2021

An Assessment of activity completion time in a health care delivery program: a five year study of the kidney transplantation program at Kenyatta National Hospital, Nairobi-Kenya.

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AN ASSESSMENT OF ACTIVITY COMPLETION TIME IN A HEALTH CARE DELIVERY PROGRAM: A FIVE YEAR STUDY OF THE KIDNEY TRANSPLANTATION PROGRAM AT KENYATTA NATIONAL HOSPITAL, NAIROBI-KENYA

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION IN HEALTHCARE MANAGEMENT AT STRATHMORE UNIVERSITY

STRATHMORE BUSINESS SCHOOL

STRATHMORE UNIVERSITY

NAIROBI, KENYA

DECEMBER, 2021

DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the dissertation itself.

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ABSTRACT

The health and economic burdens due to non-communicable diseases (NCD's) in Kenya is on the rise and requires multi-sectorial engagements and collaborations to contain. Chronic kidney disease (CKD) is one of the NCD's with significant morbidity and mortality affecting about 10% of the Kenyan population. The healthcare system should be able to provide quality healthcare to the citizens in line with the sustainable development goals (SDG) where universal health coverage (UHC) is one of the deliverables. The *Interlife* kidney transplantation program at the Kenyatta National Hospital (KNH) is one of the initiatives set up within the healthcare system with the aim to provide specialized healthcare within the CKD care continuum. This study focused on the *Interlife* program as a case model on timeliness of healthcare delivery. This was a retrospective review of medical records of patients who were evaluated for suitability for kidney transplantation and eventually underwent kidney transplantation surgeries at KNH between 2010 and 2014. The study investigated the timeliness of various key processes involved in the pre-transplant and immediate post-transplant periods. The primary objective was to determine the throughput time within the transplant evaluation process. Specific objectives were:- To determine the turnaround time for some key routine diagnostic blood tests required for safety in kidney transplantation; (Human immunodeficiency virus (HIV), Hepatitis B virus surface antigen (HBsAg), hepatitis C virus antibodies (HCV) and cytomegalovirus antibodies (CMV)), to establish the timeliness of access to consultations with two key specialties (cardiology and anesthesiology) within the kidney transplant program, to determine adherence to the kidney transplant pathway for two key processes (kidney ultrasound and blood assay for calcineurin inhibitor (CNI) in blood), to determine average hospital length of stay among kidney transplanted patients and to establish the frequency and reasons for cancellations of planned kidney transplant surgeries. The deviations of the timings from the transplant protocol which ultimately contributed to the overall delay in the program were noted. Categorical data had counts and percentages calculated. For normally distributed continuous data, means and standard deviations were calculated. For skewed data, the median and interquartile ranges were calculated. Inferential statistics were reported at 95% confidence with the p value < 0.05 considered statistically significant. Analysis was performed using the Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp). Ninety nine individual patients' medical records were traceable. Males were the majority at 73(73.7%). Twenty patients had their elective kidney transplant surgeries cancelled at least once for reasons which were medical, social, financial or logistical. In conclusion, the pre-transplant evaluations and the peri transplant processes in the program are not timely and it is recommended that measures be undertaken to address the preventable causes of delays and cancellations of elective transplant surgeries as part of the program quality improvement initiatives.

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DEFINITIONS OF TERMS

Effectiveness of a healthcare program:	Achieving desired goals in a healthcare program (Mosadeghrad, 2012)
Efficiency of a healthcare program:	The best possible use of available resources to achieve maximum results in a healthcare program (Mosadeghrad, 2012)
End stage kidney disease:	A stage in chronic kidney disease where dialysis or kidney transplantation is needed (Low, Smith, Burns, & Jones, 2008)
Kidney transplantation:	The process of removing a kidney from one person and its implantation into another (Knechtle, Marson, & Morris, 2019)
Kidney allograft:	A transplanted kidney (Knechtle et al., 2019)
Throughput time:	The amount of time required for a product to pass through a manufacturing process and be converted from a raw material to a finished good (Plossl, 1988)
Travel for transplantation:	Travel to another country for organ transplantation ("The Declaration of Istanbul on Organ Trafficking and Transplant Tourism (2018 Edition)," 2019)

LIST OF ABBREVIATIONS

ALOS	-	Average Length of Stay
CKD	-	Chronic Kidney Disease
CMV	-	Cytomegalovirus
CNI	-	Calcineurin Inhibitors
ESKD	-	End Stage Kidney Disease
FBO	-	Faith Based Organizations
HBsAg	-	Hepatitis B Virus Surface Antigen
HCV	-	Hepatitis C Virus
HIV	-	Human Immunodeficiency Virus
KHPFP	-	Kenya Health Policy Framework Paper
KNH	-	Kenyatta National Hospital
LIC	-	Low Income Countries
MLIC	-	Middle Low Income Countries
MTRH	-	Moi Teaching and Referral Hospital
NCD's	-	Non Communicable Diseases
NGO	-	Non Governmental Organization
QoL	-	Quality of Life
SDG	-	Sustainable Development Goals
sSA	-	Sub Saharan Africa
UoN	-	University of Nairobi

ACKNOWLEDGEMENTS

Foremost, I wish to thank God, the Almighty for the energy to undertake this study. I would like to thank my supervisor Prof. Gilbert Kokwaro for his time and patience as he guided me from the challenges of concept development to the conclusion of this study. I would also wish to thank the staff at the Health Records and Information Department at the Renal Department in Kenyatta National Hospital for their tireless effort in the retrieval of the required medical records of the patients. I wish to thank Dr. Samuel Kabinga, physician and nephrologist at Kenyatta National Hospital and the University of Nairobi as well as Mr. Evans Omondi from the Institute of Mathematics at Strathmore University for their invaluable input during the study. Finally, I acknowledge the management of Kenyatta National Hospital and the Kenyatta National Hospital –University of Nairobi Ethics and Research Committee for allowing me use of institutional data and guiding me through the proposal respectively. Thank you all.

DEDICATION

To my mum, wife and our two daughters Jackline and Ashley

CHAPTER ONE

1 INTRODUCTION

1.1 Background

Hypertension and diabetes are major cardiovascular risk factors which often coexist. Their association is between 30% in some settings and 80% in others and both tend to follow rural urban dichotomy (Mufunda et al., 2006). Similarly the association between chronic kidney disease (CKD) and cardiovascular disease (CVD) is well known with the latter being common in patients with CKD (Levey et al., 2007; Otieno, Ogola, Kimando, & Mutai, 2020; Szeto, McIntyre, & Li, 2018). The prevalence of CKD which leads to end stage kidney disease (ESKD) is rising mainly due to the increase in the burden of diabetes and has become one of the commonest non-communicable diseases (NCD's) (Hsu & Powe, 2017). Chronic kidney disease is both a consequence and a cause of other NCD's and also acts as a risk multiplier for them (Tonelli et al., 2014). Other common NCD's include CVD, chronic respiratory diseases and cancers (Islam et al., 2014).

