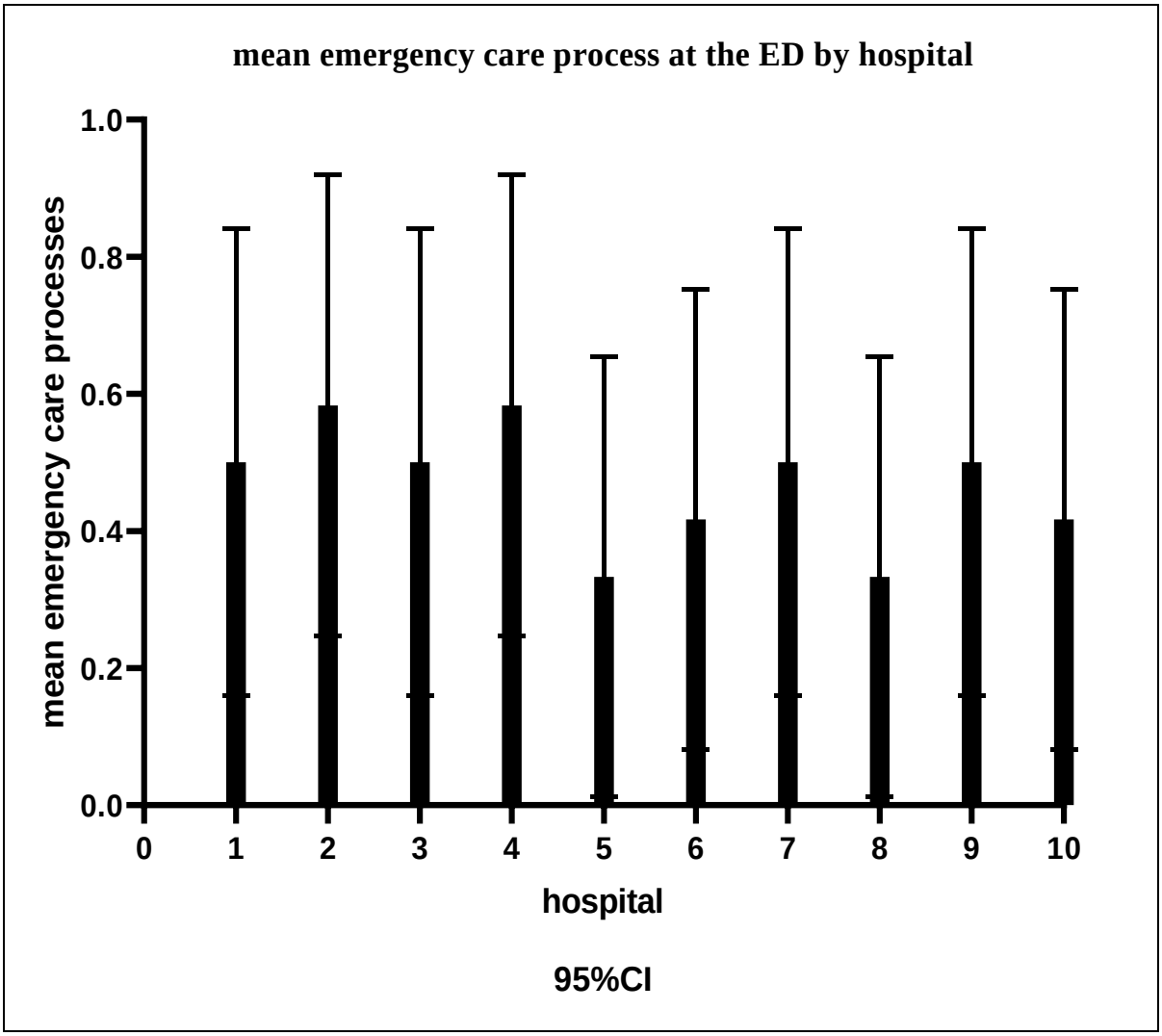
4.4.1 Interventions at the emergency department

The data indicates absence of Triage systems at all the emergency departments in public hospitals in the county. No ED performed 12 lead EKG for non-traumatic chest pains and syncope, and none administered aspirin for acute non traumatic chest pain. Patients suspected to have pneumonia had respiratory rates were monitored at 90% of the EDs; pulse rates, oxygen saturation, mental status assessment, and administration of empirical antibiotics was done at 80%, 10%, 80% and 90% of the EDs respectively. All the hospitals performed routine emergency tests such as grouping and cross match, random blood sugar, urinalysis and kept medical records. 9(90%) of the EDs had a policy on training staff on emergency care. On average 46.7% of the interventions could be performed at the EDs. Hospitals with the most intervention were Bungoma and Chwele as shown table 12 and Figure 6.

Table 12 Interventions possible at the Emergency departments in Bungoma

CATEGORY N=10 /	Hospital (%)
Respiratory rate for pneumonia	**9 (90)**
Pulse rate for pneumonia	**8 (80)**
SPO2 in pneumonia	**1 (10)**
Mental state assessment in pneumonia	**8 (80)**
Empiric antibiotics for pneumonia	**9 (90)**
Hemoglobin, GXM, RBS, urinalysis	**10 (100)**
Keep medical records	**10 (100)**
Policy on training staff on emergency care	**1 (10)**

Figure 6 Mean emergency care process at the ED by hospital



4.4.2 Availability of guidelines for emergency care

On checking for availability of guidelines for emergency care (BLS, ACLS, ATLS, ETAT, Pain relief, Obstetric, Surgery, anesthesia, and Referral) at the EDs in public hospitals in Bungoma county, the following guidelines were found: referral guidelines in 5(50%), obstetric guidelines in 4(40%), pain relief guidelines in 4(40%), and BLS guidelines in 2(20%) of the EDs. Pediatric advanced life support guidelines, advanced cardiac life support guidelines, ETAT guidelines, surgical guidelines, and anesthesia guidelines were found in 1(10%) of the EDs. The average

guideline availability at the EDs was at 17% and none of the hospitals assessed had ATLS guideline as shown in Table 13.

Table 13 Availability of Guidelines for Emergency care at the EDs

CATEGORY N=10	Hospital (%)
Basic Life Support	**2 (20)**
Pain relief	**4 (40)**
Obstetric	**4 (40)**
Surgery	**1 (10)**
Anesthesia	**1 (10)**
Referral	**5 (50)**

4.4.3 Mean timelines at the emergency department

Time spent at the ED was assessed using a time motion study using time motion tool (appendix 5), where time was recorded on the tool at each point of service. A total of 398 respondents had their time motion tool completed with no missing data. The average time spent at registration was 3.90 minutes while the mean time spent at the vitals desk was 3.95minutes. The results also found that the mean time spent by the patient before seeing the clinician (time to clinician) was 29.44 minutes. The Mean total time spent by the patient at the clinician was 43.08 minutes while the mean total time spent in the laboratory was 55.61minutes. The average time spent by patients at the pharmacy (time at the pharmacy) was 6.40 minutes while the average time to initial treatment 99.56 minutes. The results indicate that on average the patient spent (Mean total time spent at the emergency department) 111.61 minutes at the ED as shown in Tables 14 and 15.

Table 14 Timelines at the Emergency departments

Item/hospital	**County mean**
Time at registration	**3.90**
Time at triage	**3.95**
Time to clinician	**29.44**
Total time at clinician	**43.08**
Total time at laboratory	**55.61**
Total time at pharmacy	**6.40**
Time to treatment	**99.56**
Total time at ED	**111.61**

Table 15 Mean time spent at the EDs of public hospitals at Bungoma County

Item/hospital	Kimilili	Bungoma	Bumula	Chwele	Mt.Elgon	Naitiri	Webuye	Bokoli	Cheptais	Sirisia	All hospitals
Time at registration	2.98	4.85	7.81	4.72	1.44	1.38	3.0	1.94	3.79	3.47	3.90
Time at triage	2.70	-	12.00	-	-	2.0	9.43	-	-	1.67	3.95
Time to clinician	26.23	35.44	43.84	12.89	13.85	23.00	38.25	14.94	13.07	10.94	29.44
Total time at clinician	31.17	50.70	48.28	70.17	34.30	41.78	43.92	19.19	9.0	54.65	43.08
Total time at laboratory	44.06	67.13	37.88	53.89	45.88	42.60	81.00	36.00	-	47.20	55.61
Total time at pharmacy	5.15	7.89	5.42	5.33	7.92	5.33	5.67	5.38	2.86	7.29	6.40
Time to initial treatment	93.30	121.43	105.52	91.78	57.15	82.63	109.56	71.31	42.71	76.24	99.56
Total time at ED	106.20	138.13	109.06	95.28	72.96	93.60	119.22	76.81	50.86	84.29	111.61

4.4.4 Ability to perform emergency procedures

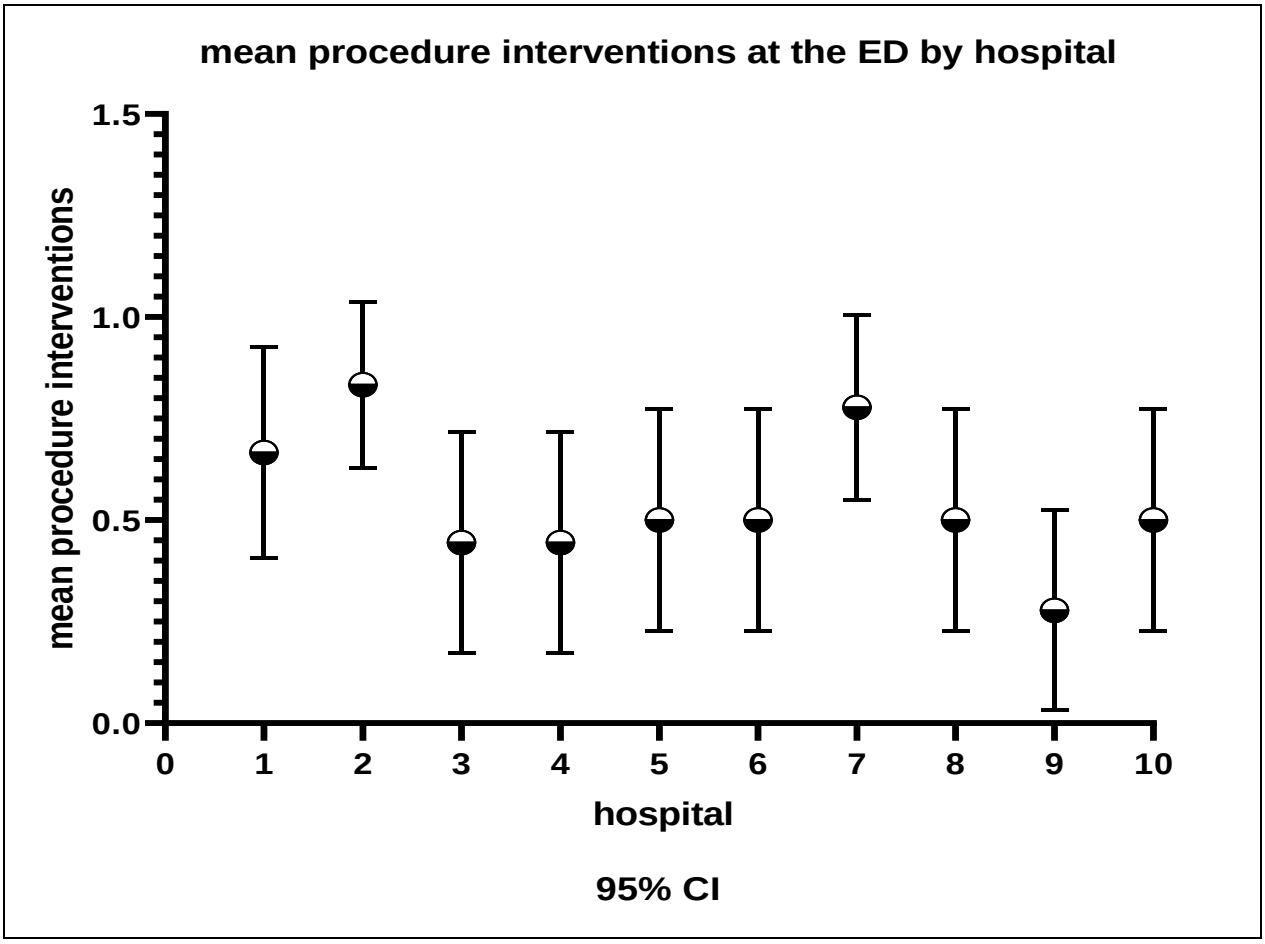
The ability to perform emergency procedures as recommended by the WHO for the first referral hospital was determined using a WHO adopted questionnaire. We found that on average 54% of the recommended emergency procedures were performed at the EDs in public hospitals in Bungoma County. All the EDs could perform suturing, MVA, and incision and drainage of an abscess. Acute burn management was performed in 9(90%) of the EDs, while CPR and wound debridement were performed in 8(80%) of the EDs. Airway management and removal of foreign body in the ear nose and throat was performed in 7(70%) EDs. Joint dislocation treatment and anesthetic blocks were performed in 6(60%) of the EDs, while peripheral venous cut-down, closed fracture management and administration of ketamine anesthesia was performed in 5(50%), 4(40%) and 3(30%) of the EDs respectively. Open fracture and amputation were performed in only two EDs (Bungoma county referral hospital and Webuye county hospital) while only 1 (10%) ED performed chest tube insertions. Cricothyroidotomy and tracheostomy were not performed in all the EDs studied as shown in Table 16.

Only three hospitals namely Bungoma county referral hospital, Webuye county hospitals were found to perform more than 50% of the procedures recommended for a first level referral hospital as shown the bar graph in Figure 7.

Table 16 Mean Procedures performed within the ED

CATEGORY N=10	Hospital (%)
Airway management	7 (70)
Removal foreign body ENT	7 (70)
Chest tube insertion	1 (10)
CPR	8 (80)
Peripheral Venous cut down	5 (50)
Acute burn management	9 (90)
`Wound debridement	8 (80)
Closed fracture management	4 (40)
Open fracture management	2 (20)
Joint dislocation treatment	6 (60)
Amputation	2 (20)
Anesthetic blocks	6 (60)
Ketamine anesthesia	3 (30)

Figure 7 Mean procedure interventions performed at the EDs by hospital



4.5 Outcomes

The outcomes at the emergency department were determined from the patient service experience or perceptions regarding the service received at the emergency department which was measured using a patient service experience questionnaire (appendix 4). They were also determined by the responses from the ED in-charges using data at the ED for a 3-month period prior to the interview which documented the total number of patients seen, number treated and allowed home, number referred, number admitted, number who died, the number of unplanned re-attendants, and the number of patients who left prior to being seen by clinician or without clinician sign off.

4.5.1 Demographics of respondents to patient service experience

The 398 participants on patient perception and service experience were drawn from the 10 public hospitals in Bungoma county and proportionately distributed among the hospitals as follows: Kimilili sub county hospital 63(15.83%), Bungoma county referral hospital 131(32.91%), Bumula sub county hospital 32(8.04%), Chwele sub county hospital 18(4.52%), Mt.Elgon sub county hospital 27(6.78%), Naitiri sub county hospital 16(4.02%), Webuye county hospital 64(16.08), Bokoli sub county hospital 14(3.52%), Cheptais sub county hospital 16(4.02%), and Sirisia sub county hospital 18(4.52%). The gender distribution was female 249(62.6%) and male 149(37.3%). The distribution as per the age groups had the majority of the participants 177(44.5%) in the bracket of over 25 to 59 years while the minority 22(5.5%) of the participants were drawn from the age bracket of over 5 -12 years and summarized in Table 17.