Chronic kidney disease is a significant health issue globally and disproportionately impacts disadvantaged populations (Brophy et al., 2015; Cass, Cunningham, & Hoy, 2002; Garcia-Garcia & Jha, 2015), with its prevalence expected to double between 2010 and 2030 (Eggers, 2011; Liyanage et al., 2015).

1.2 Managing chronic kidney disease and the economics of kidney transplantation

Available options of management for ESKD include dialysis and kidney transplantation with the latter being the treatment of choice due to its cost effectiveness (Collins, 2019; Gelan et al., 2018; Haller, Gutjahr, Kramar, Harnoncourt, & Oberbauer, 2011; Wong et al., 2012). Dialysis is most often seen as a short term bridging treatment to kidney transplantation, most commonly from a living donor (Jha et al., 2015) and is therefore the more prevalent practice worldwide and with a lot of advancement in technology (Arad, Goli, Parizad, Vahabzadeh, & Baghaei, 2021). Despite the huge investment put into improving on its delivery, dialysis has a disproportionately higher cost of management largely driven by the vast resources often mobilized for its provision (Klarenbach, Tonelli, Chui, & Manns, 2014). In Australia, Gorham *et al* performed a micro-costing analysis of dialysis service delivery in urban, rural and remote areas which revealed that maintenance dialysis is a costly and resource intense activity (Gorham et al., 2019).

Kidney transplantation is unfortunately as capital and labor intense as dialysis and therefore not widely available or accessible and calling for both innovative and effective management and financing strategies aimed at popularizing it especially in countries where uptake is still low like in Kenya (Ogeng'o, Gatonga, Olabu, & Ongera, 2011).

The economics and health benefits of managing patients in ESKD favour kidney transplantation over remaining on dialysis. According to the Dialysis Outcomes and Practice Patterns Study (DOPPS), the long-term cost involved in kidney transplantation was comparatively lesser than the cost of dialysis treatment, and the survival rate of patients who underwent kidney transplantation was also higher than that of those on dialysis treatment (Satayathum et al., 2005). It has been reported that after the first two years of kidney replacement therapy, transplantation demonstrates lower costs to the healthcare system when compared with peritoneal and hemodialysis (Gouveia et al., 2017). After successful transplantation, annual costs decline substantially to a level that is approximately 14–19% of annual dialysis costs (Mohnen et al., 2019).

A 1998 study in 8 kidney transplantation centers located in New York City found that kidney transplantation was a more cost-effective treatment than hemodialysis for the Medicare program. The initially higher costs of transplantation were fully recovered by Medicare 2 years and 10 months after surgery and patients would generate average monthly savings of $3800 over dialysis for the 2 years following the break-even point (Loubeau, Loubeau, & Jantzen, 2001).

Establishing an efficient CKD management program that includes kidney transplantation is an example of how the healthcare system should respond in an attempt to provide quality kidney disease care especially in sub-Saharan Africa (sSA) populations where majority of those affected are young and with high economic potential (Arogundade & Barsoum, 2008; Cherono, Role, & Owino, 2017; Naicker, 2013). Such a program would require a process management model which is not only well-designed but also implementable and easy to monitor and control. The adopted model should strive to continuously improve through analyses of key operations within a designed program strategy (Brocke & Rosemann, 2010; Laguna & Marklund, 2013). Unfortunately such a model would be difficult to replicate in a system facing considerable technical and financial challenges due to chronic underfunding and weak human resource management (Phares Mugo & Nafula, 2018).

1.3 Framework for developing a kidney transplantation program

A framework for developing a kidney transplant program should focus on how quality healthcare would be delivered as well as the outcomes that emanate from the structures and processes used to run the program. The structures would include resources available for the program like the staff and equipment while the processes would take into consideration all the interactions which should give rise to the likelihood of the desired health outcome (Avedis, 1988; Lohr, 2002). The cost of care within a program delivering quality healthcare is reduced due to the efficiency and the effectiveness within the system and satisfies the actors(Lee, Khong, & Ghista, 2006). Joss and Kogan describe quality in health using three dimensions: technical, systemic and generic quality. Whereas technical quality refers to the professional input to the work, systemic quality deals with the expectations of systems and processes that operate within the work environment. Generic quality refers to those aspects of quality which involve inter-personal relationships (Joss & Kogan, 1995).

Within the transplantation program, the health professionals must be responsible for promoting as well as protecting the well-being of the donors who are often in vulnerable situations related their choices. The healthcare delivery team in a transplant program must evaluate suitability of the donors guided by the health status and other social situations (Ross & Thistlethwaite, 2018). The donor-recipient pairs that will ultimately undergo surgery must be selected within a legal and ethical framework that discourages non altruistic practices like pay for donation (Ajayi, Raji, & Salako, 2016; Spearman & McCulloch, 2014).The program must therefore include a counsellor and a medical ethics team both charged with the responsibility of managing any ethical issue that may arise. Use of the available relevant guidelines will ensure that the patients and their donors are appropriately investigated and are safe to undergo surgery (Knoll et al., 2005). The referral network, healthcare financing, age, literacy level and geographical access as well as some medical conditions are potential barriers to kidney transplantation and need to be considered in order to increase uptake of kidney transplantation (Bayat et al., 2006; Gool, 2019)

A healthcare quality improvement environment is crucial for the growth of a kidney transplantation program and must accommodate the prioritization of quality improvement initiatives and the development of systems to monitor, measure and incentivize quality improvement within it. Physician leadership, infrastructural support, and prioritization of healthcare quality within the culture of the organization have all been shown to contribute to successful health program (Marjoua & Bozic, 2012).

1.4 The kidney transplant services in Kenyatta National Hospital

Kenyatta National Hospital (KNH) is a tertiary level hospital with a kidney transplant service established in 2010 and named as the "*Interlife* program". This is a multidisciplinary team comprising of various specialties. There are multiple steps involved in the evaluation of donor-recipient pairs' suitability for transplantation with the goal being of a successful kidney transplantation. Being at the apex of the referral system in Kenya, KNH is a reflection of the output of the healthcare system and the healthcare programs are offered and ran within a framework of performance contract management with the Ministry of Health (MoH).

The *Interlife* kidney transplant program is one of the most robust initiatives whose establishment was aimed at increasing local kidney transplant surgeries through capacity building and process development. *Interlife* was to run in renewable phases of five years each starting in 2010 until the hospital would acquire set competency goals to become independent in running kidney transplant services (Ochwila, Kayima, Mcligeyo, & Were, 2014). Before 2010, ad hoc transplantation activities would be undertaken whose outcomes were unsatisfactory leading to low uptake of the service (Ogeng'o et al., 2011). The program had benefited more than 200 patients by the year 2018, which is still suboptimal as the demand for kidney transplantation services is huge in the country due to the high prevalence of ESKD. There are approximately 150 patients on the chronic hemodialysis program of whom fifty percent are transplantable and waiting for an available opportunity. Sound scientific management strategies are required in order to improve the efficiency of this program and reduce the time on the waiting list which puts patients at risk of dying. Patients on waiting lists are maintained on hemodialysis which is not economically viable in the long term. The transplant program is faced with challenges of providing quality care as defined by both Avedis and Mosadehgrad (Avedis, 1966, 1980; Mosadeghrad, 2012). The dimensions used to assess quality of health care provided within the program which include safety, timeliness, efficiency, equity, effectiveness, access and patient centeredness are not only difficult to assess but also to achieve due to myriad of constraints.