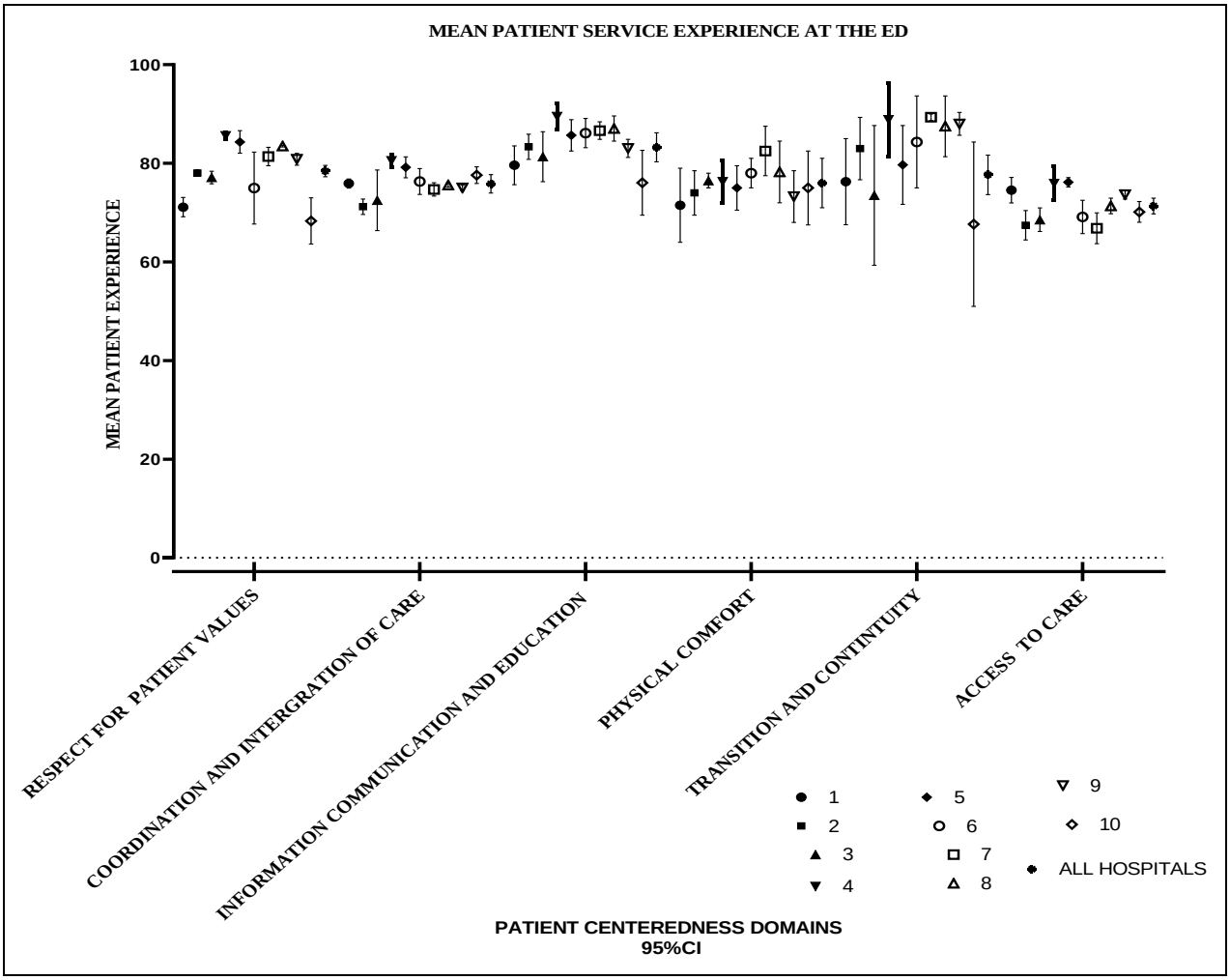
Table 17 Demographics of participants for patient service experience/perception

Category N=398	Hospital Characteristics	%
Participant distribution per hospital	1. Kimilili Sub County Hospital	15.83
	2. Bungoma County Referral hospital	32.91
	3. Bumula Sub County Hospital	8.04
	4. Chwele Sub County Hospital	4.52
	5. Mt. Elgon Sub County Hospital	6.78
	6. Naitiri Sub County Hospital	4.02
	7. Webuye County Hospital	16.08
	8. Bokoli Sub County Hospital	3.52
	9. Cheptais Sub County Hospital	4.02
	10. Sirisia Sub County Hospital	4.52
Gender	Male	37.4
	Female	62.6
Age	0-5 years	19.8
	Over 5 to 12 years	5.5
	Over 12 to 25 years	23.6
	Over 25 to 59 years	44.5
	60 years and above	6.5

4.5.2 Patient service experience of care

Patient service experience at the ED was determined through an interview of the respondents who sought care at the EDs of the 10 public hospitals. The respondents completed a patient service experience questionnaire which had 16 items. 398 respondents were surveyed and had 100% completion rate for all questions with No missing data. The data was analyzed based on the 8 picker institute principles of patient centered care after all the items on the patient service questionnaire had been aligned to each principle. Respect for patient's values, preferences and expressed needs were rated positively across all the emergency departments with scores ranging between 68-85%. Coordination and integration of care was also rated positively with scores between 71.2-85.5% across all the 10 EDs. On the principle of information and education the participants positively rated the EDs at scores ranging from 76.05% to 89.51%. Regarding physical comfort, the participants had positive experiences across all the 10 EDs with scores ranging 71.5%-82.5%. On continuity and transition at the EDs, there were positive experiences in the ED with scores of 67.7% to 89.3%. Regarding access to care there was positive experiences across the 10 EDs with scores ranging 66.8% to 76.2%. Emotional support and alleviation of fear and anxiety were rated positively with mean scores of between 71.2-81.4%. On involvement of family and friends, the experiences were positive 64.67-85.3% as shown in figure 8.

Figure 8 Mean patient service experience



Means for each of the 16 items on the questionnaire were calculated for each hospital. They were then calculated to get the overall mean of all the 16 items for all the hospitals and converted it into percentages of the maximum expected. The overall percentages at each of the hospitals represented the patient service experience as shown in table 19. The overall patient service experience was good with a mean of 76.1%. All the hospitals in the county were perceived positively by the respondents with Chwele sub county hospital having the best perception by the respondents at 81.2% followed by Mt. Elgon at 80.3. The other hospitals also had positive patient service experience all having mean percentage of over 70%. Majority of the respondents rated staff respect and the way their questions were answered very highly with means of above 4

out of the maximum 5. The lowest scores were on the time to appointment 3.48(69.6%) and time spent at the waiting bays 3.39(67.8%) as shown in the Table 19

Table 18 Mean scores for patient service experience

item/ hospital N=398	Max Expected score	Kimilili	Bungoma	Bumula	Chwele	Mt.Elgon	Naitiri	Webuye	Bokoli	Cheptais	Sirisia	All hospitals
Overall care	5	3.84	3.65	3.63	3.67	4.07	3.81	3.69	3.56	3.57	3.65	3.71
Got services needed	4	3.27	3.00	2.97	3.22	3.11	3.06	2.86	2.81	2.93	2.71	2.99
Respectful staff	5	3.75	3.87	3.97	4.22	4.00	4.38	3.94	4.19	4.14	3.88	4.03
Answer patient questions	5	3.98	3.96	4.00	4.17	4.15	4.31	4.09	4.00	3.86	3.94	4.05
Ease of access	5	3.73	3.45	3.19	3.94	3.81	3.63	3.64	3.75	3.71	3.76	3.66
Interpretive services	5	3.86	3.67	4.06	4.11	4.11	4.00	3.83	3.81	3.79	4.00	3.92
Time to get appointment	5	3.56	3.23	3.28	3.94	3.85	3.31	3.13	3.38	3.79	3.29	3.48
Time at the waiting bay	5	3.53	3.06	3.53	3.28	3.67	3.06	3.02	3.63	3.57	3.59	3.39
Asked if on medication	2	1.73	1.75	1.84	1.89	1.74	1.62	1.78	1.81	1.64	1.71	1.75
Confirmed identity	2	1.81	1.80	1.84	1.89	1.89	1.75	1.80	1.87	1.64	1.88	1.82
Saw hand washing stations	2	1.58	1.57	1.56	1.61	1.59	1.62	1.75	1.69	1.57	1.65	1.62
Notices hand washing signs	2	1.28	1.39	1.50	1.44	1.41	1.50	1.55	1.44	1.36	1.35	1.42
Got follow-up care information	3	2.02	2.30	1.78	2.44	2.15	2.25	2.66	2.44	2.57	1.53	2.21
Kept informed on care planned	3	2.06	2.32	2.31	2.61	2.63	1.87	2.41	2.50	2.43	1.88	2.30
Involved in making decisions on care	3	2.09	2.38	2.25	2.56	2.56	2.25	2.55	2.50	2.36	1.94	2.34
Treatment clearly explained	3	2.55	2.68	2.63	2.89	2.63	2.81	2.70	2.81	2.71	2.53	2.69
Mean	3.69	2.79	2.76	2.77	2.99	2.96	2.83	2.84	2.89	2.85	2.71	2.84
Mean patient service experience		75.6	74.7	75.2	81.2	80.3	76.7	76.9	78.2	77.4	73.4	76.9

4.5.3 Relationship between patient service experience and timelines

A linear regression analysis was done to review if there was a significant relationship between mean patient service experience and mean time to clinician, mean time to treatment and total time spent at the emergency department. Results show no statistical significance between patient experience and time to clinician, time to initial treatment and total time spent at the ED as shown in tables 19, 20, 21

Table 19 Correlation between patient service experience and timelines at the ED

Correlations					
		mean scores pt experience	TIME TO CLINICIAN	TOTAL TIME IN ED	TIME TO TREATMENT
Pearson Correlation	mean scores pt experience	1.000	-.028	.012	.030
	TIME TO CLINICIAN	-.028	1.000	.420	.435
	TOTAL TIME IN ED	.012	.420	1.000	.942
	TIME TO TREATMENT	.030	.435	.942	1.000
Sig. (1-tailed)	mean scores pt experience	.	.287	.406	.277
	TIME TO CLINICIAN	.287	.	.000	.000
	TOTAL TIME IN ED	.406	.000	.	.000
	TIME TO TREATMENT	.277	.000	.000	.
N	mean scores pt experience	394	394	394	394
	TIME TO CLINICIAN	394	394	394	394
	TOTAL TIME IN ED	394	394	394	394
	TIME TO TREATMENT	394	394	394	394

Table 20 Model summary for relationship between patient experience and timelines

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.072[a]	.005	-.002	.4051367	.005	.678	3	390	.566

a. Predictors: (Constant), TIME TO TREATMENT, TIME TO CLINICIAN, TOTAL TIME IN ED

Table 21 ANOVA of patient service experience and timelines at the ED

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.334	3	.111	.678	.566[b]
	Residual	64.013	390	.164		
	Total	64.347	393			

a. Dependent Variable: mean scores pt experience

b. Predictors: (Constant), TIME TO TREATMENT, TIME TO CLINICIAN, TOTAL TIME IN ED

4.5.4 Relationship between structure, process and patient experience

Linear Regression analysis was done to analyze if there a statistical relationship between structure and process with outcomes (patient service experience). The results from the linear regression analysis indicated that there was no significant relationship between availability of essential emergency supplies, essential emergency equipment, emergency interventions, emergency personnel, infrastructure and patient experience as shown in table 22, 23 and 24.

Table 22 Correlation between structure process and patient experience

Correlations								
		mean scores pt experience	mean supply availability	procedures at ED	procedures at the ED	equipment availability	personnel availability	mean scores for infrastructure
Pearson Correlation	mean scores pt experience	1.000	-.695	-.538	-.018	-.101	-.766	-.267
	mean supply availability	-.695	1.000	.219	-.012	.231	.640	.148
	proceedures at ED	-.538	.219	1.000	.310	.591	.692	.818
	procedures at the ED	-.018	-.012	.310	1.000	.559	.209	.284
	equipment availability	-.101	.231	.591	.559	1.000	.505	.843
	personnel availability	-.766	.640	.692	.209	.505	1.000	.669
	mean scores for infrastructure	-.267	.148	.818	.284	.843	.669	1.000
Sig. (1-tailed)	mean scores pt experience	.	.013	.054	.480	.391	.005	.228
	mean supply availability	.013	.	.271	.487	.260	.023	.342
	proceedures at ED	.054	.271	.	.192	.036	.013	.002
	procedures at the ED	.480	.487	.192	.	.046	.282	.214
	equipment availability	.391	.260	.036	.046	.	.068	.001
	personnel availability	.005	.023	.013	.282	.068	.	.017
	mean scores for infrastructure	.228	.342	.002	.214	.001	.017	.

Table 23 Relationship between structure, process and patient experience

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.910[a]	.828	.485	.2711307	.828	2.413	6	3	.251
a. Predictors: (Constant), mean scores for infrastructure, mean supply availability, procedures at the ED, procedures at ED, personnel availability, equipment availability									

Table 24 ANOVA between structure, process and patient experience

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.064	6	.177	2.413	.251[b]
	Residual	.221	3	.074		
	Total	1.285	9			
a. Dependent Variable: mean scores pt experience						
b. Predictors: (Constant), mean scores for infrastructure, mean supply availability, procedures at the ED, procedures at ED, personnel availability, equipment availability						

4.5.5 Three-month patient outcomes at the emergency department

A total of 81,375 patients were seen at the emergency department with 6.06% admitted, 93.72 % treated and allowed home. 0.16 % were referred, 0.17% left without being seen, 0.10 % of the patients died at the outpatient unit. Unplanned re-attendance was 35.73 %, 0.86 % left without clinician or consultant sign off. (Table 25).

Table 25 Summary of patient for a 3month period

Category /patients (%)	KIMILILI	BUNGOMA	BUMULA	CHWELE	MT.ELGON	NAITIRI	WEBUYE	BOKOLI	CHEPTAIS	SIRISIA	ALL HOSPITALS
Number of patients seen in 3months	11105	32825	2990	4790	3836	3309	15407	2177	2124	2812	81375
No admitted	594 (5.3)	1231 (3.8)	184 (6.2)	110 (2.3)	219 (5.7)	240 (7.3)	1486 (9.6)	121 (5.6)	311 (14.6)	435 (15.5)	4931 (6.1)
Treated and released home	10484 (94.4)	31564 (96.2)	2778 (92.9)	4670 (97.5)	3603 (93.9)	3069 (91.8)	13863 (89.9)	2050 (94.2)	1813 (85.4)	2368 (84.2)	76262 (93.7)
Referred	21 (0.2)	0 (0)	26 (0.9)	6 (0.2)	8 (0.2)	29 (0.9)	34 (0.2)	6 (0.3)	0 (0)	0 (0)	130 (0.2)
Died	6 (0.1)	30 (0.1)	2 (0.1)	4 (0.1)	6 (0.2)	1 (0.03)	24 (0.2)	0 (0)	0 (0)	9 (0.3)	82 (0.1)
Unplanned re attendance	3929 (35.4)	17050 (51.9)	633 (21.2)	449 (9.4)	883 (23.0)	1314 (39.7)	2959 (19.2)	359 (16.5)	574 (21.0)	925 (32.9)	29075 (35.7)
Left without clinician or consultant sign off	121 (1.1)	300 (0.9)	20 (0.7)	18 (0.4)	6 (0.2)	9 (0.3)	148 (1.0)	12 (0.6)	40 (1.9)	27 (1.**0**)	701 (0.9)

CHAPTER FIVE

DISCUSSION

The main objective of this study was to evaluate quality of medical care at emergency departments in public hospitals in Bungoma county Kenya. The study utilized the donabedian model which looks at structure and process which ultimately influence outcomes (Ayanian & Markel, 2016). It has been found that provision of quality healthcare is an international mandate, nowhere is the challenge greater than in the emergency department (Letvak & Rhew, 2015).

On structure, results in this study indicate inadequacies of key infrastructure. The overall infrastructure availability was 42.0% of the WHO recommendation. No facility had a designated emergency area, or majors and minors area. Running water was at 70% (7), oxygen was at 10% (1), and blood banks were at 50 %(5) of the EDs. The low availability of infrastructure in this study could be attributed to norms and standards (KEPH) used to set them up, which was a package for primary health care. Some of the hospitals were also upgraded from health centers to level four facilities without any infrastructure upgrade. A study in Burundi, Ethiopia, Kenya, Malawi, Mozambique, Rwanda, Tanzania, Uganda, Zambia, and Zimbabwe, indicated that only 31% of the hospitals had formal accident and emergency departments (Chokotho et al., 2016). The results in this study are comparable to a study done in Afghanistan which found overall infrastructure at 30% of the recommended. In 30% of the 17 facilities examined, oxygen supply was limited and irregular; uninterrupted running water was not accessible in 40%; electrical power was not available continuously in 66% (Contini et al., 2010). Running water in the current study was unavailable at 30% of the EDs studied which is against the infection prevention best practices requiring running water at the clinical service areas. Lack of running

water predisposes the ED users to hospital acquired infections. This was better than another study in East Africa which had percentage of hospitals with dependable running water and electricity ranged from 22% to 46% (Hsia et al., 2012). The hospitals can invest in elevated water tanks, bore holes and tap rainy water during the rainy season. This will improve the infection prevention practices in the hospitals.

The results show lack of resuscitation areas at all the 10 public hospitals studied. This was contrary to the international federation of emergency medicine recommendation for appropriate number and size of resuscitation rooms at the ED to aid in provision of quality care (Cameron, 2012). Provision of emergency care in the above set up impacts negatively on the delivery of service as the areas play a crucial role in the process necessary for service delivery and eventual outcomes. Lack of resuscitation area could lead to delays in the provision of the critical service or suboptimal care. Studies have indicated that it is a nightmare to note that there is a key supply missing during resuscitation (Swanson, 2014). A study showed that delays in resuscitation efforts occurred more frequently on crowded days and were associated with higher in-hospital mortality (Hong, Shin, Song, Cha, & Cho, 2013). It is important that the facilities in Bungoma County be restructured to create this key area of resuscitation, majors, minors, in order to improve emergency care.

Triage areas were present at 7(70%) of the EDs but there was no triage system in place at all the 10 EDs of the public hospitals in Bungoma county. This could be due lack of guidelines on triage and categorization of the patients, inadequate supervision and personnel could lead to the situation. The lack of triage and patient categorization system lead to prolonged timelines in service delivery, delayed treatments, prolonged length of time spent at the ED, increase in number of patients leaving before being seen and negative patient perceptions regarding the

service received at the emergency department. A study in the UK showed that the introduction of a comprehensive strategy to improve initial patient assessment has had a profound effect on patient outcomes in the ED and has helped reduce mortality rates in the trust. The strategy was supported by an extensive education plan, designed to monitor and ensure adequate training for all members of the team (Evans, Hughes, & Ferguson, 2017). It will be key for the EDs in Bungoma County to be reviewed and the triage desk personnel trained on how to categorize patients according to acuity scale. Also training all the staff working within the ED on triaging system and patient categorization will help develop a multi-tasking system and also support the efforts of triaging.

Radiology units were at 4(40%), procedure rooms at 70%, observation room with beds at 20%, blood banks were at 5(50%) of the ED. The unavailability of the units could be attributed to lack of guidelines on emergency department setup accompanied by limited resource availability in the county. This lead to patients being transferred over long distances in such of imaging services, high dependency unit care and poor outcomes for those who cannot afford the cost of transfers. The lack of radiology units at the majority of the EDs is concerning as patients with time sensitive conditions requiring diagnostic imaging face delays as they will have to be transferred from one ED to another. A study at a level 1 trauma center indicated that availability of radiology services 24/7 were associated with decreased length of stay in the hospital from 11.19 to 8.25 hours and reduction of costs (Bodanapally et al., 2011, p. 7). Similar studies have shown that diagnostic imaging is very important in the diagnosis and management of the emergency patient. It is necessary for the emergency radiology unit to be located within the Emergency Department, and to allow the interdisciplinary management of the patient by all specialists. Logistics, technological equipment and staff of the emergency radiology unit must be designed and worked out in the best way to guarantee the fastest and effective assistance to the emergency

patient (Miele, Andreoli, & Grassi, 2006). Developing a public private partnership in constructing and installing radiology units in Bungoma county could help the county overcome the acute shortage of the units.