1.5 Study variables

The Interlife program has schedules which detail the various processes which are undertaken in the evaluation of kidney donor-recipient pairs (**Figure 2.1**). These processes are graduated from simple to complex tests which have financial and complexity bearings. The program has developed a protocol which is followed from admission to the discharge of a donor-recipient pair admitted for kidney transplantation surgery (**Appendix IX**). The study variables were delivered from the pre-transplant evaluation schedule and the transplant protocol. To achieve the objectives

of the study, relevant independent, dependent and intervening variables were selected (**Figure 2.2**). These variables are majorly grouped into those that introduces the donor-recipient pair into the transplantation program and are the independent variables while the variables that looks into structure, processes and outcomes of the program are the dependent variables and the ones that were studied. The intervening variables are the ongoing activities and include test reviews whose outcomes determine who continues with the evaluation or not and the continuous counselling.

1.6 Research theories

The study was grounded on operational research theory of Project Evaluation and Review Technique and Critical Path Method (PERT/CPM) (Kwak, 2005). It is similar in that it involves listing the activities in the transplantation process, setting the relationships, determining the sequence of the activities and drawing a schedule of these activities in order to minimize the overall time (throughput) and contain the cost of the program. It is possible that one can exploit this theory and come up with the shortest and most cost effective activity path in kidney transplantation with an assumption that there is optimum control of resources. It would enable management to obtain a tradeoff between cost and time which is crucial in a kidney transplantation program (Sharma, 2006).

The study also looks at both the organizational theory (Kuh, 2003) and organizational behavior (Chandan, 2009) in that it takes consideration of the different disciplines involved in kidney transplantation and how they relate to come up with a common solution. The elements of organizational behavior namely people, structure, technology, and the external environment they relate with are well outlined in a kidney transplantation project and by understanding how they interact with each other can inform on improvement initiatives.

1.7 Problem definition

Kidney transplantation is a highly specialized and expensive treatment of CKD whose output should be optimal in order to offer acceptable returns on the healthcare investment by providing a seamless transition from the highly challenging and more expensive kidney dialysis and to provide huge economic benefits (Englesbe, Dimick, Fan, Baser, & Birkmeyer, 2009). In Kenya, kidney transplantation is offered at the apex of the healthcare tier and can therefore be used as a healthcare system output indicator and whose model can be replicated to counties with predicable financial and clinical performances (Kabinga et al., 2016). There has been unsubstantiated claims against the quality of the kidney transplantation service offered locally especially the duration of the evaluation process which has been used as a justification of Kenyan citizens to travel for transplantation abroad with significant economic loss to the government (Modi, 2011; Ulasi et

al., 2020). This study comes at a time when government is increasing both financial and geographical access to dialysis which will potentially increase demand for kidney transplantation as a sustainable management of ESKD (Mugi, Githemo, & Wala, 2021). The time management within the transplant program has not been studied in terms of both effectiveness and efficiency and this study therefore aimed at identifying some operational gaps that would influence time management which when corrected could impact on quality of care provided within the program.

1.8 Study objectives

1.8.1 Overall objective

The overall objective was to assess the time management in the kidney transplant program in Kenyatta National Hospital.

1.8.2 Primary objective

To establish the throughput time by patients in the kidney transplantation program at Kenyatta National Hospital.

1.8.3 Specific objectives

i. To determine the turnaround time for routine diagnostic blood tests required for safety in kidney transplantation (Human immunodeficiency virus, Hepatitis B virus surface antigen, hepatitis C virus antibodies and cytomegalovirus antibodies)

ii. To establish the timeliness of access to consultations with two key specialties (cardiology and anesthesiology) within the kidney transplant program

iii. To determine adherence to the kidney transplant pathway for two key processes (kidney ultrasound and serum drug blood levels)

iv. To determine average hospital length of stay among kidney transplanted patients, and the deviations from the timing in the protocol

v. To establish the frequency and reasons for cancellation of a planned kidney transplantation surgery.

1.9 Scope of the study

This included medical records of all patients transplanted at the KNH within the *Interlife* program for a five-year period between 2010 and 2014. This time was chosen as it was within the first five year term of the collaboration when stakeholders' commitment was very high and with an aggressive marketing strategy. The total time taken for a patient to go through the

transplantation preparation process up to discharge was determined and frequency of any cancellations of surgery recorded. Reasons for cancellation of a planned surgery were documented. Durations taken to undertake key kidney transplantation preparation activities including specialty multidisciplinary consultations were recorded.

1.10 Significance of the study

Chronic kidney disease is a very prevalent non communicable disease in Kenya with both high health and economic burden and whose management is multi-sectorial. An effective and efficient kidney transplantation program would offer a sustainable solution to the management of this disease by improving on the uptake of the service and therefore saving on huge amounts of money used on dialysis. The kidney transplant program at KNH offers transplantation surgery to many needy patients but unfortunately no operational aspect of this program has so far been studied since its inception and areas that would need improvement have not been identified objectively. This study provides baseline data on time durations for key activities within the program, which is useful for quality improvement initiatives. An understanding of the timeliness of care would be key when assessing on some aspects of quality determinants within the program and if successful can be used as a model for managing other NCD.

1.11 Rationale

The study findings will assist in identification and positioning of managerial problems, as well as consistency and implementation of managerial responsibilities at every level along the entire chain of kidney transplantation services in the hospital. The findings will inform areas of improvement in the aspect of timeliness to ensure improved efficiency in service delivery.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 Introduction

This chapter aims to discuss the theoretical and empirical review associated with the activity completion time in a health care delivery program in the kidney transplantation program at Kenyatta national hospital, Nairobi-Kenya

2.2 Causes of non-communicable diseases

2.2.1 Environmental and epigenetics

Environmental and epigenetic influences have been blamed as some of the causes of most of these ailments (Vineis, Stringhini, & Porta, 2014), with CVD accounting for most of the NCD-related deaths followed by cancers, respiratory diseases and diabetes respectively ("World Health Organisation Non communicable diseases- fact sheets," 2018). The key environmental factors that contribute to NCD's include those related to agriculture and food production, education, working and living conditions, transport, housing and unemployment (Amuyunzu-Nyamongo, 2010; Mensah, 2013).

2.2.2 Lifestyle and longevity

Although demographic transition causing population aging is also thought to contribute to some extent to the increasing incidence of CVD, unhealthy changes in lifestyle patterns due to globalization, increased industrialization, and urbanization are recognized as the most salient factors propelling the epidemic (BeLue et al., 2009; Islam et al., 2014; Ogeng'o et al., 2011). Gender disparity for some risk factors has been associated with social cultural perceptions in some regions like in West and South Africa where a study found women obesity interpreted as a sign of beauty (Abubakari, Jones, Kirk, & Lauder, 2008; Dugas et al., 2009), while in Zambia perception that thinness was associated with human immunodeficiency virus (HIV) contributed to female obesity (Tateyama et al., 2019).