The results in this study found no high dependency units at all the 10 EDs studied in the county. This could be attributed to the fact that little emphasis has been placed on emergency care services in the county. There have also been little or lack of investment in the emergency units with the major efforts more towards inpatient and primary health care. Absence of HDU is critical as they are vital to the continuity of care for patients who are in critical states and after successful resuscitation at the emergency departments. The provision of care at HDU ensures critically ill patients are stabilized, continuously monitored and cared for even as they await intensive care unit space. Similar studies have found EDs to be the main entry for many severely ill patients who require hospital care (Berger, 2013). Another study found that the HDU was effective in providing high level care and monitoring for a group of patients at risk of postoperative complications. It was also associated with additional benefits in the running of the adjacent ward (Armstrong, Young, Hayburn, Irish, & Nikoletti, 2003).

Only 20% of the EDs were found to have observation rooms with beds, this is despite similar studies indicating the importance of patient observation in order to stabilize the patient condition before disposing off. Lack of this units leads to disposition of unstable patients or prolonged length stays at the ED hallways which is indicative of substandard care. Observation care is a key component of the emergency care delivery, in the United States the chest pain was the highest reason for ED visit resulting in the observation (Venkatesh et al., 2011). Emergency department observation units are often used to monitor critical patients in a situation of constant emergency department overcrowding and lack of intensive care beds (Ribeiro, Petrini, Marino, &

Brandao-Neto, 2015). An Observation Unit can care for a wide variety of patients who require multiple consultations, procedures, and care coordination while maintaining an acceptable length of stay and admission rate (Southerland et al., 2018). Another study on the ED observation unit Evaluation of a Low-risk Mild Traumatic Brain Injury and Intracranial Hemorrhage was associated with an independently statistically significant decreased odds ratio (OR) for admission or worsening intracranial hemorrhage on repeat CT scan (OR = 0.45, 95% confidence interval [CI] = 0.25–0.82, p = 0.009) in the observation unit. The emergency departments in Bungoma county public hospitals need to set-up observation units with beds within the emergency departments as this will go far in reducing the number of unnecessary admissions. It will also give confidence in the healthcare workers at the ED as they will have adequate time to stabilize the patient before disposition. Also observation rooms will enable patients to be done further investigations instead of waiting on the hallways.

On-site blood bank or availability of blood transfusion services was available at 50% of the emergency departments. This is related to the unavailability of the cold chain system necessary during blood storage. It is also associated to the low investments in the emergency preparedness at the facilities. This leads to patients in need of emergency transfusion services having too be transferred for long distances before getting the desired service. This is indicative of the lack of adequate preparations for emergency or disaster situations. Lack of blood transfusion exposes the patients to suboptimal resuscitation and risks of delays in service and death to those who will not get emergency blood transfusion. A comparable study in Cameroon showing similar results with infrastructures for emergency and essential surgical care surveyed largely inadequate with the largest gaps in the availability of oxygen, and onsite blood bank, with blood banks not available at 8 of the 12 hospitals studied (Kouo-Ngamby et al., 2015). In another comparable study, it was

found that in all the countries, the facilities that reported offering surgical services generally had a shortage of the necessary items for offering the services and this varied greatly between the countries, with the facilities having on average 27–53% of the items necessary for offering basic surgery, 56–83% for comprehensive surgery, 49–72% for comprehensive obstetric care and 54–80% for blood transfusion. Furthermore, few facilities had all the necessary items present (D A Spiegel et al., 2017). It will be important for the facilities in the Bungoma county to invest in fridges and supplies for emergency transfusion at all the hospitals as this is life saving.

Oxygen source and delivery tubing were available at 10% of the EDs, which is way below the required level which is required of all EDs. Oxygen therapy is used during preoxygenation for intubation, supplemental oxygen for hypoxia, and support during respiratory distress. The unavailabilty could be related lack of planning by the hospital management in prioritizing oxygen supply. Also this could mean that the units lack skills and knowledge on resuscitation. The low availability of oxygen at the emergency departments in this study was similar to a study which found that Sub-optimal oxygen supply was identified as a major and frequent deficiency contributing to disruption of services (Shah et al., 2015). Similar studies have shown the need for oxygen availability and therapy in pediatric and adult populations with sepsis in low and middle income countries to improve oxygen saturations to above 90% (Dünser et al., 2012). In other similar studies about severe sepsis and septic shock, supplemental oxygen has been shown to be an essential therapy for those in respiratory distress, but oxygen availability is woefully inadequate in countries with constrained resources. An analysis of 231 district hospitals in 12 sub-Saharan African nations corroborated this pattern, with 43.8% reporting “always” having access to any source of oxygen, 29.1% having at least 1 oxygen cylinder, 24.6% possessing a functioning oxygen concentrator, and 34.3% having at least 1 face mask and tube set always

available(Belle et al., 2010). This problem is not unique to the African continent: similar limitations have been reported in Mongolia (Otgon et al., 2010) and Papua New Guinea (Matai et al., 2008). The governments can save costs by installing oxygen generation plants at all the 10 hospitals and also piping the oxygen to all the service delivery points. This will not only improve quality of care but will save lives.

Overall equipment availability at the ED in this study was 34.7% with only 10% of the EDs having pulse oximeter, 40% with X-ray, nebulizer and anesthesia machines. The emergency and trauma carts were available at 50% and 10% of the EDs respectively. The regular maintenance of EEE was at 52.5% of the facilities. This could be explained by the lack of norms and guidelines used in equipping these facilities. There are also inadequacies in resource allocation. The findings in this study are comparable to similar study in Cameroon which showed inadequate of equipment across all the levels of care (Kouo-Ngamby et al., 2015) This was overall an under preparedness for emergency care as patients had to be transferred for long distances for imaging services. Monitoring of vitals such pulse oximetry is vital in determining whether further interventions are necessary. EDs studied did not have ECGs despite studies recommending ECG use in all patients with non-traumatic chest pain and syncope (Kelly, 2013). A similar study in Bangladesh found inadequacies in essential emergency equipment which worse at the sub district hospitals (Loveday et al., 2017). There is need for considered investment in the minimum equipment for emergency medicine as put forth by the WHO within the EDs in Bungoma County.

The overall personnel cadre availability necessary for emergency care at all the 10 EDs was 47.5%, with specialist doctors not available in most of the hospitals. The study also indicates the lack of basic emergency training among the healthcare personnel working within the EDs.

Training in basic emergency courses by the 320 healthcare personnel at the EDs were low: ACLS (2.8%), ATLS (0.9%), BLS (8.4%) and ETAT (1.3%). This could be attributed to inadequate resources to employ staff and also lack of clear guidelines on training at the hospitals. A similar study in Japan evaluating quality of care indicators at trauma centers in tertiary hospitals found that factors significantly associated with lower mortality risk were, ED director's qualification as a specialist (HR 0.57) or consultant (HR 0.58), review of patient arrival process (HR 0.68), triage functions (HR 0.69), availability of psychiatrists (HR 0.75) and operating room being ready 24-hours(HR 0.81) (Nakahara et al., 2017). The International Federation of Emergency Medicine requires the emergency departments to have the right personnel: healthcare staff who are appropriately trained and qualified to deliver emergency care, with the early involvement of senior doctors with specific expertise in Emergency Medicine where life-threatening/changing illness (physical or mental) or injury is suspected (Cameron, 2014). It is vital for the hospitals to carry out in-service training for the personnel on emergency courses, advocate for multi-tasking and create a list of extra personnel on standby in cases of emergency disasters.

As regards to supplies necessary for emergency care, this study showed low supply and unavailability of consumable and non-consumable stores necessary for service delivery. The least available at 22% was supplies necessary for airway management which include Oxygen source and tubing, suction pump with catheter, adult and pediatric oropharyngeal airway, nasogastric tube, adult and pediatric Magill forceps, adult and pediatric Endotracheal tubes, adult and pediatric laryngoscopes with blades, Cricothyroidotomy set**.** The guidelines necessary for emergency care were available at 17% of the facilities. The inadequacies in these supplies affect the quality of service delivery, despite the departments being said to perform airway resuscitation

the low supplies for emergency care indicate otherwise. Also this indicates the suboptimal care at the units. The low supply could have been due to erratic nature of supply of materials by the county government, where facilities face frequent stock outs. A similar study in East Africa showed availability of supplies to control infection and safely dispose of hazardous waste was generally poor (less than 50%) across all facilities (Hsia et al., 2012). The findings were similar to a study done in Ghana, where the results demonstrated a critical lack of job-specific continuing education and training among all staff members and shortages or an absence of many essential emergency care items and medications including several low cost items (e.g. airway supplies, chest tubes, PPE) (Japiong et al., 2016) A previous study in Kenya also showed similar results of shortage of emergency medical supplies (Wesson et al., 2013). This was a significant finding since airway management is the first step towards resuscitation and most saving. Procedures such as Endotracheal intubation have been found to be key to saving lives (Fry & Ruperto, 2009). The findings on supplies are key and the facilities need to determine the essential supplies for emergency care and ensure that there are no frequent stock outs. This can be done by using electronic records to manage the supply chain with early warning signs set up.

On processes assessed at the emergency department this study found no triage system at all the EDs studied. The patients were seen on first come first serve basis with no system in place to categorize the patients. The nurse at desk took vital signs but there was no effort to categorize patients as per the acuity. This could lead to delays in identifying patients with time sensitive illness and prolonged waiting time for patients with emergent conditions at the ED. This was contrary to another study showing improved triage and emergency care for children reduces inpatient mortality in a resource constrained setting (Molyneux, Ahmad, & Robertson, 2006). In this study those EDs with triage stations got vital signs, blood pressure, temperature, respiratory

rate and pulse rate but triage scores assigning and categorization of the cases at the ED were not done. This is despite studies showing that Higher severity of triage was associated with being attended in the area of Vital and Medical Care, a longer stay in the ED and a higher proportion of hospital admissions, so that triage performed by nursing is considered adequate. "Non-urgent" visits obtained less severity of triage, a shorter stay in ED and a greater proportion of hospital discharges (Vinuales, 2018). There is need for the emergency department managers to institute measures to ensure that patients are triaged and managed as per the acuity score or category. There is need for staff training on triage and patient categorization.

There was no emergency department that performed 12 lead ECG for non traumatic chest pain and syncope. There was also no ED administering aspirin for non traumatic chest pain which is contrary to studies which cite need for early performance of ECG for non traumatic chest pain and syncope and administration of aspirin to have mortality benefits (Zègre-Hemsey, Sommargren, & Drew, 2011). In an American study, out of the patients that had non traumatic chest pain 45.4% received aspirin from the EMS provider (Tataris, Mercer, & Govindarajan, 2015). The American college of emergency physicians (ACEP) developed several Emergency medicine measures that required performance of 12 lead EKG for non traumatic chest pain and syncope plus Aspirin administration on arrival for patients with non traumatic chest pain, acute myocardial infarction. The same ACEP recommended vital signs for pneumonia and empiric antibiotics which were partly performed at all the hospitals EDs (Wiler et al., 2010). Results in this study found that the EDs did not get a full set of vital signs for patients with pneumonia, as only 1 ED was able to perform pulse oximetry. It will be important for the departments to be equipped with ECG and emergency carts be stocked with aspirin, this has been shown to have mortality benefits.

On mean times in minutes at the emergency departments, this study found mean to clinician was 29.44 minutes, mean time to initial treatment 99.56 minutes, Mean total time spend at the emergency department 111.61 minutes. This timelines are comparable to those set by the Royal College of Emergency Physicians in the UK. Total time spent at the ED 95% of the patients having less than 4 hours, time to initial assessment should be within 20 minutes of arrival, while time to treatment for 95% of the patient within 60 minutes. The clinical indicator time to initial assessment requires 95% of the patients expected to have been seen by a clinician or decision maker within 15minutes. The indicator time to treatment is expected to be within 60 minutes of arrival, on total time spent at the ED good indicators require that 95% of the patients to be should not spent more than 4 hours at the ED, patients who left without being seen should be less than 5% as this indicates excessive waiting times and is associated with poor patient experiences (Sørup, Jacobsen, & Forberg, 2013). The timelines in this study were way above the desired recommendation which could be attributed to the number of personnel in the ED and may their lack of training in emergency care. Similar studies done show that emergency care in large urban hospitals across the country is in the midst of major redesign intended to deliver quality care through improved access, decreased wait times, and maximum efficiency (Melon, White, & Rankin, 2013).This timeline helps us to determine whether the patient was allocated the correct triage score and whether the patients saw the decision maker within the timelines. According to the American academic journal reducing waiting times to less than 4 hours improved patient satisfaction (Graff et al., 2002) commonly employed, although times from 24 hours to a week are used elsewhere. In another study the duration of treated and released (T&R ED) visits varied significantly by admission hour, day of the week, patient volume, patient characteristics, hospital characteristics and area characteristics. The mean duration of treated and released (T&R ED)

visit was 195.7 minutes. Hospitals with large bed size were associated with longer duration of visits (222.2 minutes) when compared to hospitals with small bed size (172.4 minutes) or those with medium bed size (166.5 minutes) (Karaca, Wong, & Mutter, 2012). It will be important for the emergency departments in Bungoma to carry out regular timeline studies, train the personnel on the emergency care and to multitask.

On the outcomes at the ED in the public hospitals in Bungoma County, the results indicate a positive patient service experience with average score of 76.9%. The ED with the highest rating was Chwele sub county hospital (81.2%). Overall majority of the respondents (49.5%) rated overall care as good. The least scores were on the timelines at the emergency departments. The respondents were dissatisfied with the time it took to get an appointment and the time they had to wait in the waiting bays before service. The results could be attributed to the good patient health care worker relationships. This is despite the care being provided in a set up that is poorly resourced. Results from a similar study in Sweden found that Patients estimated quality of care at the emergency department as fairly good, but there were areas in need of improvement. A high percent of inadequate quality was related to the environment in the emergency department. About 20% of patients reported that they did not receive effective pain relief. More than 20% estimated that nurses did not show an interest in their life situation and patients did not receive useful information on self-care and about which physician was responsible for their medical care (Muntlin et al., 2006). Similar studies in the UK reviewing patient service experience noted that Patient experience is one of the fundamental determinants of healthcare quality. The Studies have demonstrated its positive associations with health outcomes (Male, Noble, Atkinson, & Marson, 2017). Another study found that Emergency department (ED) waiting time has been known strongly related to patient satisfaction (Huang, Sabljak, & Puhala, 2018). This patient

service experience results call for continued work and reassessments annually to ensure continued improvement of patient care. Results in the current study show positive patient experience with ratings above 70% across all the 8 picker institute principles at all the 10EDs. A similar study found that timeliness and effectiveness quality measures showed an inverse, dose-related association with crowding, an effect not moderated by equity measures (Sills, Fairclough, Ranade, & Kahn, 2011). Another study showed that Patient experiences of care were related to measures of technical quality of care, supporting their validity as summary measures of hospital quality, the results indicated that the overall rating of the hospital and willingness to recommend the hospital had strong relationships with technical performance in all medical conditions and surgical care. Better patient experiences for each measure domain were associated with lower decubitus ulcer rates, and for at least some domains with each of the other assessed complications, such as infections due to medical care (Isaac, Zaslavsky, Cleary, & Landon, 2010).

A total of 81,375 patients were seen at the emergency department in public hospital ED in Bungoma County with 6.06% admitted, 93.72 % treated and allowed home. 0.16 % referred 0.9 % left without being seen, while 0.10 % of the patients died at the outpatient unit. Unplanned re-attendance was 35.73 % and 0.86 % left without clinician or consultant sign off. This is contrary to standards set by the international federation of emergency medicine and the royal college of emergency medicine measures. According to these guidelines, unplanned re-attendance was to be less than 5%, those who leave before clinician sign off should not be more than 5%, and all patients should have consultant sign off before leaving the ED. Several clinical indicators have been used to measure quality of care within the ED. The unplanned re-attendants at the ED, which measures the percentage of patients who are unplanned re-attendants at the ED within 7

days with good practice expecting less than 5%(Hughes, 2012). The results in the current study being a baseline assessment will inform further evaluations, which with time will improve care within the ED. The high re-attendants rates could be due to lack of clear guideline given to the patient or patient dissatisfaction with the care received. This calls for efficiency and accuracy both in coming up with the diagnosis and the type of care given to the patients. There was also a significant number of patients who left without being seen which is indicative of the efficiency of the emergency units in this EDs. Similar studies reviewing outcomes at the ED through a systematic review of a total of 196 abstracts and 11articles found five studies reported that ED crowding is associated with higher rates of patients leaving the ED without being seen (Carter, Pouch, & Larson, 2014).A similar study looking at patients who leave without being seen was carried out in Italy, 2% left without being seen (2%; Male 51.5%; Female 48.2%). The mean age was 41 years (median 37; range 14-95)(Bambi, Scarlini, Becattini, Alocci, & Ruggeri, 2011). This study compared with the current results in this study had worse outcomes. Another study through the chart review identified a correlation between wait times and patients leaving without being seen during hours of peak demand (Reinhardt, 2017). It is important for the ED in charges to come up with strategies on how to reduce number of re attendants, those leaving without being seen by improving efficiency and improving the set up in which care is provided.