2.3 Burden of non-communicable diseases in Africa

The World Health Organization (WHO) describes the health burden due to NCD as high, contributing to 41 million deaths (equivalent to 71% of all deaths globally) in 2018 with the highest of these burden occurring in low-and middle-income countries (Islam et al., 2014; "World Health Organisation Non communicable diseases- fact sheets," 2018). In 1990 NCD accounted for 28% and 35% of all morbidity and of mortality respectively in sSA, figures that

were projected to rise to 60% and 65% respectively by 2020 (Murray & Lopez, 1996). Between 2005 and 2009, NCD accounted for over half of the top 20 causes of disease-related deaths in Kenya and was associated with high expenditures leading to risks of financial catastrophe and poverty (Mwai & Muriithi, 2016; Nugent et al., 2018). The predicted rise in disease projection is supported by population studies that demonstrate an increasing burden of CVD and related risk factors in SSA (Sampson, Amuyunzu-Nyamongo, & Mensah, 2013).

2.4 Health system efficiency and the burden of NCD in Kenya

There exists several constrains to improved health systems performance in Africa ranging from low density of health facilities, low uptake of health technologies, shortages in human resource for health to gross underfunding (Sambo & Kirigia, 2014). These constraints render most systems inefficient to achieve delivery of performance targets, especially the sustainable development goals. It is against this backdrop that individual systems must design efficient strategies to manage the ever increasing burden of NCD's (Boutayeb & Boutayeb, 2005).To achieve this goal the Kenyan health system should be innovative and look up to the wider business world for principles and practices that inspire achievement of an optimal trade-off between efficiency and patients responsiveness such as business process management (BPM) (Buttigieg, Dey, & Cassar, 2016). This would require implementation of multi-sectorial policies aimed at decreasing population-level risks for NCD's while offering effective and affordable delivery of primary care interventions for patients with chronic NCD's (Maher, Harries, Zachariah, & Enarson, 2009; Otieno et al., 2020). The inputs to manage this and other emerging health challenges are not only overwhelming but also limited and demand achievement in both technical and allocative efficiencies within the available system for cost effectiveness (Cylus, Papanicolas, & Smith, 2016; Lawanson & Novignon, 2016).

In 2019, the government of Kenya, in response to this challenge, formed a task force to develop a universal healthcare coverage (UHC) financing strategy for the citizens within an economic concept known as the "*Big 4 Agenda"* which also aligns with the sustainable development goals (SDG). This was due to the realization of the significant gaps in Kenya's quest to achieve UHC with healthcare financing and need for health sector reforms being the most notable (Barasa, Nguhiu, & McIntyre, 2018). Within the UHC implementation strategy is a very strong emphasis on development of a primary care service model ("Report on the UHC-Essential Benefits Package," 2019; Sambo & Kirigia, 2014).

2.5 Health care management and cost of care for non-communicable diseases

The common goal of a health care system should be to achieve optimal quality of health care delivered to patients while efficiently utilizing the health care resources available to it which includes patients personalized care from clinicians as an output among others (Shortell & Schmittdiel, 2004). Quality Health Care Management (QHCM) is an outcome of a complex relationship between the patient, the provider and the environment within which the care is offered (Mosadeghrad, 2014). Healthcare in both low and middle income economies (LMICs) is provided within either the public or private sectors respectively with the former being funded by the state and often taking up the bigger burden of care. The disparities observed in efficiency, accountability and sustainability of the care provided within the two systems are due to some extent in the differences in reporting and utilization of their health outcome measures (Basu, Andrews, Kishore, Panjabi, & Stuckler, 2012). Private care providers are a heterogeneous group comprising of institutions for-profit, not- for-profit, faith-based organizations (FBO) and non-governmental organizations (NGO). In a descriptive study on obstetrics care capacity between NGOs/FBOs and government institutions in three African countries, Vogel *et al*, observed that these institutions were not only effective providers but also offered comparative services as government institutions and should therefore be recognized as key stakeholders of healthcare delivery in developing nations (Vogel et al., 2012).

Access to healthcare, its cost and accountability are key challenges in healthcare management that hinder the implementation of universal health coverage in developing countries (Kasthuri, 2018). The need to maintain universal access to healthcare while ensuring financial sustainability within the healthcare system has forced even developed economies to engage in transforming their financing systems (Saltman, Figueras, & Sakellarides, 1998). The rising health care costs has put pressure on healthcare policy makers and organizations on how to ensure that processes in the systems run efficiently and how to reduce on wastage (Berwick & Hackbarth, 2012; Hans, Houdenhoven, & Hulshof, 2012). There is therefore a need for healthcare providers to focus on cost control as they provide care to individual patients, while looking into the effectiveness of the care provided and using evidence-based practices (Lega, Prenestini, & Spurgeon, 2013). Healthcare providers should also aim at integrating both operational and clinical processes in care delivery in order to realize the best value (Roberts, Marshall, & Charlesworth, 2012) which could involve use of local and affordable solutions with an example in Kenya where the government has a policy of 'Buy Kenya, Build Kenya' *(Buy Kenya-Build Kenya Strategy, 2017).*

Besides the rising cost of care, other challenges facing healthcare management include variations in quality, diversity in consumers, and concerns about return of value in investment in healthcare (Shortell & Conrad, 2007). Containing costs in healthcare is particularly important if sustainable development goal (SDG) 3.4 which aims to reduce premature NCDs mortality by a third by 2030 is to be achieved (Nugent et al., 2018). It calls for policies that promote considerable reduction in alcohol, tobacco use and high blood pressure (Bennett et al., 2018). Examples of such policies include the heavy taxation on cigarettes, alcohol and betting in Kenya which is aimed at discouraging their consumption (Chesire, 2018; Hira, 2018; Jeiza, 2018) and is similar to the tax on soda in USA (Liu, 2018). Due to the high cost of care of CKD and other NCD's , health care systems in many developing countries are poorly designed and cannot deliver comprehensive care which is crucial for good outcomes (Okpechi, Bello, Ameh, & Swanepoel, 2017). The high cost is also a major cause of late diagnosis and a driver to the high rate of non-adherence and discontinuation of care observed in these countries (Dodd, Palagyi, Guild, Jha, & Jan, 2018). Health care systems in LMIC are therefore challenged to change their health care delivery models and to accommodate those that offer integrated approaches to care of chronic conditions ("Innovative care for chronic conditions: meeting report, 30-31 May 2001-World Health Organization,"). Such integrated care would result into efficient referral systems which will get rid of the persistent inefficiencies and untimeliness in care delivery (Clarke, Bourn, Skoufalos, Beck, & Castillo, 2017). Establishing an effective and efficient referral system requires government commitment in increasing healthcare care funding in order to improve on both financial and geographical access but chronic health underfunding in LMIC is unfortunately a major contributor to the weakness of the health referral systems in these countries (Bossyns, Abache, Abdoulaye, & Lerberghe, 2005).