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The study assessed quality of medical care at emergency departments in Bungoma County, Kenya utilizing the donabedian model (structure, process and outcome). The study found average percentage infrastructure availability in the county at 42.0% of the recommended WHO infrastructure for a first referral hospital. Major inadequacies were in areas designated as emergency care areas, resuscitation rooms, HDU, observation rooms with beds, imaging areas and blood banks. Emergency equipment was at 34.7% with oxygen source, emergency trauma carts, point of care ultrasound, ECG machines, pulse oximeter lacking across all EDs. The capacity to maintain the emergency equipment in the county was at 52.5%, with only one hospital providing information on the supply, repair and availability of spare parts. The overall availability of the supplies for emergency care was 52% with major deficiencies in supplies for airway management (22%) and emergency medical care guidelines (17%). The personnel for emergency care were at 47.5% with unavailability of doctors at the EDs. Also the personnel at the ED did not have specific training in emergency care.

In process the study found no EDs with a triage system, none utilized standard protocols for emergency care for instance provision of aspirin and ECG for all patients with non traumatic chest pain and syncope. None of the facilities had all emergency medicine guidelines and none provided the care to the patients using the emergency care pathways.

The patient service experience at the ED was 76% with 49.5% of the respondents rating the overall care as good. There was no significant relationship between supplies, personnel, infrastructure availability plus processes at the emergency department with the patient service

experience.. Of the patients seen at the ED, (35.7%) were unplanned re-attendants, 6.1% were admitted, and 0.9% left before being seen or without clinician sign off, 0.2% was referred while 0.1% died.

Regarding timelines, the time to clinician was 29.44 minutes, time to initial treatment was 99.56 minutes, and total time at the ED was 111.61 minutes. On average the patients spent 43.08 minutes at the clinician and 55.61minutes at the laboratory.

In conclusion the study showed that the quality of care at the EDs in Bungoma is being affected by lack of adequate infrastructure, trained personnel, equipment, and supplies and processes such lack of triage systems. This has contributed to prolonged turnaround time in the ED and high re-attendance rates.

6.2 Recommendations

6.2.1 Recommendations on Structure

1. The department of health at the Bungoma County develops norms and standards for infrastructure, essential emergency equipment, ED department staffing and essential supplies for emergency care in the emergency departments at public hospitals.
2. The Bungoma County government allocates adequate resources to construct designated emergency departments as per the developed norms and standards at all the 10 public hospitals.
3. The Bungoma county government provides essential emergency equipment and essential supplies as per the developed norms and standards for minimal requirements for the first referral hospital at all the EDs in public hospitals.

4. The county department of health to carry out skills audit and deploy the staff at the emergency department keeping in mind the requisite skills and numbers necessary at the EDs. Enough doctors should be deployed as part of the health care teams at the ED
5. The county develops and implements a policy on the training of the staff working at the ED ensuring all are trained in emergency courses (ATLS, BLS, ACLS, ENMOC, ETAT, PALS.). They can organize in-service training of the staff on the courses.

6.2.2 Recommendations on the Process

1. The health facilities to develop triage systems and patient categorization systems to ensure patients are assigned triage scores and care given as per the triage category
2. The county department of health and the health facilities to develop emergency protocols and ensure patients are managed on emergency care pathways.
3. The county department of health to supply guidelines for emergency care at the EDs

6.2.3 Recommendations on Outcomes

1. The hospitals to carry out patient perception of care surveys at the EDs annually to determine patient experiences and strive to improve patient experience
2. The county department of health to develop specific indicators for monitoring the care provided at the EDs in public hospitals. These reports on the performance at the EDs to be made monthly for decision making at the hospital and county
3. The county government of Bungoma to implement the recommendations of this study so that they can improve the quality of care at EDs

6.3 Recommendations for Future Study

1. Evaluate the quality of emergency care at the private health facilities in Bungoma County
2. Evaluate the quality of emergency care at the primary care facilities, dispensaries and health centers, in Bungoma county
3. Conduct a comprehensive study on patient satisfaction at the emergency departments using SERVQUAL tool.
4. Conduct an assessment of pre-hospital emergency care

REFERENCES

Anest, T., Stewart de Ramirez, S., Balhara, K. S., Hodkinson, P., Wallis, L., & Hansoti, B. (2016). Defining and improving the role of emergency medical services in Cape Town, South Africa. *Emergency Medicine Journal : EMJ*, *33*(8), 557–561. https://doi.org/10.1136/emermed-2015-205177

Arafat, A., Al-Farhan, A., & Abu Khalil, H. (2016). Implementation of the Canadian Emergency Department Triage and Acuity Scale (CTAS) in an Urgent Care Center in Saudi Arabia. *International Journal of Emergency Medicine*, *9*(1), 17. https://doi.org/10.1186/s12245-016-0112-9

Ardagh, M. (2015). What have five years of the shorter stays in the emergency department health target done to us? *The New Zealand Medical Journal (Online)*, *128*(1421), 47.

Armstrong, K., Young, J., Hayburn, A., Irish, B., & Nikoletti, S. (2003). Evaluating the impact of a new high dependency unit. *International Journal of Nursing Practice*, *9*(5), 285–293. https://doi.org/10.1046/j.1440-172X.2003.00439.x

Ayanian, J. Z., & Markel, H. (2016). Donabedian's Lasting Framework for Health Care Quality. *The New England Journal of Medicine*, *375*(3), 205–207.

Baker, T., & Dawson, S. L. (2014). Small rural emergency services still manage acutely unwell patients: A cross-sectional study. *Emergency Medicine Australasia*, *26*(2), 131–138. https://doi.org/10.1111/1742-6723.12229

Bambi, S., Scarlini, D., Becattini, G., Alocci, P., & Ruggeri, M. (2011). Characteristics of Patients Who Leave the ED Triage Area Without Being Seen By a Doctor: A Descriptive Study in an Urban Level II Italian University Hospital. *Journal of Emergency Nursing*, *37*(4), 334–340. https://doi.org/10.1016/j.jen.2010.05.004

Banerjea, K., & Carter, A. O. (2006). Waiting and interaction times for patients in a developing country accident and emergency department. *Emergency Medicine Journal*, *23*(4), 286. https://doi.org/10.1136/emj.2005.024695

Belle, J. M., Cohen, H. J., Shindo, N., Lim, M. L., Velazquez-Berumen, A., Ndihokubwayo, J.-B., & Cherian, M. N. (2010). Influenza preparedness in low-resource settings: a look at oxygen delivery in 12 African countries. *The Journal of Infection in Developing Countries*, *4*(07), 419–424.

Berger, E. (2013). RAND Study Highlights Evolving Value of Emergency Medicine: Emergency Physicians Play Key Role as Gatekeepers to Hospital. *Annals of Emergency Medicine*, *62*(3), A16–A18. https://doi.org/10.1016/j.annemergmed.2013.07.008

Bernard, K., Hasegawa, K., Sullivan, A., & Camargo, C. (2017). A Profile of Indian Health Service Emergency Departments. *Annals of Emergency Medicine*, *69*(6), 705-710.e4. https://doi.org/10.1016/j.annemergmed.2016.11.031

Bodanapally, U. K., Shanmuganathan, K., Nutakki, K., Mirvis, S. E., Sliker, C. W., & Shet, N. (2011). Implementation of 24/7 radiology services in an academic medical centre level 1 trauma centre: Impact on trauma resuscitation unit length of stay and economic benefit analysis. *Injury*, *44*(1), 75–79. https://doi.org/10.1016/j.injury.2011.10.037

Bruijns, S. R., Wallis, L. A., & Burch, V. C. (2008). A prospective evaluation of the Cape triage score in the emergency department of an urban public hospital in South Africa. *Emergency Medicine Journal*, *25*(7), 398. https://doi.org/10.1136/emj.2007.051177

Burke, T. F., Hines, R., Ahn, R., Walters, M., Young, D., Anderson, R. E., … Nelson, B. D. (2014). Emergency and urgent care capacity in a resource-limited setting: an assessment of health facilities in western Kenya. *BMJ Open*, *4*(9), e006132.

Cameron, P. A. (2014). International emergency medicine: Past and future. *Emergency Medicine Australasia*, *26*(1), 50–55.

Carter, E. J., Pouch, S. M., & Larson, E. L. (2014). The Relationship Between Emergency Department Crowding and Patient Outcomes: A Systematic Review. *Journal of Nursing Scholarship*, *46*(2), 106–115. https://doi.org/10.1111/jnu.12055

Chokotho, L., Jacobsen, K. H., Burgess, D., Labib, M., Le, G., Peter, N., … Pandit, H. (2016). A review of existing trauma and musculoskeletal impairment (TMSI) care capacity in East, Central, and Southern Africa. *Injury*, *47*(9), 1990–1995. https://doi.org/10.1016/j.injury.2015.10.036

Constitution, K. (2010). Government Printer. *Kenya: Nairobi*.

Contini, S., Taqdeer, A., Cherian, M., Shokohmand, A. S., Gosselin, R., Graaff, P., & Noel, L. (2010). Emergency and Essential Surgical Services in Afghanistan: Still a Missing Challenge. *World Journal of Surgery*, *34*(3), 473–479. https://doi.org/10.1007/s00268-010-0406-7

Cowling, T. E., Cecil, E. V., Soljak, M. A., Lee, J. T., Millett, C., Majeed, A., … Harris, M. J. (2013). Access to primary care and visits to emergency departments in England: a cross-sectional, population-based study. *PloS One*, *8*(6), e66699.

Cowling, T. E., Soljak, M. A., Bell, D., & Majeed, A. (2014). Emergency hospital admissions via accident and emergency departments in England: time trend, conceptual framework and policy implications. *Journal of the Royal Society of Medicine*, *107*(11), 432–438.

DeLia, D., & Cantor, J. C. (2009). Emergency department utilization and capacity. *The Synthesis Project. Research Synthesis Report*, (17), 1–11.

Donabedian, A. (2005). Evaluating the quality of medical care. *The Milbank Quarterly*, *83*(4), 691–729.

Dünser, M. W., Festic, E., Dondorp, A., Kissoon, N., Ganbat, T., Kwizera, A., … Global Intensive Care Working Group of the European Society of Intensive Care Medicine. (2012). Recommendations for sepsis management in resource-limited settings. *Intensive Care Medicine*, *38*(4), 557–574. https://doi.org/10.1007/s00134-012-2468-5

Ekernas, K., Myers, J., Wangara, A., Maingi, A., Wilson, P., Mutiso, V., … Dunlop, S. (2016). 168 Head Injury is the Leading Cause of Presentation and Admission to a Tertiary Care Center in Kenya: A Descriptive Analysis of Emergency Department Patients at Kenyatta National Hospital. *Annals of Emergency Medicine*, *68*(4), S66.

Evans, C., Hughes, C., & Ferguson, J. (2017). Improving patient safety through the introduction of a formal triage process. *Emergency Nurse*, *24*(9), 19–25. https://doi.org/10.7748/en.2017.e1647

Flessa, S., Moeller, M., Ensor, T., & Hornetz, K. (2011). Basing care reforms on evidence: the Kenya health sector costing model. *BMC Health Services Research*, *11*(1), 128.

Forero, R., McCarthy, S., & Hillman, K. (2011). Access block and emergency department overcrowding. *Critical Care*, *15*(2), 216.

Fry, M., & Ruperto, K. (2009). A 12 month retrospective study of airway management practices. *International Emergency Nursing*, *17*(2), 108–112. https://doi.org/10.1016/j.ienj.2008.11.003

Goldstein, L. N., Morrow, L. M., Sallie, T. A., Gathoo, K., Alli, K., T M M Mothopeng, & Samodien, F. (2017). The accuracy of nurse performance of the triage process in a tertiary hospital emergency department in Gauteng Province, South Africa. *South African Medical Journal*, *107*(3), 243–247. https://doi.org/10.7196/SAMJ.2017.v107i3.11118

Graff, L., Stevens, C., Spaite, D., & Foody, J. (2002). Measuring and improving quality in emergency medicine. *Academic Emergency Medicine*, *9*(11), 1091–1107.

Hirshon, J. M., Risko, N., Calvello, E. J. B., Stewart de Ramirez, S., Narayan, M., Theodosis, C., … Acute Care Research Collaborative at the University of Maryland Global Health Initiative. (2013). Health systems and services: the role of acute care. *Bulletin of the World Health Organization*, *91*(5), 386. https://doi.org/10.2471/BLT.12.112664

Hong, K. J., Shin, S. D., Song, K. J., Cha, W. C., & Cho, J. S. (2013). Association between ED crowding and delay in resuscitation effort. *The American Journal of Emergency Medicine*, *31*(3), 509–515. https://doi.org/10.1016/j.ajem.2012.09.029

House, D. R., Nyabera, S. L., Yusi, K., & Rusyniak, D. E. (2014). Descriptive study of an emergency centre in Western Kenya: challenges and opportunities. *African Journal of Emergency Medicine*, *4*(1), 19–24.

Hsia, R. Y., Mbembati, N. A., Macfarlane, S., & Kruk, M. E. (2012). Access to emergency and surgical care in sub-Saharan Africa: the infrastructure gap. *Health Policy and Planning*, *27*(3), 234–244. https://doi.org/10.1093/heapol/czr023

Huang, Y.-H., Sabljak, L. A., & Puhala, Z. A. (2018). Emergency department patient experience and waiting time. *American Journal of Emergency Medicine*, *36*(3), 510–511. https://doi.org/10.1016/j.ajem.2017.07.093

Hughes, G. (2012). A&E quality indicators. *Emergency Medicine Journal*, *29*(2), 90. https://doi.org/10.1136/emermed-2011-200876

Isaac, T., Zaslavsky, A. M., Cleary, P. D., & Landon, B. E. (2010). The Relationship between Patients' Perception of Care and Measures of Hospital Quality and Safety. *Health Services Research*, *45*(4), 1024–1040. https://doi.org/10.1111/j.1475-6773.2010.01122.x

J Murray Michael. (2003). The Canadian Triage and Acuity Scale: A Canadian perspective on emergency department triage. *Emergency Medicine*, *15*(1), 6–10. https://doi.org/10.1046/j.1442-2026.2003.00400.x

Japiong, K. B., Asiamah, G., Owusu-Dabo, E., Donkor, P., Stewart, B., Ebel, B. E., & Mock, C. N. (2016). Availability of resources for emergency care at a second-level hospital in Ghana: a mixed methods assessment. *African Journal of Emergency Medicine*, *6*(1), 30–37.

Jarvis, P. R. E. (2016). Improving emergency department patient flow. *Clinical and Experimental Emergency Medicine*, *3*(2), 63.

Kang, H., Bastian, N. D., & Riordan, J. P. (2017). Evaluating the Relationship between Productivity and Quality in Emergency Departments. *Journal of Healthcare Engineering*, *2017*(Journal Article). https://doi.org/10.1155/2017/9626918

Karaca, Z., Wong, H. S., & Mutter, R. L. (2012). Duration of patients' visits to the hospital emergency department. *BMC Emergency Medicine*, *12*(1), 15–15. https://doi.org/10.1186/1471-227X-12-15

Kellermann, A. L., Hsia, R. Y., Yeh, C., & Morganti, K. G. (2013). Emergency Care: Then, Now, And Next. *Health Affairs*, *32*(12), 2069–2074. https://doi.org/10.1377/hlthaff.2013.0683

Kellermann, A. L., & Martinez, R. (2011). The ER, 50 years on. *New England Journal of Medicine*, *364*(24), 2278–2279.

Kelly, A.-M. (2013). What is the incidence of major adverse cardiac events in emergency department chest pain patients with a normal ECG, thrombolysis in myocardial infarction score of zero and initial troponin <=99th centile: an observational study? *Emergency Medicine Journal : EMJ*, *30*(1), 15–18. https://doi.org/10.1136/emermed-2011-200810

Kharbanda, A. B., Hall, M., Shah, S. S., Freedman, S. B., Mistry, R. D., Macias, C. G., … Neuman, M. I. (2013). Variation in Resource Utilization Across a National Sample of Pediatric Emergency Departments. *The Journal of Pediatrics*, *163*(1), 230–236. https://doi.org/10.1016/j.jpeds.2012.12.013

Kironji, A. G., Hodkinson, P., de Ramirez, S. S., Anest, T., Wallis, L., Razzak, J., … Hansoti, B. (2018). Identifying barriers for out of hospital emergency care in low and low-middle income countries: a systematic review. *BMC Health Services Research*, *18*(1), 291. https://doi.org/10.1186/s12913-018-3091-0

Kouo-Ngamby, M., Dissak-Delon, F. N., Feldhaus, I., Juillard, C., Stevens, K. A., & Ekeke-Monono, M. (2015). A cross-sectional survey of emergency and essential surgical care capacity among hospitals with high trauma burden in a Central African country. *BMC Health Services Research*, *15*(1), 478.

Lange, R., Popp, S., & Erbguth, F. (2016). Focal point emergency departments. *Der Nervenarzt*, *87*(6), 592.

Latifi, R., Gunn, J. K. L., Stroster, J. A., Zaimi, E., Olldashi, F., Dogjani, A., … Donaldson, R. I. (2016). The readiness of emergency and trauma care in low- and middle-income countries: a cross-sectional

descriptive study of 42 public hospitals in Albania. *International Journal of Emergency Medicine*, *9*(1), 26. https://doi.org/10.1186/s12245-016-0124-5

Lecky, F., Benger, J., Mason, S., Cameron, P., & Walsh, C. (2014). The International Federation for Emergency Medicine framework for quality and safety in the emergency department. *Emergency Medicine Journal*, *31*(11), 926. https://doi.org/10.1136/emermed-2013-203000

Leonardsen, A.-C. L., Grøndahl, V. A., Ghanima, W., Storeheier, E., Schönbeck, A., Løken, T.-A., … Jelsness-Jørgensen, L.-P. (2017). Evaluating patient experiences in decentralised acute care using the Picker Patient Experience Questionnaire; methodological and clinical findings. *BMC Health Services Research*, *17*(1), 685. https://doi.org/10.1186/s12913-017-2614-4

Letvak, S., & Rhew, D. (2015). *Assuring quality health care in the emergency department*. *3*, 726–732. Multidisciplinary Digital Publishing Institute.

Loveday, J., Sachdev, S. P., Cherian, M. N., Katayama, F., Akhtaruzzaman, A. K. M., Thomas, J., … Johnson, W. D. (2017). Survey of Emergency and Essential Surgical, Obstetric and Anaesthetic Services Available in Bangladeshi Government Health Facilities. *World Journal of Surgery*, *41*(7), 1743–1751. https://doi.org/10.1007/s00268-017-3918-6

Magid, D. J., Masoudi, F. A., Vinson, D. R., van der Vlugt, T. M., Padgett, T. G., Tricomi, A. J., … Rumsfeld, J. S. (2005). Older Emergency Department Patients With Acute Myocardial Infarction Receive Lower Quality of Care Than Younger Patients. *Annals of Emergency Medicine*, *46*(1), 14–21. https://doi.org/10.1016/j.annemergmed.2004.12.012

Male, L., Noble, A., Atkinson, J., & Marson, T. (2017). Measuring patient experience: a systematic review to evaluate psychometric properties of patient reported experience measures (PREMs) for emergency care service provision. *International Journal for Quality in Health Care : Journal of the International Society for Quality in Health Care*, *29*(3), 314–326. https://doi.org/10.1093/intqhc/mzx027

Marsh, R. H., & Rouhani, S. A. (2018). Gaps in physical access to emergency care in sub-Saharan Africa. *The Lancet Global Health*, *6*(3), e240–e241. https://doi.org/10.1016/S2214-109X(18)30026-3

Mason, S. (2011). Keynote Address: United Kingdom Experiences of Evaluating Performance and Quality in Emergency Medicine. *Academic Emergency Medicine*, *18*(12), 1234–1238. https://doi.org/10.1111/j.1553-2712.2011.01237.x

Matai, S., Peel, D., Wandi, F., Jonathan, M., Subhi, R., & Duke, T. (2008). Implementing an oxygen programme in hospitals in Papua New Guinea. *Annals of Tropical Paediatrics*, *28*(1), 71–78.

Melon, K. A., White, D., & Rankin, J. (2013). Beat the clock! Wait times and the production of 'quality' in emergency departments. *Nursing Philosophy*, *14*(3), 223–237. https://doi.org/10.1111/nup.12022

Miele, V., Andreoli, C., & Grassi, R. (2006). The management of emergency radiology: Key facts. *European Journal of Radiology*, *59*(3), 311–314. https://doi.org/10.1016/j.ejrad.2006.04.020

Molyneux, E., Ahmad, S., & Robertson, A. (2006). Improved triage and emergency care for children reduces inpatient mortality in a resource-constrained setting. *Bulletin of the World Health Organization*, *84*(4), 314.

Moore, L., Lavoie, A., Bourgeois, G., & Lapointe, J. (2015). Donabedian's structure-process-outcome quality of care model: Validation in an integrated trauma system. *The Journal of Trauma and Acute Care Surgery*, *78*(6), 1168.

Morganti, K. G., Bauhoff, S., Blanchard, J. C., Abir, M., Iyer, N., Smith, A., … Kellermann, A. L. (2013). The evolving role of emergency departments in the United States. *Rand Health Quarterly*, *3*(2).

Muntlin, Å., Gunningberg, L., & Carlsson, M. (2006). Patients' perceptions of quality of care at an emergency department and identification of areas for quality improvement. *Journal of Clinical Nursing*, *15*(8), 1045–1056.

Mwinga, S., Kulohoma, C., Mwaniki, P., Idowu, R., Masasabi, J., English, M., … the SIRCLE Collaboration. (2015). Quality of surgical care in hospitals providing internship training in Kenya: a cross

sectional survey. *Tropical Medicine & International Health*, *20*(2), 240–249. https://doi.org/10.1111/tmi.12422

Myers, J.G., Hunold, K. M., Ekernas, K., Wangara, A. A., Maingi, A., Mutiso, V., … Martin, I. B. K. (2016). 166 A Triple Burden of Disease Revealed by Pilot Prospective Registry in a Major East Africa Accident and Emergency Department. *Annals of Emergency Medicine*, *68*(4), S65. https://doi.org/10.1016/j.annemergmed.2016.08.179

Myers, Justin Guy, Hunold, K. M., Ekernas, K., Wangara, A., Maingi, A., Mutiso, V., … Martin, I. B. K. (2017). Patient characteristics of the Accident and Emergency Department of Kenyatta National Hospital, Nairobi, Kenya: a cross-sectional, prospective analysis. *BMJ Open*, *7*(10). https://doi.org/10.1136/bmjopen-2016-014974

Nakahara, S., Sakamoto, T., Fujita, T., Uchida, Y., Katayama, Y., Tanabe, S., & Yamamoto, Y. (2017). Evaluating quality indicators of tertiary care hospitals for trauma care in Japan. *International Journal for Quality in Health Care*, *29*(8), 1006–1013.

Nascimento, B. R., Brant, L. C. C., Marino, B. C. A., Passaglia, L. G., & Ribeiro, A. L. P. (2019). Implementing myocardial infarction systems of care in low/middle-income countries. *Heart*, *105*(1), 20. https://doi.org/10.1136/heartjnl-2018-313398

Ogendi, Japheths, Odero, W., Mitullah, W., & Khayesi, M. (2013). Pattern of Pedestrian Injuries in the City of Nairobi: Implications for Urban Safety Planning. *Journal of Urban Health*, *90*(5), 849–856. https://doi.org/10.1007/s11524-013-9789-8

Ogendi, JOK, & Ayisi, J. (2011). Causes of injuries resulting in a visit to the emergency department of a Provincial General Hospital, Nyanza, western Kenya. *African Health Sciences*, *11*(2).

Ogunmola, O. J., & Olamoyegun, M. A. (2014). Patterns and outcomes of medical admissions in the accident and emergency department of a tertiary health center in a rural community of Ekiti,

Nigeria. *Journal of Emergencies, Trauma, and Shock*, *7*(4), 261–267. https://doi.org/10.4103/0974-2700.142744

Ogunnowo, B. E., Olufunlayo, T. F., & Sule, S. S. (2015). Client perception of service quality at the outpatient clinics of a General hospital in Lagos, Nigeria. *Pan African Medical Journal*, *22*(1).

O'Neill, K., Takane, M., Sheffel, A., Abou-Zahr, C., & Boerma, T. (2013). Monitoring service delivery for universal health coverage: the Service Availability and Readiness Assessment. *Bulletin of the World Health Organization*, *91*(12), 923.

Otgon, B., Lundeg, G., Tsenddorj, G., Jochberger, S., Grander, W., Baelani, I., … Dünser, M. W. (2010). Nationwide survey on resource availability for implementing current sepsis guidelines in Mongolia. *Bulletin of the World Health Organization*, *88*, 839–846.

Ouma, P. O., Maina, J., Thuranira, P. N., Macharia, P. M., Alegana, V. A., English, M., … Snow, R. W. (2018). Access to emergency hospital care provided by the public sector in sub-Saharan Africa in 2015: a geocoded inventory and spatial analysis. *The Lancet Global Health*, *6*(3), e342–e350. https://doi.org/10.1016/S2214-109X(17)30488-6

Rampanjato, R. M., Florence, M., Patrick, N. C., & Finucane, B. T. (2007). Factors influencing pain management by nurses in emergency departments in Central Africa. *Emergency Medicine Journal*, *24*(7), 475. https://doi.org/10.1136/emj.2006.045815

Reinhardt, M. R. (2017). A Systematic Approach to Evaluation of Performance Deficiencies in ED Triage. *Journal of Emergency Nursing*, *43*(4), 329–332. https://doi.org/10.1016/j.jen.2017.01.003

Ribeiro, S., Petrini, C., Marino, L., & Brandao-Neto, R. (2015). Implementation of a horizontal intensive care team can impact efficiency in an emergency observation unit in Brazil. *Critical Care*, *19*(1), P520. https://doi.org/10.1186/cc14600

Schuur, J. D., & Venkatesh, A. K. (2012). The growing role of emergency departments in hospital admissions. *The New England Journal of Medicine*, *367*(5), 391. https://doi.org/10.1056/NEJMp1204431

Shah, M. T., Bhattarai, S., Lamichhane, N., Joshi, A., LaBarre, P., Joshipura, M., & Mock, C. (2015). Assessment of the availability of technology for trauma care in Nepal. *Injury*, *46*(9), 1712–1719. https://doi.org/10.1016/j.injury.2015.06.012

Sills, M. R., Fairclough, D., Ranade, D., & Kahn, M. G. (2011). Emergency Department Crowding Is Associated With Decreased Quality of Care for Children With Acute Asthma. *Annals of Emergency Medicine*, *57*(3), 191-200.e7. https://doi.org/10.1016/j.annemergmed.2010.08.027

Smith, J. E., Russell, R., & Horne, S. (2011). Critical decision-making and timelines in the emergency department. *Journal of the Royal Army Medical Corps*, *157*(Suppl 3), S273–S276.

Son, N. T., Thu, N. H., Tu, N. T. H., & Mock, C. (2007). Assessment of the status of resources for essential trauma care in Hanoi and Khanh Hoa, Vietnam. *Injury*, *38*(9), 1014–1022. https://doi.org/10.1016/j.injury.2007.04.010

Sørup, C., Jacobsen, P., & Forberg, J. (2013). *Evaluation of emergency department performance – a systematic review on recommended performance and quality-in-care measures* (Vol. 21). https://doi.org/10.1186/1757-7241-21-62

Southerland, L. T., Simerlink, S. R., Vargas, A. J., Krebs, M., Nagaraj, L., Miller, K. N., … Barrie, M. G. (2018). Beyond observation: Protocols and capabilities of an Emergency Department Observation Unit. *The American Journal of Emergency Medicine*, (Journal Article). https://doi.org/10.1016/j.ajem.2018.12.049

Spiegel, D A, Droti, B., Relan, P., Hobson, S., Cherian, M. N., & O'Neill, K. (2017). Retrospective review of Surgical Availability and Readiness in 8 African countries. *BMJ Open*, *7*(3), e014496. https://doi.org/10.1136/bmjopen-2016-014496

Spiegel, David A, Abdullah, F., Price, R. R., Gosselin, R. A., & Bickler, S. W. (2013). World Health Organization global initiative for emergency and essential surgical care: 2011 and beyond. *World Journal of Surgery*, *37*(7), 1462–1469.

Swanson, C. (2014). Reorganizing a Resuscitation Room Using Six Sigma (6S) Principles. *Journal of Emergency Nursing*, *40*(4), 371–376. https://doi.org/10.1016/j.jen.2013.04.006

Tataris, K. L., Mercer, M. P., & Govindarajan, P. (2015). Prehospital aspirin administration for acute coronary syndrome (ACS) in the USA: an EMS quality assessment using the NEMSIS 2011 database. *Emergency Medicine Journal*, *32*(11), 876. https://doi.org/10.1136/emermed-2014-204299

Thomassen, O., Mann, C., Mbwana, J. S., & Brattebo, G. (2015). Emergency medicine in Zanzibar: the effect of system changes in the emergency department. *International Journal of Emergency Medicine (Online)*, *8*. https://doi.org/10.1186/s12245-015-0072-5

Venkatesh, A. K., Geisler, B. P., Gibson Chambers, J. J., Baugh, C. W., Bohan, J. S., & Schuur, J. D. (2011). Use of observation care in US emergency departments, 2001 to 2008. *PloS One*, *6*(9), e24326. https://doi.org/10.1371/journal.pone.0024326

Viñuales, I., Monzón-Fernández, A., Viñuales, M., & Sanclemente, T. (2018). Evaluation of the triage performed by registered nurses in the Hospital Clínico Universitario “Lozano Blesa” Emergency service (Saragossa, Spain). *Enfermería Clínica (English Edition)*.

Wachira, B., & Martin, I. B. (2011). The state of emergency care in the Republic of Kenya. *African Journal of Emergency Medicine*, *1*(4), 160–165.

Wachira, B. W., & Smith, W. (2013). Major incidents in Kenya: the case for emergency services development and training. *Prehospital and Disaster Medicine*, *28*(2), 170–173.

Wachira, B. W., Wallis, L. A., & Geduld, H. (2012). An analysis of the clinical practice of emergency medicine in public emergency departments in Kenya. *Emergency Medicine Journal*, *29*(6), 473. https://doi.org/10.1136/emj.2011.113753

Weil, A. R. (2017). Emergency Departments, Behavioral Health, And More. *Health Affairs*, *36*(10), 1695–1695. https://doi.org/10.1377/hlthaff.2017.1188

Wesson, H. K., Bachani, A. M., Wekesa, J. M., Mburu, J., Hyder, A. A., & Stevens, K. A. (2013). Assessing trauma care at the district and provincial hospital levels: a case study of hospitals in Kenya. *Injury*, *44*, S75–S80.

Wiler, J. L., Gentle, C., Halfpenny, J. M., Heins, A., Mehrotra, A., Mikhail, M. G., & Fite, D. (2010). Optimizing Emergency Department Front-End Operations. *Annals of Emergency Medicine*, *55*(2), 142-160.e1. https://doi.org/10.1016/j.annemergmed.2009.05.021

Wong, E. G., Gupta, S., Deckelbaum, D. L., Razek, T., Kamara, T. B., Nwomeh, B. C., … Kushner, A. L. (2014). The International Assessment of Capacity for Trauma (INTACT): an index for trauma capacity in low-income countries. *Journal of Surgical Research*, *190*(2), 522–527.

Zègre-Hemsey, J., Sommargren, C. E., & Drew, B. J. (2011). Initial ECG Acquisition Within 10 Minutes of Arrival at the Emergency Department in Persons With Chest Pain: Time and Gender Differences. *Journal of Emergency Nursing*, *37*(1), 109–112. https://doi.org/10.1016/j.jen.2009.11.004

Zimmermann, M., Brokmann, J. C., Gräff, I., Kumle, B., Wilke, P., & Gries, A. (2016). Emergency departments--2016 update. *Der Anaesthesist*, *65*(4), 243.

APPENDICES

APPENDIX 1: MAP OF STUDY AREA

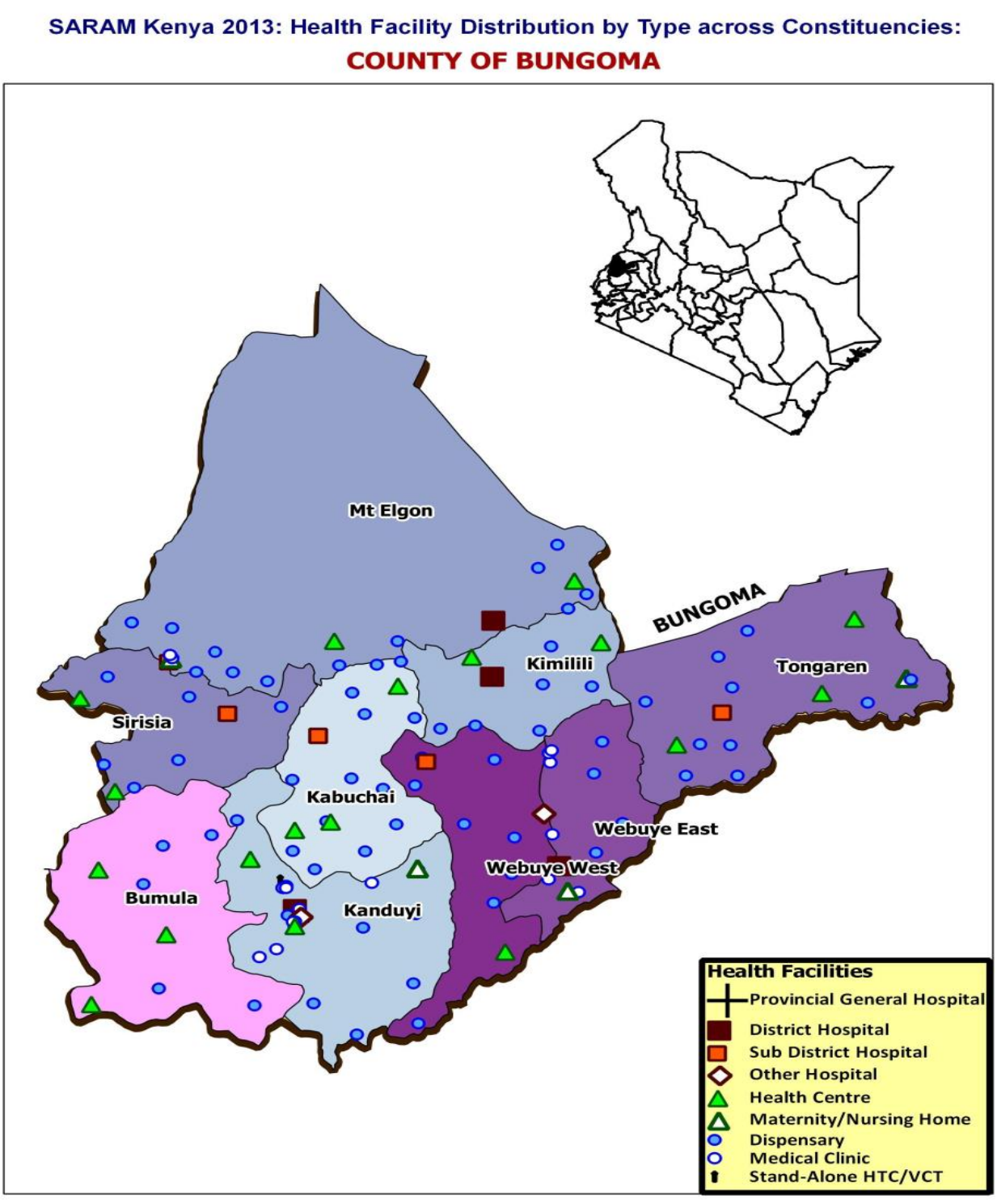


Figure 9 Map of Bungoma County

APPENDIX 2: QUESTIONNAIRE

ASSESSMENT OF QUALITY OF CARE AT THE EMERGENCY DEPARTMENTS AT PUBLIC HOSPITALS IN BUNGOMA COUNTY

Objective: *to assess the gaps in the availability of emergency care at emergency departments in Bungoma county hospitals.*