In Kenya, the burden of management of CKD lay with the teaching and referral hospitals where all activities and policies related to screening, prevention, dialysis and kidney transplantation are organized from. Poor literacy levels, inefficient and poorly managed human resource for health with lack or limited government support have contributed to the absence of robust prevention programs which are crucial in reducing the morbidity and mortality related to CKD in sSA (Arogundade & Barsoum, 2008).

2.6 Operationalization of the dependent study variables

The Institute of Medicine (IOM) has described several attributes that are used to define quality in healthcare. These attributes include efficiency, accessibility (providing timely, geographically reasonable care), patient centeredness, equity (delivering health care that does not vary in quality

because of personal characteristics of the patient), safety and effectiveness (*Institute of Medicine (US) Committee on Quality of Health Care in America. Crossing the Quality Chasm: A New Health System for the 21st Century*, 2001). Integrated care, patient pathways, clinical audits, patient flow, patient empowerment and teamwork are some of the activities used in attempts to deliver quality care and which reflect the complex dynamics of health care delivery systems (Buttigieg, Dey, & Gauci, 2016).

Use of process concept in healthcare was described by Donabedian, who identified the importance of looking at the organizational structure and the processes involved in producing good outcomes for patients (Avedis, 1966). Processes can be studied from departmental, organizational or industry perspectives (Leseure, Hudson-Smith, Hellström, Lifvergren, & Quist, 2010). They do not always occur in neat succession but rather they may be in operation simultaneously, in parallel or iteratively. Processes where applied are closely related with a problem in one process causing the subsequent processes to suffer (Bergman, Neuhauser, & Provost, 2011). Continual improvement of these processes is important and can be achieved through adoption of learning mechanisms (Shani & Docherty, 2008).

Provision of healthcare comprises of thousands of interlinked processes that result in a very complex system just like in the manufacturing industry. Quality improvement is therefore the science of process management which must be measurable for it to be improved (Haughom, 2017). Hospitals must have robust operating systems where inputs, processes, and outputs are designed in an orderly way that closes the loop in quality-of-care delivery. Such operating systems must have detailed process mapping that integrates patient care pathways with properly defined roles of health providers and supporting professionals (Buttigieg, Dey, & Gauci, 2016). This study attempts in putting management science into use in a health care delivery system comprising of many processes for the management of an NCD. (**Figure 2.1**). Hospitals must work towards becoming high-reliable organizations (HROs) where processes are set up to reduce clinical errors thus ensuring patient safety (Enya, Pillay, & Dempsey, 2018; Spath, 2011; Sutcliffe, 2011; Vanhaecht et al., 2012). With use of statistical thinking, operational and clinical processes can be measured and improved with better health outcomes (Britz, Emerling, Hare, Hoerl, & Shade, 1997; Carey, 2002; Thor et al., 2007).

Timeliness is an important dimension of health care quality (Olsson, Schultz, & Gould, 2009) and the time taken by a patient within a healthcare process has an influence on the total cost utilized to obtain care and therefore analyzing the influence of throughput to total cost of patient

care should be critical for healthcare managers (Kujala, Lillrank, Kronström, & Peltokorpi, 2006). Throughput time reduction in healthcare processes, just like in manufacturing industry, requires in-depth understanding of the various factors that influence it for effective mitigation (Johnson, 2003). Adoption of medical technologies and automation within the processes is an example on how resources can be used to facilitate in improvement of throughput time (Fleming, Harrington, Kearney, Tomsho, & Sheils, 2012). Reducing delays within a patient flow-dependent project adds value to care offered and improves on patients' satisfaction (Roesler & Dydyk, 2007).

Setting up of patient care pathways and adhering to them has been shown to have a positive impact on the patients' waiting and throughput times in studies undertaken on management of various non-communicable diseases (Pham, Ginsburg, McKenzie, & Milstein, 2007; van Hoeve et al., 2015; van Huizen et al., 2018). It is useful in reducing both the average length of stay (ALOS) and complications among patients (Ayalon et al., 2011) besides the effects it has on improvement of patients' satisfaction (Husted, Holm, & Jacobsen, 2008). Reducing the average length of stay has the potential of introducing financial sustainability in patient management within institutions (McEvoy et al., 2016; Pham et al., 2007).

Multidisciplinary approach to patient care is extensively used in management of many NCD's especially in cancer, obesity, diabetes, trauma, and in both kidney and liver disease managements including organ transplantations (Forni et al., 2016; Frank, 1998; Haddad, Annino, & Tishler, 2008; Schwartz et al., 1995). Such approach is especially needed in disease situations where other comorbidities exist in order to offer quality and holistic care including reducing ALOS and total cost of care (Dargis, Pantelejeva, Jonushaite, Vileikyte, & Boulton, 1999; Ko & Chaudhry, 2002; Young et al., 1998).

A prospective study to assess the effect of adopting a multidisciplinary approach in a living kidney donor program showed a gradual increase in the number of kidney transplants performed over a 7 year period and with a remarkable decrease in waiting times (Fonouni et al., 2010). A case report from the Brigham and Women's hospital also showed how an effective multidisciplinary approach can improve outcomes in facial transplantation (Bueno, Diaz-Siso, & Pomahac, 2011).

A kidney transplant evaluation process should be able to pick out unacceptable risks while at the same time be efficient and cost effective (Holley, Monaghan, Byer, & Bronsther, 1998). During the transplant evaluation process a set of activities and tests aimed at establishing the safety of the procedure for both the recipient and donor are undertaken(O'Connell et al., 2020). Imaging

studies as well as blood tests like human immunodeficiency virus (HIV), hepatitis B and C viruses B as well as cytomegalovirus infections are carried out (Gabolde, Hervé, & Moulin, 2001; Moore et al., 2015).

Cancellation of elective operations is a parameter useful in assessing quality of patient care and the quality of a management system with a reported incidence of cancellation in different hospitals ranging between 10% and 40% (Kumar & Gandhi, 2012). Theatre schedule cancellation is an indicator of system inefficiency and leads to increased cost of health care and should therefore be reduced to a minimum (Zafar, Mufti, Griffin, Ahmed, & Ansari, 2007). A report on theatre cancellations in an academic and referral center in Ethiopia identified improper scheduling, medical illness, unavailability of room space and surgeons respectively as the most common causes of cancellations. The report notes that these cancellations were preventable (Melaku et al., 2018).

The average length of hospital stay is an indicator of hospital performance and a surrogate measure for cost and quality with hospitals having lengthy average duration of stay being considered inefficient in use of resources while those with extremes of length of stay duration having a quality concern (Thomas, Guire, & Horvat, 1997). In kidney transplant surgery, specific factors that influence length of stay are related to both donor and recipient characteristics and include the duration taken to extract the donor kidney, recipient diabetes, age for the pair, re-transplant surgery, preemptive surgery and dialysis vintage. (Serrano et al., 2019).