Respondent/Cadre _____

Gender M/F _____

Position at the ED_____

Qualification _____

Role at the ED _____

How long have you worked at the ED_____

Name of facility_____

Date_____

Questions

1. Do you have an area designated for emergency care? *YES/NO*___If NO where do you offer emergency care to the out patients_____
2. Do you have the following rooms at the emergency department?
   (a) Waiting bay YES ___NO___
   (b) Triage area YES ___NO___
   (c) Resuscitation room YES ___NO___
   (d) Priority 1 area YES ___NO___
   (e) Priority 2 area YES ___NO___
   (f) Priority 3 area YES ___NO___
   (g) Procedure room YES ___NO___
   (h) High dependency unit YES ___NO___
   (i) Imaging/radiology YES ___NO___
   (j) Laboratory YES ___NO___
   (k) Observation room with beds YES ___NO___
3. Do you have running water at the Emergency department? YES ___NO___
4. Do you have an electricity source/operational power generator? YES ___NO___

5. Do you have oxygen cylinder or Concentrator supply with tubing and mask at the emergency department? YES ___NO___
6. Do you have the following carts at the emergency department?
    (a) An emergency cart YES ___NO___
    (b) Trauma cart YES___NO___
7. Do you have a blood bank available at the facility? YES ___NO___
8. Is there a list of extra personnel to be contacted in disaster situations? YES____NO_____
9. Please indicate the number of personnel per cadre

Table 26 Questionnaire on personnel at ED at training in emergency care

Cadre	Qualified Number available	How many have undertaken trainings below in the past 1 year				
		ATLS	BLS	ACLS	ETAT	ENMOC
Emergency physician						
Internist physician						
General surgeon						
Orthopedic surgeon						
Pediatrician						
Emergency nurses						
General nurses						
Radiologist						
Radiographer						
Sonographer						
Medical officers						
Pharmacists						
Drivers						
Casuals						
Clinical officer						
Anesthesiologists						
Gynecologists						
Health records and information						
Laboratory technologist						

10. Do you have an electrocardiogram (ECG) machine at the emergency department?

YES___NO___

11. Do you have a portable point of care ultrasound machine?

YES___NO___

12. Do you have aspirin on your emergency cart?

YES___NO___

13. Do you have a functioning pulse oximeter available?

YES___NO___

14. Do you have a nebulizer machine?

YES___NO___

15. Do you have an operational anesthesia machine?

YES___NO___

16. Do you have a functional X-ray machine available?

YES___NO___

17. Do you have a facility available to test hemoglobin, GXM, random blood sugar and urine?

YES___NO___

18. Is a list of essential emergency care equipment available?

YES___NO___

19. Is the emergency equipment in working order?

YES___NO___

20. Is there access to repair if the equipment fails?

YES___NO___

21. Is there access to repair within the health care facility?

YES___NO___

22. Is there access to repair outside the health care facility?

YES___NO___

23. Is there an agreement for maintenance of the equipment with the supplier?

YES___NO___

24. Does the health care staff in the emergency room get trained in the use of the equipment?

YES___NO___

25. Is the information available on supply, repair, and spare parts for the equipment?

YES___NO___

26. Do you have a triage system the ED?

YES___NO__

27. Do you perform 12-lead ECG for non traumatic chest pain?

YES__NO__

28. Do you perform 12-lead EKG for syncope?

YES__NO__

29. Do you administer aspirin for all patients arriving with acute non traumatic chest pain on arrival? YES___NO___

30. Do you take the following vital signs routinely for community acquired pneumonia at the emergency room?

Table 27 Questionnaire on Vital signs

Vital Signs	YES/NO
Respiratory Rate	
Pulse Rate	
SPO2	
Assessment of Mental Status	
Empiric Antibiotics	

31. Do you have the following management guidelines available for emergency care?

Table 28 questionnaire on Availability of Emergency Guidelines

Guideline	YES/NO
Advanced Trauma Life Support(ATLS)	
Basic Life Support(BLS)	
Advanced Cardiac Life Support(ACLS)	
Pediatric Advanced Life Support(PALS)	
Emergency Triage Assessment and Treatment(ETAT)	
Pain relief	
Obstetric	
Surgery	
Anesthesia	
Referral	

32. Do you keep medical records? YES__NO__

33. Is there policy to promote training for health staff in emergency care for trauma, obstetric, basic life support, advanced life training support, pediatric life support(both basic and advanced) YES____NO____

34. Do you have capacity to carry out the following procedures? Indicate with YES or NO

Table 29 Emergency Procedures performed at the ED

PROCEDURE	YES/NO
Airway management	
Removal of foreign body- throat, eye ear, nose	
Cricothyroidotomy	
Tracheostomy	
Chest tube insertion	
Cardiopulmonary resuscitation	
Peripheral venous cut down	
Acute burn management	
Suturing	
Wound debridement	
MVA	
Incision and drainage of an abscess	
Closed fracture management	
Open fracture treatment	
Joint dislocation treatment	
Amputation	
Anesthesia blocks	
Ketamine anesthesia	

35. Please list the Top 10 conditions seen at the emergency department

_____ _____ _____

_____ _____ _____

_____ _____ _____

36. Patient outcomes in numbers in past three months

Total No of patients seen at the ED in the past 3months_____

Admitted _____

Discharged _____

Referred_____

Left without being seen_____

Died_____

Unplanned re attendance_____

Left before clinician/consultant sign off_____

APPENDIX 3: CHECKLIST

HOSPITAL EMERGENCY CARE CHECK LIST AT EMERGENCY ROOMS IN HOSPITALS AT BUNGOMA COUNTY

FACILITY NAME_____ DATE _____

Checklist to be filled by the investigator during observation

Table 30 Emergency Observation Checklist

CAPITAL OUTLAYS		QUANTITY	DATE CHECKED
1.Rescitator bag valve and mask(Adult)			
2. Resuscitator bag valve and mask (pediatric)			
3.Oxygen source (cylinder/concentrator) with mask and tubing			
4.Stethoscope			
5.Sunction pump (Manual or electric) with catheter			
6.Blood pressure measuring equipment			
7.Thermometer			
8.Scapels with Blades			
9.Retractor			
10.Scissors			
11.oropharyngeal airway (adult size)			
12.oropharyngeal airway (pediatric size)			
13.Forcep/artery			
14.Gloves(sterile)			
15. Gloves(examination)			
16.sterilizer			
17.Vaginal speculum			
18.Inventory List of equipment and supplies			
19.Best practice guidelines for emergency care	ATLS		
	ACLS		
	BLS		
	ENMOC		
	ETAT		

RENEWABLE ITEMS	QUANTITY	DATE CHECKED
20.Nasogastric tubes		
21.Light source(lamp/flash light)		
22.intravenous fluid infusion sets		
23.Intravenous cannulas or scalp veins infusion set		
24.syringes with needles (disposable)		
25.Sharps disposal container		
26.tourniquet		
27.Needles and sutures		
28.Splints for arm and leg		
29.urinary catheters (Foley disposable)		
30.waste disposal Container		
31. Face Masks		
32.Eye protection		
33.Protective Gowns/ aprons		
34. Soap		
SUPPLEMENTARY FOR USE BY SKILLED HEALTH PROFESSIONALS	QUANTITY	DATE CHECKED
35.Magill forceps (Adults)		
36. Magill forceps (pediatrics)		
37.Endotracheal tubes(adults)		
38. Endotracheal tubes (pediatrics)		
39. IV infuser bags		
40. Chest tube insertion equipment		
41. Laryngoscope Handle		
42. Laryngoscope Macintosh blades (adults) with bulbs and batteries.		
43. Laryngoscope Macintosh blades (pediatrics) with bulbs and batteries.		
44. Cricothyroidotomy set		

APPENDIX 4: PATIENT QUESTIONNAIRE

QUESTIONAIRE ON ED RESPONSE AND PATIENT SERVICE EXPERIENCE

Respondent/Patients

Gender _____

Age_____

Date_____

Signature _____

1. Overall, how would you rate the care you received today?

   ☐ Excellent ☐ Good ☐ Fair ☐ Poor ☐ Very poor

2. Did you get the kind of service you needed?

   ☐ No, definitely ☐ No, not really ☐ Yes, generally ☐ Yes, definitely

3. How respectful were the staff and healthcare professionals you saw?

   ☐ Excellent ☐ Good ☐ Fair ☐ Poor ☐ Very poor

4. How well did your healthcare provider answer your questions?

   ☐ Excellent ☐ Good ☐ Fair ☐ Poor ☐ Very poor

5. How easy was it to access the service you received?

   ☐ Excellent ☐ Good ☐ Fair ☐ Poor ☐ Very poor

6. How would you rate the interpretive service you received?

   ☐ Excellent ☐ Good ☐ Fair ☐ Poor ☐ Very poor

7. How do you rate the time it took to get this appointment?

   ☐ Excellent ☐ Good ☐ Fair ☐ Poor ☐ Very poor

8. How would rate the time you had to wait in the waiting room?

   ☐ Excellent ☐ Good ☐ Fair ☐ Poor ☐ Very poor

9. Were you asked about the medications you take?

   ☐ Yes ☐ No

10. Were you asked to confirm your identity (i.e. by your date of birth, health care card etc?

☐ Yes ☐ No

11. Did you see hand-washing or sanitizing stations?

☐ Yes ☐ No

12. Did you notice signs or posters that told you to wash hands?

☐ Yes ☐ No

13. Were you given information of follow-up care?

☐ Yes ☐ Somewhat ☐ No

14. Were you kept informed about the care planned for you?

☐ Yes ☐ Somewhat ☐ No

15. Were you involved with the decisions affecting your care?

☐ Yes ☐ Somewhat ☐ No

16. Was your treatment or procedure clearly explained to you?

☐ Yes ☐ Somewhat ☐ No

APPENDIX 5: WAITING TIME/ TIME TO TREATMENT CARD

Please indicate time arrived and left each of the following sections

Table 31 Waiting Card/ Time stamps card

Department	Arrived	Left	Total time at department
Registration			
Triage			
Clinician			
Eye			
Ear			
Radiology/imaging			
Laboratory			
Pharmacy			
Registration			
Time left the hospital			
Time admitted			
Time arrived in the ward			
Time initial medication started			

APPENDIX 6: RESPONDENT CONSENT FORM

My name is DAVID WANIKINA MUKE a Graduate student at the school of medicine in MASENO UNIVERSITY. I am carrying out a research on the QUALITY OF MEDICAL CARE TO PATIENTS AT EMERGENCY DEPARTMENTS AT BUNGOMA COUNTY PUBLIC HOSPITALS, KENYA. My co-investigators are Professor Wilson Odero and Professor Ng'wena Magak both lecturers at the school of medicine, Maseno university.

Objectives of the study are to assess the quality of emergency care to patients presenting at emergency departments at public hospitals in Bungoma County: to evaluate infrastructure availability necessary for emergency medical care at emergency departments in Bungoma county; to determine essential equipment, essential drugs, personnel, consumables, and non consumables available for offering emergency care at the emergency departments in Bungoma County; to examine processes and protocols involved in provision of emergency care in the emergency department; To determine patient perceptions as regards service at emergency departments in hospitals in Bungoma County; To identify the medical conditions and outcomes at the emergency departments in Bungoma county

The Study will be conducted at the outpatient emergency units of all the 10 public hospitals in Bungoma County. The purpose of this study is to assess the quality of emergency medical care to patients presenting to public hospital Emergency departments in Bungoma County. It is hoped that the findings obtained from this study will inform development of norms and standards of emergency care and identify gaps in service delivery to be corrected.

The study involves you answering a questionnaire and filling out a time sequence card as you receive your care and at the end as you exit the emergency unit. The questionnaire has 16

questions which will take less than 10 minutes to complete. The study will not alter the usual service delivered at the unit. It is a one off exercise which does not require you to follow up and no specimen will be collected from you. We would be glad to answer any concerns regarding the study from you and commit to update you should any changes arise during the study period.

You can voluntarily participate or withdraw at any time without penalties. We do not anticipate any harm or risk to arise from the study. The study is beneficial as it will identify gaps in care and inform need for interventions to improve care to patients in future.

All information received will be Confidential and confidentiality will be observed throughout the study, the information given will be used specifically for the study. We will not require your names nor expose the source of information to any one without your consent.

You will be required to give informed consent before we begin the interview. For patients who are minors or unstable assent will be sort from the caretakers/parents/guardians and will answer questionnaire.

For any questions or concerns about the study or in the event of a study-related injury, contact person is DAVID WANIKINA MUKE Mobile phone no 0721517633 at any time day or night, physical address Maseno university School of medicine private bag Maseno.

For any questions pertaining to rights as a research participant, contact person is: The Secretary, Maseno University Ethics Review Committee, Private Bag, Maseno; Telephone numbers: 057-51622, 0722203411, 0721543976, 0733230878; Email address: muerc-secretariate@maseno.ac.ke; muerc-secretariate@gmail.com.

I invite you to participate in this study by signing below

Having read/ been read to and understood the above information that the study, I hereby freely give my consent to take part in this research study.

PARTICIPANTS SIGNATURE……..... DATE……

INVESTIGATORS SIGNATURE……DATE……

WITNESS SIGNATURE……DATE…….

KIBALI CHA HIARI

Jina langu ni DAVID WANIKINA MUKE, Mwanafunzi anayesomea shahada ya uzamili kwenye shule ya matibabu, chuo Kikuu cha Maseno. Kwa sasa ninafanya utafiti kuhusu kiwango cha ubora wa huduma za matibabu kwenye idara ya dharura kwa wagonjwa wajao katika hospitali za umma kaunti ya Bungoma Kenya. Watafiti wenzangu ni Profesa Wilson Odero na Profesa Ng'wena Magak wote waadhiri katika shule ya masomo ya matibabu kwenye chuo kikuu cha Maseno.

Utafiti huu unafanyika kwenye idara za dharura Kwa wagonjwa wajao kwa mara ya kwanza katika hospitali 10 za umma kaunti ya Bungoma. Utafiti huu unalenga kufahamu kiwango cha ubora wa huduma za dharura kwa wagonjwa katika hospitali za umma katika kaunti ya Bungoma. Ni tamanio letu kwamba utafiti huu utasababisha kuweko kwa viwango vya ubora wa matibabu ya dharura. Pia twarajia kwamba utaonyesha utepetefu katika huduma ambayo itarekebishwa.

Hitaji letu kwako ni kujibu maswali na kutufuatilia kwa kujaza fomu za saa ambazo umepata huduma. Ujaze saa wakati unapohudumiwa lakini maswali utajibu ukisha ruhusiwa kutoka idara ya dharura. Maswali ni 16 na itachukuwa chini ya dakika kumi kujibu. Utafiti huu hautadhuru upokeaji wa huduma katika idara hii. Inahitaji tu kujibu maswali haya kwa safari moja pekee na hakuna damu/kinyesi ama chochote kitachukuliwa kwako. Twajitolea kujibu maswali yoyote utakayokuwa nayo na kukujulisha mabadiliko yatokeyayo wakati wa utafiti.

Uko na uhuru wa kuamua kushiriki au kutoshiriki na Pia waweza kujiondoa wakati wowote. Hakuna madhara yanayotarajiwa kutokea kwa sababu ya utafiti huu. Twatazamia kuwa uzuri wa

utafiti huu itakuwa kutambua ulegevu uliopo katika huduma, kuirekebisha ili tuwe na mbinu bora za kutoa huduma.

Kuna hakikisho la usiri kuwekwa wakati wowote, na maelezo tutakayo yapata kwako yatatumika tu kwa ajili ya utafiti huu. Hatutahitaji majina yako na pia hatutatoa ujumbe uliotupa bila idhini yako.

Utahitajika kupeana idhini kuwa umeelewa kwa kuweka sahihi ya hiari yakukubali kabla ya utafiti kuanza. Kwa watoto chini ya miaka kumi na minane na wagonjwa waliomahututi, tutapata idhini ya hiari na kuelewa kutoka kwa wanaowalinda au wazazi wao ambao pia watasaidia kujibu maswali.

Ikiwa utakuwa na swali lolote kuhusiana na utafiti huu ama pengine kukiwa na madhara kwa sababu ya utafiti , mtafute DAVID WANIKINA MUKE, simu ya rununu 0721517633 wakati wowote iwe usiku au mchana.Waweza pia kumpata katika Shule ya masomo ya matibabu , chuo kikuu cha Maseno. Sanduku la posta private bag Maseno.

Kwa maswali kuhusu haki za Yule amekubali kushiriki utafiti uliza katibu wa kamati ya ukaguzi wa maadili ya utafiti, chuu kikuu cha Maseno. Mtafute : katibu nambari ya simu: 057-51622, 0722203411, 0721543976, 0733230878; barua pepe: muerc-secretariate@maseno.ac.ke; muerc-secretariate@gmail.com.