2.7 Activity scheduling in kidney transplantation: A manufacturing process analogy

There are numerous operational issues and challenges that face the kidney transplantation program at the Kenyatta National hospital. Such challenges includes; resource allocation, scheduling activities, waiting time reduction, length of stay in hospital and procurement of drugs and disposable supplies. Any decision made within the program is connected to efficiency and patient responsiveness tradeoff (Buttigieg, Dey, & Cassar, 2016).

In comparison to a manufacturing process, kidney transplant preparation activities are done in a sequence where some activities cannot be done before others but contrasts in that some activities can be done concurrently (Medina-Pestana, 2006). Multiple teams work in synergy towards the delivery of a quality product (a transplanted patient). Delays or other shortcomings at any process along the line affect the quality of product produced. Exploiting time limited centralized work up

models reduces transplantation evaluation time (Formica et al., 2012; Yuan, Bohen, & Abbott, 2012). Although differences may exists across transplant programs regarding the exact sequence of events, the kidney transplant evaluation process in most programs is comprised of specific components with the key components comprising of the following: referral/initial screening, education and consent for evaluation, medical and psychosocial evaluation, and

multidisciplinary selection committee review (Moore et al., 2015). The process guiding the patient-donor pair transplantation evaluation at KNH is thus both standardized and continuous as in other programs and shown in **figure 2.1** and has been used to construct the conceptual frame work shown in **Figure 2.2.**

Stage	Counseling and donor fitness testing	Tests for Infections, heart kidney functions and blood grouping	Imaging of the kidneys	Tissues typing
1				
2				
3				
4				
5				
6				

Figure 2.1. Kidney transplantation schedule in Kenyatta National Hospital

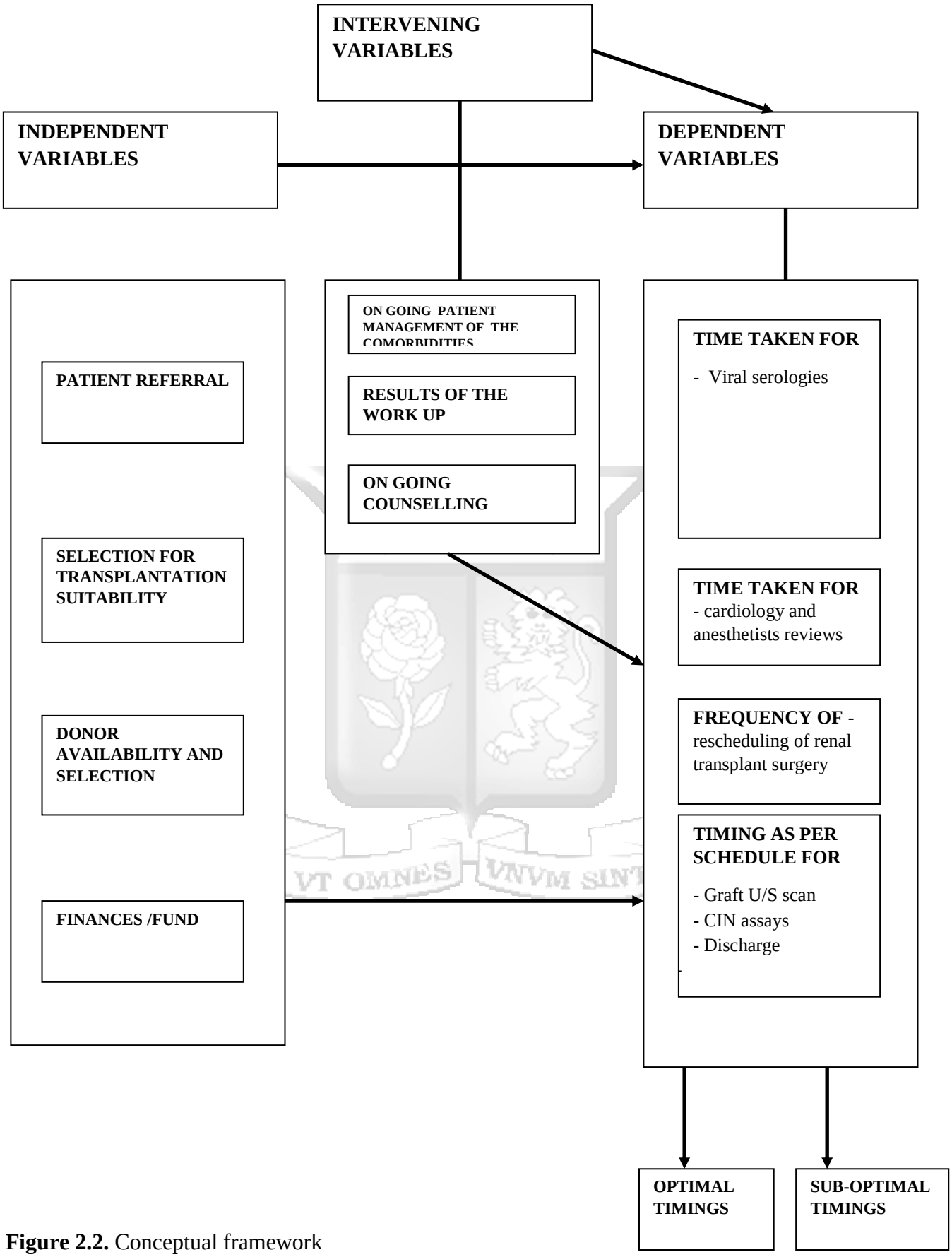

Figure 2.2. Conceptual framework

CNI calceneurin inhibitor, U/S utrasound

CHAPTER THREE

3 RESEARCH METHODOLOGY

The principal investigator undertook to understand the kidney transplant services as offered by the Kenyatta national Hospital *Interlife* program. The principal investigator convened several meetings with the stakeholders in the *Interlife* program. The stakeholders included the senior management at Renal Department, nephrologists, medical laboratory specialists, imaging and radiology staff, nursing officers, medical health and information officers and the transplant coordinator in order to understand various aspects of kidney transplantation. From these meetings, the key aspects in the kidney transplant evaluation were noted from which the research instrument was developed and pilot tests conducted followed by assessments for validity and reliability.

3.1 Study design

This was a cross-sectional, retrospective descriptive study.

3.2 Target population and sampling

This was a population study which utilized all available medical records for post-transplant patients for the period between 2010 and 2014.

3.3 Inclusion criteria

All medical records of patients who underwent pre-transplant evaluation at KNH and were also transplanted at Kenyatta National Hospital between 2010 and 2014.

3.4 Exclusion criteria

Patients who underwent pre-transplant elsewhere and non-traceable medical records were excluded from the study.

3.5 Sample size

The population of 130 patients who underwent kidney transplantation at KNH between 2010 to 2014 was considered as finite and therefore used the formula described by Daniel (Daniel, 1999). This formula is given by:-

$$n' = \frac{NZ^2P(1-P)}{d^2(N-1)+Z^2P(1-P)}$$

Where: P = expected proportion (0.5), Z= Z statistic for a level of confidence (1.96), d = Precision (0.05), N = Population size (130), n' = Sample size with finite population correction (98).