Nakukaribisha ushiriki utafiti huu kwa kutia sahihi.

Baada ya maelezo haya, nimeelewa niliyo yasoma au kusomewa . Nakubali kushiriki utafiti huu.

SAHIHI YA MSHIRIKI…… TAREHE……

SAHIHI YA MTAFITI……TAREHE……

SAHIHI YA SHAHIDI……TAREHE……..

APPENDIX 7: MASENO UNIVERSITY ETHICS REVIEW COMMITTEE APPROVAL

Figure 10 MUERC - Ethical review approval letter

MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3050
Fax: +254 057 351 221

Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 25th August, 2017

TO: David Wanikina Muke
PG/MMED/SM/00118/2014
Department of Family and Emergency Medicine
School of Medicine, Maseno University
P. O. Box, Private Bag, Maseno, Kenya

REF:MSU/DRPI/MUERC/00425/17

RE: Quality of Medical Care at the Emergency Departments in Public Hospitals in Bungoma County, Kenya. Proposal Reference Number MSU/DRPI/MUERC/00425/17

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues raised at the initial review were adequately addressed in the revised proposal. Consequently, the study is granted approval for implementation effective this 25th day of August, 2017 for a period of one (1) year.

Please note that authorization to conduct this study will automatically expire on 24th August, 2018. If you plan to continue with the study beyond this date, please submit an application for continuation approval to the MUERC Secretariat by 15th July, 2018.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach the MUERC Secretariat by 15th July, 2018.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advice MUERC when the study is completed or discontinued.

Thank you.

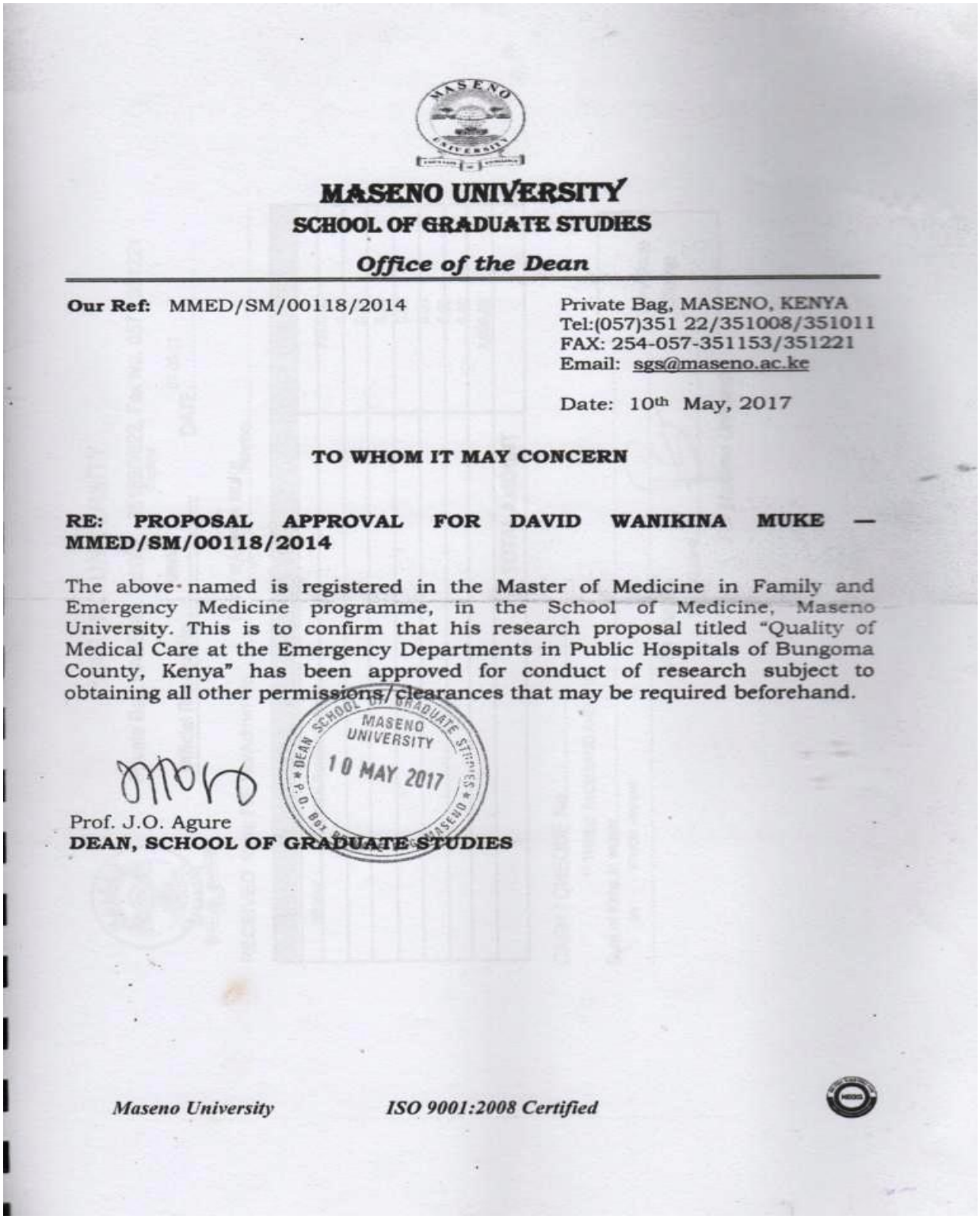
DIRECTORATE OF RESEARCH PUBLICATION & CONSULTANCIES 25 AUG 2017 MASENO UNIVERSITY

Dr. Bonuke Anyona,
Secretary,
Maseno University Ethics Review Committee

Cc: Chairman,
Maseno University Ethics Review Committee.

APPENDIX 8: SCHOOL OF GRADUATE STUDIES APPROVAL

Figure 11 School of graduate studies letter of approval



MASENO UNIVERSITY

SCHOOL OF GRADUATE STUDIES

Office of the Dean

Our Ref: MMED/SM/00118/2014

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
FAX: 254-057-351153/351221
Email: sgs@maseno.ac.ke

Date: 10th May, 2017

TO WHOM IT MAY CONCERN

RE: PROPOSAL APPROVAL FOR DAVID WANIKINA MUKE — MMED/SM/00118/2014

The above named is registered in the Master of Medicine in Family and Emergency Medicine programme, in the School of Medicine, Maseno University. This is to confirm that his research proposal titled "Quality of Medical Care at the Emergency Departments in Public Hospitals of Bungoma County, Kenya" has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required beforehand.

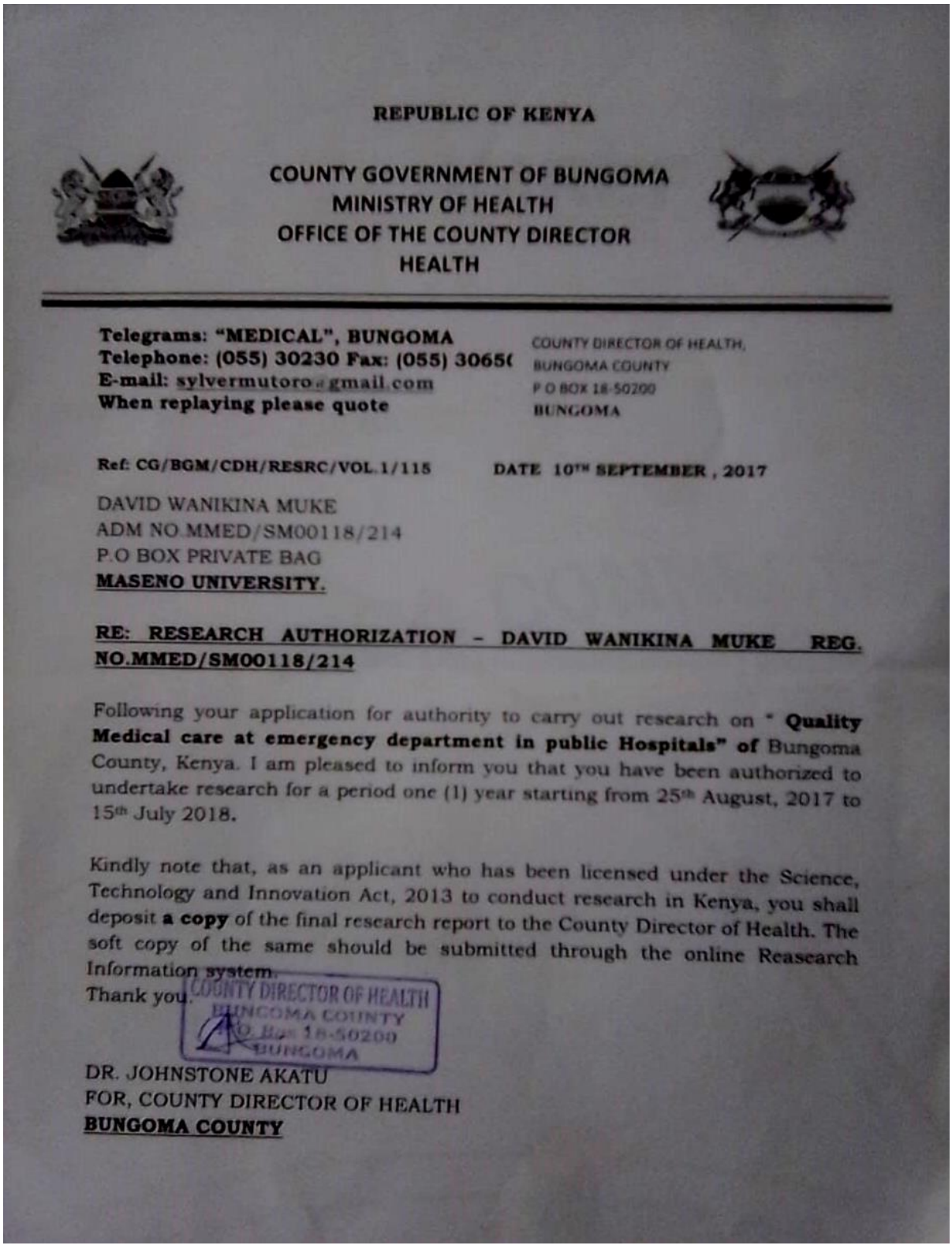
MASENO UNIVERSITY
10 MAY 2017

Prof. J.O. Agure
DEAN, SCHOOL OF GRADUATE STUDIES

Maseno University *ISO 9001:2008 Certified*

APPENDIX 9: Bungoma County Director of Health Research Authorization

Figure 12 Bungoma County Director of Health Research Authorization



REPUBLIC OF KENYA

COUNTY GOVERNMENT OF BUNGOMA
MINISTRY OF HEALTH
OFFICE OF THE COUNTY DIRECTOR
HEALTH

Telegrams: "MEDICAL", BUNGOMA
Telephone: (055) 30230 Fax: (055) 3065(
E-mail: sylvermutoro@gmail.com
When replaying please quote

COUNTY DIRECTOR OF HEALTH,
BUNGOMA COUNTY
P O BOX 18-50200
BUNGOMA

Ref: CG/BGM/CDH/RESRC/VOL.1/115 **DATE 10TH SEPTEMBER , 2017**

DAVID WANIKINA MUKE
ADM NO.MMED/SM00118/214
P.O BOX PRIVATE BAG
MASENO UNIVERSITY.

RE: RESEARCH AUTHORIZATION - DAVID WANIKINA MUKE REG. NO.MMED/SM00118/214

Following your application for authority to carry out research on " **Quality Medical care at emergency department in public Hospitals" of** Bungoma County, Kenya. I am pleased to inform you that you have been authorized to undertake research for a period one (1) year starting from 25th August, 2017 to 15th July 2018.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit **a copy** of the final research report to the County Director of Health. The soft copy of the same should be submitted through the online Reasearch Information system.
Thank you.

COUNTY DIRECTOR OF HEALTH
BUNGOMA COUNTY
P.O. Box 18-50200
BUNGOMA

DR. JOHNSTONE AKATU
FOR, COUNTY DIRECTOR OF HEALTH
BUNGOMA COUNTY

APPENDIX 10: WHO needs assessment & evaluation for essential emergency equipment in the ED

Figure 13 WHO needs assessment and evaluation form for Essential Emergency Equipment in the ED

World Health Organization

NEEDS ASSESSMENT & EVALUATION FORM
FOR ESSENTIAL EMERGENCY EQUIPMENT IN THE EMERGENCY ROOM*
Emergency and Essential Surgical Care (EESC) Training Workshop

** "Emergency Room" denotes any entry point in a health facility such as an Emergency Room, Admission Room, Treatment Room, Casualty Room*

NAME OF HEALTH CARE FACILITY _____

ADDRESS OF HEALTH CARE FACILITY

STREET _____

CITY _____ COUNTRY _____

TYPE OF HEALTH CARE FACILITY
Please check one

- ☐ Primary or First Referral-Level Facility / District Hospital / Rural Hospital
- ☐ Health Centre
- ☐ Teaching Hospital

HUMAN RESOURCES IN THE EMERGENCY ROOM
Please indicate number of health staff

- ☐ Specialist Doctors
- ☐ Doctors
- ☐ Nurses
- ☐ Clinical / Health Officers
- ☐ Technicians
- ☐ Paramedical Staff

PHYSICAL RESOURCES *Please check one*

• INFRASTRUCTURE	YES	NO
Is there an area or room designated for emergency care?	☐	☐
Is there running water? *Please check one* *If you chose 'Yes', is it* Interrupted *or* Uninterruped?	☐ Interrupted ☐ Uninterruped	☐
Is there an electricity source? *Please check one* *If you chose 'Yes', is it* Interrupted *or* Uninterruped?	☐ Interrupted ☐ Uninterruped	☐
• EQUIPMENT		
Is a list of essential emergency care equipment available?	☐	☐
Are the following available:	☐ Interrupted ☐ Uninterruped	☐
Oxygen cylinder?		
Oxygen concentrator?	☐ Interrupted ☐ Uninterruped	☐
Equipment for oxygen administration? E.g. tubes, masks	☐	☐

ESSENTIAL EMERGENCY (EE) EQUIPMENT *Please check one*

	YES in ALL equipment	YES in SOME equipment	NO
Is the EE equipment in working order?	☐	☐	☐

WHO/HPW/CPR 2004, reformatted 2012

World Health Organization

Is there access to repair if equipment fails?	☐	☐	☐
Is there access to repair within the health care facility?	☐	☐	☐
Is there access to repair outside the health care facility?	☐ 1 – 25 km ☐ 26 – 50 km ☐ 51 – 200 km ☐ > 200 km	☐ 1 – 25 km ☐ 26 – 50 km ☐ 51 – 200 km ☐ > 200 km	☐
Is there an agreement for the maintenance of the equipment with the supplier?	☐	☐	☐
Does the health care staff in the Emergency Room get training in the use of the equipment?	☐	☐	☐
Is information available on supply, repair and spare parts for the equipment?	☐	☐	☐

QUALITY, SAFETY, ACCESS AND USE *Please check one*

	YES in ALL equipment	YES in SOME equipment	NO
Are the best practices protocols for managements of essential emergency procedures available?	☐	☐	☐
Are the protocols for safe appropriate use of equipment in essential emergency procedures available?	☐	☐	☐
How often is 'room-to-room inspection' performed to ensure that EE equipment and supplies required for the essential emergency procedures are available and functioning? *Please check one.*	☐ Daily ☐ Weekly ☐ Monthly	☐ Every 6 months ☐ Yearly	☐ Once every ____ years ☐ Never

	YES	NO
Are the information, education and training materials on emergency procedures and equipment available in the Emergency Room for health care staff use?	☐	☐
Are there introductions of any new procedures / interventions? *If 'yes', please specify which procedure / intervention:*	☐	☐
Has referral to other health care facilities decreased because of skills and knowledge of procedures and intervention?	☐	☐
Are records maintained?	☐	☐

POLICY *Please check one*

	YES	NO
Is there a policy to promote training for health care staff in the essential emergency management of trauma, obstetric care and anesthesia?	☐	☐
Is there a policy to update the protocols for the emergency management of trauma and obstetric care adapted to local needs?	☐	☐
Are there any guidelines on donation, procurement and maintenance of all EE equipment?	☐	☐
Is there a list of extra health personnel to be contacted in disaster situations?	☐	☐

For guidance, please use the 'WHO Generic Essential Emergency Equipment List'

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World Health Organization | 20 Avenue Appia, 1211, Geneva 27, Switzerland
Fax 41 22 791 4836 Internet: www.who.int/surgery

WHO/HPW/CPR 2004, reformatted 2012

APPENDIX 11: WHO generic essential emergency Equipment List

Figure 14 WHO generic Esssential Emergency Equipment List

WHO Generic Essential Emergency Equipment List

This checklist of essential emergency equipment for resuscitation describes minimum requirements for emergency and essential surgical care at the first referral health facility

Capital Outlays	Quantity	Date Checked DD/MM/YYY
Resuscitator bag valve and mask (adult)		
Resuscitator bag valve and mask (pediatric)		
Oxygen source (cylinder or concentrator) with mask and tubing		
Stethoscope		
Suction pump (manual or electric) with catheter		
Blood pressure measuring equipment		
Thermometer		
Scalpel with blades		
Retractor		
Scissors		
Oropharyngeal airway (adult size)		
Oropharyngeal airway (pediatric size)		
Forcep, artery		
Gloves (sterile)		
Gloves (examination)		
Needle holder		
Sterilizer		
Vaginal speculum		
Inventory list of equipment and supplies		
Best practice guidelines for emergency care		

Renewable Items	Quantity	Date Checked DD/MM/YYY
Nasogastric tubes		
Light source (lamp & flash light)		
Intravenous fluid infusion set		
Intravenous cannulas/scalp vein infusion set		
Syringes with needles (disposable)		
Sharps disposal container		
Tourniquet		
Needles and sutures		
Splints for arm, leg		
Urinary catheters (Foleys disposable)		
Waste disposal container		
Face masks		
Eye protection		
Protective gowns/aprons		
Soap		

WHO/HPW/CPR/2003 formatted 2012

Supplementary equipment for use by skilled health professionals	Quantity	Date Checked DD/MM/YYY
Magill Forceps (adult)		
Magill Forceps (pediatric)		
Endotracheal tubes (adult)		
Endotracheal tubes (pediatric)		
IV infusor bags		
Chest tube insertion equipment		
Laryngoscope handle		
Laryngoscope Macintosh blades (adult) with bulbs and batteries		
Laryngoscope Macintosh blades (pediatric) with bulbs and batteries		
Cricothyroidotomy set		

This list was compiled from the following WHO resources:

WHO training manual: Surgical Care at the District Hospital
WHO Emergency Relief Items, Compendium of Basic Specifications*
WHO/UNFPA Essential drugs and other commodities for reproductive health services
WHO Essential Trauma Care Guidelines

* For specifications, refer to this book.