3.6 Sampling techniques

All available records of the kidney transplant patients from 2010 to 2014 were utilized.

3.7 Data collection

The principal investigator with assistance from the nephrologists in the *Interlife* program developed a data extraction sheet. The data to be extracted were for the key aspects in the interlife program to show the time taken to navigate through the kidney transplant evaluation program.

The principal investigator recruited two medical records and information officers who were diploma holders and were taken through the developed data collection proforma. The tool was pretested using the data of patients who had been transplanted after 2014 as these were outside the target study period.

The data extraction proforma is provided in **Appendix I**. The proforma was designed to maintain anonymity of participants and important information related to demographic profiles, major laboratory tests duration, specialized consultations, surgery rescheduling, peri-operative tests timing and discharge from the hospital were gathered.

3.8 Research procedure

Patients' post-transplant medical records for the duration between 2010 and 2014 were reviewed. Bio-data at enrolment into the transplant program namely age, sex, marital status, educational level, county of residence and occupation were obtained. Documentation on the dates of requisition and receipt of the results for serologies for human immunodeficiency virus (HIV), hepatitis B surface antigen (HBsAg), hepatitis C virus antibodies (HCVabs) and cytomegalovirus antibodies (CMVabs) were obtained and recorded. Consultation dates as scheduled in the admission protocol for cardiology and anesthesia were noted and the dates the actual consultations took place were obtained and recorded. The times patients were admitted and underwent a kidney transplantation (respectively) were noted while the times patients were not operated on despite being admitted were also noted and reasons documented. Time to have a post-transplant graft ultrasound scan and blood level of Calcineurin inhibitor (CNI) assays as per schedule in the protocol were noted and the actual date when the results were availed recorded. The discharge date as scheduled in the transplant protocol and the actual date the patient went home were noted and the variance calculated.

3.8.1 Actual data collection

The selected medical files were placed in the renal transplant coordinator's office from where the study proforma were filled. The completed proforma and the medical files were kept in a lockable cabinet in the transplant coordination office.

3.9 Quality control

The two medical records and information officers were trained for one day on the requirements of the study and the data which the study sought to collect. The data extraction proforma was pretested before it was used to collect the data. Data collected and recorded were counterchecked by an independent research assistant. Any transcription errors were noted and corrected. Actual dates and not durations were used to determine times in order to minimize transcription errors. The completeness of the data collection proforma were ascertained before returning of the medical records to the archives.

3.10 Data management

3.10.1 Data entry and storage

Filled data collection proformas were serialized and entered into the computer statistical package (SPSS Version 20). The proformas was kept under lock and key by the principal investigator until 1 year after completion of the study upon which they would be shredded. Data backup was provided.

3.10.2 Analysis

International Business Machine- Statistical Package for the Social Sciences (IBM®-SPSS®) version 20 was used for statistical analysis. Kolmogorov-Smirnov (K-S) Test for normality was performed for numerical data and the median and inter-quartile ranges used as a measure for central tendency for data not normally distributed while the mean was used for those normally distributed. Frequencies for qualitative data were presented in charts while quantitative data were presented in tables. Statistics were carried out at 95% confidence level.

3.11 Ethical considerations

The proposal was approved by Strathmore University School of Business and was submitted for ethical approval to the Kenyatta National Hospital-University of Nairobi Ethics and Research Committee. The permission to use the medical records and the facility at the Kenyatta National Hospital was sought from the director of medical services of Kenyatta National Hospital (Appendix IV and Appendix V).Upon ethical approval and before commencement, the study was

registered in the Renal Department and a certificate obtained as required by the Kenyatta National Hospital Research Department (Appendix VI and Appendix VII).

3.12 Handling incidental findings

Incidental findings related to timings were notified to the concerned provider(s) for further scrutiny and if possible, interventions that would benefit patients who were currently undergoing transplant assessment made.

3.13 Privacy and confidentiality

Coding of patients information was done to protect privacy and information gathered held in confidence by the investigator and was only used for the study and not for any other purpose.

3.14 Budget and timeframe

The budget is summarized in Appendix II while the timeframe is shown in Appendix III. The cost of the study was footed by the principal investigator.

CHAPTER FOUR

4 PRESENTATION OF RESEARCH FINDINGS

4.1 Results

This chapter presents the results of the study and includes both descriptive and inferential statistics. In particular tables have been used in presentation of the results. The distribution of baseline characteristics and reasons for discharge without transplantation was categorized and described in frequencies while continuous variable like time durations and age were described in medians with interquartile ranges following normality tests which demonstrated non normal distribution. For inferential statistics, P values <0.05 were considered statistically significant.

4.2 Selected medical records

One hundred and nineteen (119) of a possible 130 medical files were located and perused. Twenty (20) files were excluded from the study. (16 due to missing initial volumes of the files while 4 had poor documentation of test results). 99 files (83% of available medical records) were included in the study. **(Figure 4.1).** The year of enrollment and the number transplanted between 2010 and 2014 is as shown in **table 4.1.**