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APPENDIX 12: Tool for Situational analysis to assess Emergency and Essential Surgical Care

Figure 15 Tool for Situational Analysis to Assess Emergency and Essential Surgical care

World Health Organization

Tool for Situational Analysis to Assess Emergency and Essential Surgical Care

Reference: WHO Integrated Management for Emergency & Essential Surgical Care (IMEESC) toolkit:
http://www.who.int/surgery/publications/imeesc/en/index.html
Objective: to assess the gaps in the availability of Emergency and Essential Surgical Care (EESC) at resource-constrained health facilities.

If you prefer to complete the paper version, please print and return this form by email to cherianm@who.int or post or fax to the following address:

Dr Meena Cherian
Emergency & Essential Surgical Care program
Clinical Procedures Unit
Department of Health Systems Policies & Workforce
World Health Organization
20 Avenue Appia, 1211
Geneva 27, Switzerland
Fax: 41 22 791 4836 www.who.int/surgery

Facility Information Fields marked with an asterisk (*) are mandatory	
COUNTRY*	
DATE OF DATA COLLECTION* (dd/mm/yyyy)	
NAME of person(s) filling out form*	
PHONE NUMBER of person(s) filling out form*	
EMAIL*	
NAME and ADDRESS of health care facility* (include city, state or province)	
Phone number of health care facility*	

Type of health care facility	Health Centre	Subdistrict / Community Hospital	District / Rural Hospital	Provincial Hospital	General Hospital	Private / NGO / Mission Hospital
	○	○	○	○	○	○

Section A: Infrastructure	Insert number
1. Population served by this health care facility	
2. Number of beds	
3. Number of total admissions in one year	
4. Number of total outpatients in one year	
5. Number of total functioning operating rooms (major & minor)	
6. Number of patients at this facility requiring major & minor surgical (including obs/gyn) procedures per year	
7. Number of children (aged less than 15 years) at this facility requiring surgical procedures per year	
8. Number of patients to this facility that you refer for surgical intervention to a higher level facility per year	
9. How far (in km) does the average patient travel to get to your health facility for surgical services?	(km)
10. If you do not provide surgical services, how far does the average patient travel to access surgical services?	(km)

Fill in with either **Not available, Sometimes or All the time**	Not available	Sometimes	All the time
11. Do you have oxygen cylinder or concentrator supply with mask and tubing?			
12. Do you have running water?			
13. Do you have an electricity source/operational power generator?			
14. Do you have a functioning anesthesia machine?			
15. Do you keep medical records?			
16. Do you have an area designated for Emergency care?			

Fill in with either **Not available, Sometimes or All the time**	Not available	Sometimes	All the time
17. Do you have an area designated for Postoperative care?			
18. Do you have management guidelines available for Emergency care?			
19. Do you have management guidelines available for Surgery?			
20. Do you have management guidelines available for Anesthesia?			
21. Do you have management guidelines available for Pain Relief?			
22. Do you have a blood bank available at the facility?			
23. Do you have a facility to test hemoglobin & urine?			
24. Do you have a functioning X-ray machine available?			
25. Do you have a functioning pulse oximeter available?			

Section B: Human Resources

	Number of Full Time Workers	Number of Part Time Workers
26. Surgeons (qualified)		
27. Anesthesiologist physicians (qualified)		
28. Obstetricians/Gynecologists (qualified)		
29. General doctors providing surgery (including obstetrics)		
30. General doctors providing anesthesia		
31. Nurses/Clinical officers providing anesthesia		
32. Clinical officers providing surgery (including obstetrics)		
33. Paramedics/Midwives providing surgery (including obstetrics)		

Section C: Interventions

	Do you perform these procedures?		If you refer, is it due to... (circle ALL that apply)		
	Yes/No	Do you refer?	Lack of skills?	Non-functioning equipment?	Lack of supplies/ drugs?
34. Resuscitation (airway, hemorrhage, peripheral percutaneous intravenous access, peripheral venous cut down)	Y N	Y N	Y N	Y N	Y N
35. Cricothyroidotomy/Tracheostomy	Y N	Y N	Y N	Y N	Y N
36. Chest tube insertion	Y N	Y N	Y N	Y N	Y N
37. Removal of foreign body (throat/eye/ear/nose)	Y N	Y N	Y N	Y N	Y N
38. Acute burn management	Y N	Y N	Y N	Y N	Y N
39. Incision & drainage of abscess	Y N	Y N	Y N	Y N	Y N
40. Suturing (for wounds, episiotomy, cervical & vaginal lacerations)	Y N	Y N	Y N	Y N	Y N
41. Wound debridement	Y N	Y N	Y N	Y N	Y N
42. Caesarean section	Y N	Y N	Y N	Y N	Y N
43. Dilatation & curettage/vacuum extraction (obstetrics/gyn)	Y N	Y N	Y N	Y N	Y N
44. Obstetric fistula repair	Y N	Y N	Y N	Y N	Y N
45. Tubal ligation/vasectomy	Y N	Y N	Y N	Y N	Y N
46. Biopsy (lymph node, mass, other)	Y N	Y N	Y N	Y N	Y N
47. Appendectomy	Y N	Y N	Y N	Y N	Y N
48. Hernia repair (strangulated, elective, congenital)	Y N	Y N	Y N	Y N	Y N
49. Hydrocelectomy	Y N	Y N	Y N	Y N	Y N
50. Cystostomy	Y N	Y N	Y N	Y N	Y N
51. Urethral stricture dilatation	Y N	Y N	Y N	Y N	Y N
52. Laparotomy (uterine rupture, ectopic pregnancy, acute abdomen, intestinal obstruction, perforation, injuries)	Y N	Y N	Y N	Y N	Y N

Section C: Interventions

	Do you perform these procedures?				
	Yes/No	Do you refer?	If you refer, is it due to... (circle ALL that apply)		
			Lack of skills?	Non-functioning equipment?	Lack of supplies/ drugs?
53. Male circumcision	Y N	Y N	Y N	Y N	Y N
54. Neonatal surgery: abdominal wall defect, colostomy imperforate anus, intussusceptions	Y N	Y N	Y N	Y N	Y N
55. Cleft lip repair	Y N	Y N	Y N	Y N	Y N
56. Clubfoot repair	Y N	Y N	Y N	Y N	Y N
57. Contracture release/skin grafting	Y N	Y N	Y N	Y N	Y N
58. Closed treatment of fracture	Y N	Y N	Y N	Y N	Y N
59. Treatment of open fracture	Y N	Y N	Y N	Y N	Y N
60. Joint dislocation treatment	Y N	Y N	Y N	Y N	Y N
61. Drainage of osteomyelitis/septic arthritis	Y N	Y N	Y N	Y N	Y N
62. Amputation	Y N	Y N	Y N	Y N	Y N
63. Cataract surgery	Y N	Y N	Y N	Y N	Y N
64. Regional anesthesia blocks	Y N	Y N	Y N	Y N	Y N
65. Spinal anesthesia	Y N	Y N	Y N	Y N	Y N
66. Ketamine intravenous anesthesia	Y N	Y N	Y N	Y N	Y N
67. General anesthesia inhalational	Y N	Y N	Y N	Y N	Y N

Section D: Emergency & Essential Surgical Care Equipment and Supplies

For details refer to WHO IMEESC toolkit www.who.int/surgery/publications/imeesc; WHO ETC guidelines www.who.int/violence_injury_prevention/services; WHOEML www.who.int/medicines/publications

	0 absent	1 available with frequent shortages or difficulties	2 fully available for all patients all the time
Capital Outlays			
68. Resuscitator bag valve & mask (adult)			
69. Resuscitator bag valve & mask (pediatric)			
70. Stethoscope			
71. Suction pump (manual or electric) with catheter			
72. Blood pressure measuring equipment			
73. Thermometer			
74. Scalpel with blades			
75. Retractor			
76. Scissors			
77. Oropharyngeal airway (adult size)			
78. Oropharyngeal airway (pediatric size)			
79. Forceps, artery			
80. Gloves (sterile)			
81. Gloves (examination)			
82. Needle holder			
83. Sterilizer			
84. Vaginal speculum			
85. Nasogastric tubes			
86. Light source (lamp & flash light)			
87. Intravenous fluid infusion set			
88. Intravenous cannulas/scalp vein infusion set			

	0 absent	1 available with frequent shortages or difficulties	2 fully available for all patients all the time
89. Syringes with needles (disposable)			
90. Sharps disposal container			
91. Tourniquet			
92. Needles & sutures			
93. Splints for arm, leg			
94. Urinary catheters (Foleys disposable)			
95. Waste disposal container			
96. Face masks			
97. Eye protection			
98. Protective gowns/aprons			
99. Soap			
Supplementary equipment for use by skilled health professionals			
100. Magill forceps (adult)			
101. Magill forceps (pediatric)			
102. Endotracheal tubes (adult)			
103. Endotracheal tubes (pediatric)			
104. IV infusor bags			
105. Chest tubes insertion equipment			
106. Laryngoscope Macintosh blades with bulbs & batteries (adult)			
107. Laryngoscope Macintosh blades with bulbs & batteries (pediatric)			
108. Cricothyroidotomy set			

THANK YOU FOR YOU TAKING THE TIME TO COMPLETE THIS FORM

APPENDIX 13: KENYAN STAFFING NORMS BY LEVEL OF CARE

Figure 16 Kenyan staffing norms by level of care

Table 5: Distribution of Staffing norms by level of care

STAFF CATEGORY	Sub categories	Regional (2ndary referral) hospital-L5	County (primary) hospital-L4	Health Centre-L3	Dispensary-L2	Community Unit-L1
Medical Officers & Specialists	Medical Officers	50	16	2	-	-
	Anesthesiologist	6	2	-	-	-
	Oromaxillofacial Anesthesiologist	1	-	-	-	
	Cardiologist	2	-	-		
	General Surgeon	4	2			
	Orthopaedic Surgeon	2	1			
	Cardiothoracic Surgeon	1				
	Critical Care Physician	1				
	ENT surgeon	2	1			
	Gastroentologist	2				
	Obs/Gyne Specialist	3	2			
	Palliative Care Specialist	2				
	Neonatologist	2	1			
	Nephrologist	2	1			
	Neurologist	1	1			
	Plastic Surgeon(Recon-structive Surgeon	1				

STAFF CATEGORY	Sub categories	Regional (2ndary referral) hospital-L5	County (primary) hospital-L4	Health Centre-L3	Dispensary-L2	Community Unit-L1
	Neuro-Surgeons	1				
	Oncologist	4				
	Opthamologist	2	1			
	Optiometrist	1	1			
	Dermatologists	1	1			
	Paediatric Endocrinologist	1				
	Paediatric Nephrologist	1				
	Paediatric Neurologist	1				
	Paediatric Surgeon	1				
	Paeditrician	4	2			
	Pathologist	2	1			
	Psychiatrist	4	2			
	Radiologists	4	2			
	Rheumatologist	1				
	Specialist Physician(Internist)	4	2			
	Medical Endocrinologist	1				
	Public Health Physician	2	1			
	Urological Surgeon	1				
	Child & Adolescent Psychiatrist	1				
	Community Psychiatrist	1				
	Forensic Psychiatrist	1				
	General Clinical Officers(Diploma)	44	30	6	2	1
	Graduate Clinical Officers	7	14	1		
	Specialised Clinical Officers	4	2	1		
	Clinical Officer ENT/Audiology					
	Clinical Officer Lung & Skin	2	4	1		
	Specialised Clinical Officers	4	2	1		
	Clinical Officer ENT/Audiology					
	Clinical Officer Lung & Skin	2	4	1		
Clinical Officers	CO Ophthalmology/Cataract Surgery	2	4			
	CO Paediatrics	6	2	1		
	CO Reproductive Health	2	2	1		
	CO Dermatology/ Venereology	2	1	–	–	
	CO Orthopaedics	2	1	–	–	
	CO Anaesthetists	15	6			
	CO Psychiatry/Mental Health	2	1			
	CO Oncology/Palli--ative Care	2	1			
Nurses and specialist nurses	BSN Nurse	12	4			
	Cardiology Nurse	2				
	Critical Care Nursing	20				
	Dental Nurse	8	8	2		
	Forensic Nurse	2				
	Kenya Enrolled Community Health Nurse	250	100	12	4	1
	Kenya Registered Community Health Nurse	260	50	8	2	1
	Kenya Registered Nurse	80	20	2		
	Enrolled Nurse	10	6	4	2	

STAFF CATEGORY	Sub categories	Regional (2ndary referral) hospital-L5	County (primary) hospital-L4	Health Centre-L3	Dispensary-L2	Community Unit-L1
	Nephrology Nurse	10				
	Oncology Nurse	10	2			
	Ophthalmic Nurse	6	2			
	Paediatric Nurse	10	2			
	Palliative Care Nurse	6	4			
	Psychiatrist Nurse	20	6			
	Registered Midwives	60	20	6		
	Sign Language Nurse	2	1	1		
	Theater Nurses	60	10			
	Anaesthetist Nurse	4	6			
	Accidents & Emergency Nurse	10	10			
Pharmacy Staff	Pharmacist	6	4	1		
	Clinical pharmacist	4	2			
	Oncology Pharmacist	1				
	Pharmaceutical Technologist	10	8	4	1	
Plaster Staff	Plaster Technicians/Technologists	6	4	2		
Rehabilitative staff	Orthopaedic Technologist	6	3	1	1	
	General Physiotherapist	12	6	3	1	1
	BSc Physiotherapy	2	1			
	Specialized Physiotherapists	3	2			
	Occupational Therapist	12	10	3	2	1
Clinical psychologists	Clinical psychologists	2	1			
Dental staff	Dental Officers	10	4	1		
	Oromaxillofacial Surgeon	2	1			
	Paediatric Dentist	6	2			
	Orthodontist	2	1			
	Dental Technologists	10	6	2		
	Community Oral Health Officers		2	4	2	1
Diagnostics & Imaging	General Radiographer	10	6	2		
	Ultrasonographer	2	1			
	Mammographer	1				
	CT Scan /MRI Radiographer	3				
	Dental Radiographer	2	1			
	Therapy Radiographer	2				
Diagnostics & Imaging	General Radiographer	10	6	2		
	Ultrasonographer	2	1			
	Mammographer	1				
	CT Scan /MRI Radiographer	3				
	Dental Radiographer	2	1			
	Therapy Radiographer	2				
	Nuclear Medicine Technologist	2				
	Radiation Monitoring & Safety Officer	1				
Health Promotion Officers	Health Promotion Officers	6	4	4	2	2
Medical Social Work	Medical Social Work	8	6	2	1	1
Health Administrative staff	Medical Superintendent	1	1			
	Health Administrative Officers	2	2	1		
	Human Resource Management Officer	2	2			

STAFF CATEGORY	Sub categories	Regional (2ndary referral) hospital-L5	County (primary) hospital-L4	Health Centre-L3	Dispensary-L2	Community Unit-L1
	Clerks	20	10	4	2	
	Secretaries	2	1			
	Accountants	6	2			
	Supply Chain Assistant	6	4	1		
	Supply Chain Officer	2	2			
Health Information ICT	Health Records Information Management Officers-HRIMO	12	8	4	1	
	ICT Officer	4	2	1		
Medical Engineering Staff	Medical Engineers	2				
	Medical Engineering Technologists	8	5			
	Medical Engineering Technician	6	2	2		
Medical Laboratory Scientists	Medical Laboratory Technologists	50	40	10	2	
Nutrition staff	Nutrition & Dietetic Officer	20	10	2		
	Nutrition & Dietetic Technologist	12	8	4	2	1
	Nutrition & Dietetic Technician	4	4	2	1	1
	Cateress	2	2			
Environmental Health Staff	Public health Officers	4	4	2	1	2
	Public Health Technician			2	2	4
Community Health Service Staff	Community Health Service Personnel(CHSP)					5
	Community Health Volunteers(CHV)					10
Support staff	Cooks	20	10	2		
	Drivers	15	12	4		
	Support Staff	60	40	10	4	
	Mortuary Attendant	10	6	2		
	Security	16	10	4	2	

Table 4: Estimates of administrative staff required, by facility type

Cadres	Requirements per facility				
	Tertiary referral hospital	*Secondary referral hospital*	*Primary hospital*	*Health Centre*	*Dispensary*
Drivers	40	10	8	2	-
Clerks	50	20	10	2	-
Cleaners	25	15	5	3	1
Security	20	10	4	2	1
Accountants	20	10	4	1	-
Administrators	25	10	5	1	-
Cooks	30	15	6	2	-
Secretaries	15	10	3	1	-