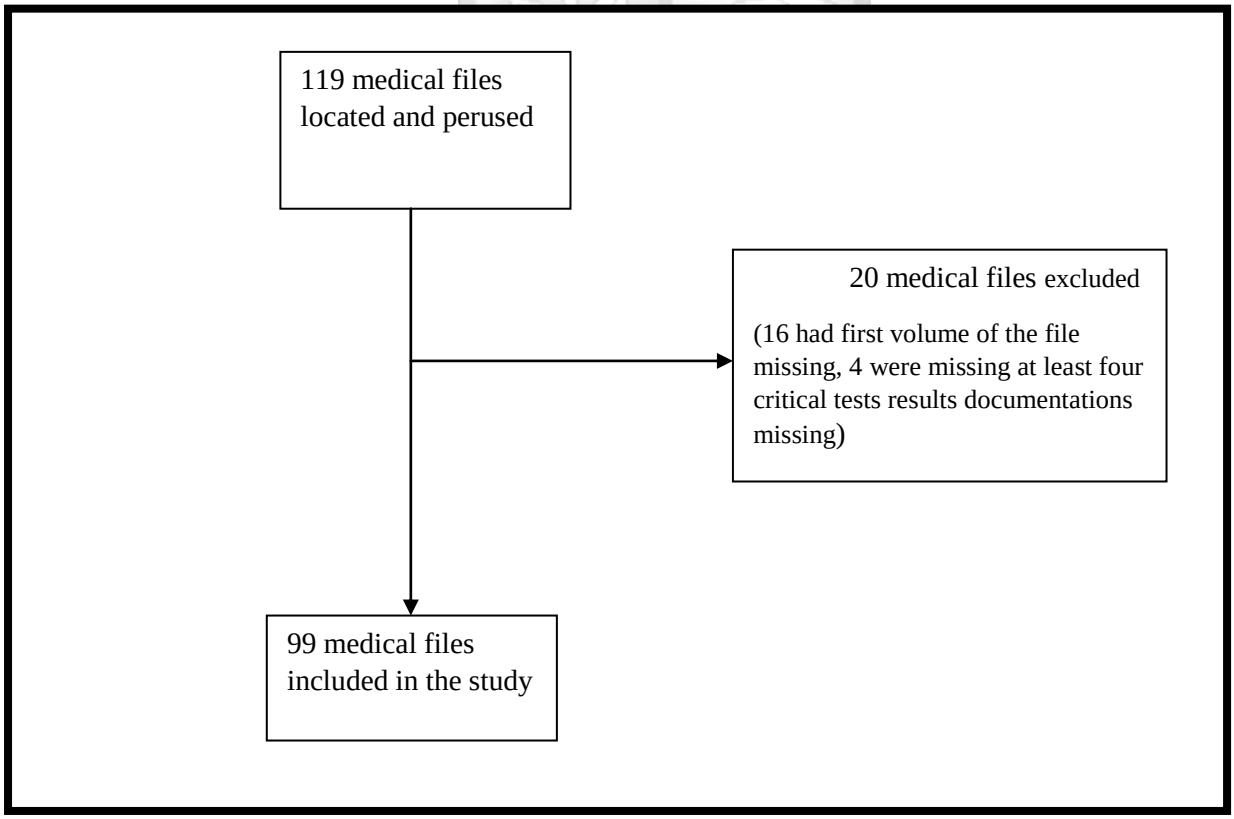

Figure 4.1. Recruitment flowchart

Table 4.1 Year of enrollment in the kidney transplant evaluation and the number transplanted between 2010 and 2014

Year	Enrollment in kidney transplant evaluation number(%)	Transplanted number(%)
2007	2 (2.0)	-
2008	7(7.1)	-
2009	16(16.2)	-
2010	15(15.2)	18(18.2)
2011	12(12.1)	20(20.2)
2012	23(23.2)	13(13.1)
2013	15(15.2)	20(20.2)
2014	9(9.1)	28(28.3)
Total	**99(100.0)**	**99(100.0**

4.3 Sociodemographic profiles of the kidney transplant recipients

Males dominated the transplanted patients at 73.7% with a Majority of the recipients being married (62.6%) and in formal employment (38.4%). **(Table 4.2)** The recipients were young with a median age of 34 (IQR 27,50) years.

Table 4.2 Sociodemographic characteristics of the kidney transplant recipients

Characteristic	Description	number(%)
Sex	Male	73(73.7)
Marital status	Married	62(62.6)
	Single	37(37.4)
Employment	Formal employment	38(38.4)
	Self-employment	27(27.3)
	No employment	34(34.3)

Table 4.3 Delay in durations for undertaking various key processes in the transplantation program

Description	Day	p-value†	CI
Median delay in serology tests	3.0	0.02	2.26-25.32
Median delay in cardiology consultation	2.0	<0.001	2.04-3.36
Median delay in anesthesiology consultation	2.0	<0.001	1.61-2.23
Median delay in calcineurin inhibitor drug level assay	1.0	<0.001	1.09-2.91
Median delay in kidney allograft ultrasound scan	1.0	<0.001	1.07-2.54
Median delay in hospital discharge	5.0	<0.001	5.10-7.54
Median duration from enrolment to transplantation in months	10.0*	<0.001	9.80-14.77

CI confidence interval, †one-sample test, *this duration is in months

4.4 Serology test results turnaround time

From the service charter (Appendix VIII), the turnaround time for serology test is one day and only 6 (6.1%) of the recipients received the serology results within this duration. Median duration in delay for getting serological results was three days with a mean of 13.79 days (~2 weeks) as shown in **Table 4.3**.

4.5 Specialized consultations

Specialized medical consultations are key in the transplantation program. The two specialized consultations assessed in the study were from cardiology and anesthesiology departments. The maximum allowed time taken to receive the consultations is one day as per the service charter. The median duration in delay was 2 days for both. About 18(18.2%) patients received the cardiology consultations while 16(16.2%) patients received anesthesiology consultations as planned. **(Table 4.3).**

4.6 Graft ultrasound and test for drug level in blood

Only 47.9% of the recipients received the graft ultrasound scan earlier or as scheduled while 22.7% received the blood level test for CNI as scheduled. The median duration in delay for receiving these tests results were one day for both with a p- value <0.001 for each of them

(Table 4.3).

4.6 Overall duration

The overall duration taken by a patient to navigate from the enrollment to transplantation was a median of 10 months (3, 84), p<0.001 95% CI [9.80-14.77] **Table 4.3).**

4.7 Discharged without undergoing kidney transplantation

Twenty (20.2%) of the patients had been admitted for kidney transplantation but were discharged from the hospital without transplantation surgery taking place. Reasons for not undergoing transplantation were varied as shown in **table 4.4.** The table shows the reasons as financial (15%), medical (55%), Undiagnosed donor problems (10%), recipient death (5%), system problems (10%) and a social problem (5%) respectively.

Table 4.4 Reason for discharge without transplantation surgery

s/no	Reason n =20	Number (%)
1	Financial problems	3(15)
2	Abnormal chest findings	2(10)
3	Catheter sepsis	2(10)
4	Poorly controlled blood pressure	2(10)
5	Patient died on transplant date	1(5)
6	Dental problem	1(5)
7	Donor had hematuria	1(5)
8	Donor hepatitis C virus positive	1(5)
9	Drainage obstruction	1(5)
10	Grandmother refusal	1(5)
11	Logistic difficulties	1(5)
12	Needed blood transfusion	1(5)
13	Newly diagnosed urinary tract infection	1(5)
14	Gastritis	1(5)
15	Surgeon availability not confirmed.	1(5)
16	Abnormal thyroid function tests	1(5)

n,number, s/no serial number

CHAPTER FIVE

5 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

Demographic characteristics of the study population within the *Interlife* kidney transplantation program at KNH show that the kidney transplant recipients were young with a median age of 34 years and with a predominant age group of 31-40 years, majority of them being males. This findings compare well with those of Kayima et al (Kayima, McLigeyo, Were, & Luta, 1996) and Kubo et al (Kubo, Kayima, Were, McLigeyo, & Ogola, 2015) and also similar to those observed in a retrospective study of transplant donors and recipients within a transplant program in Ethiopia in which 40 recipients (76.9%) were males with the recipient mean age of 34.5 years (Gelan et al., 2018). This finding also concur with other studies elsewhere which show that women tend to be majority donors while men are majority recipients (Ahmed et al., 2017) and that donors are much younger as compared to those in developed countries.

Many Population based studies have confirmed the existence of gender based disparity in the epidemiology of CKD with more women suffering CKD but paradoxically progressing very slowly to ESKD as compared to men (Carrero, Hecking, Chesnaye, & Jager, 2018; Mosca, Barrett-Connor, & Wenger, 2011). These findings are however different from those of a Korean study where men donated more kidneys than women (Kwon & Kwak, 2004), implying men were healthier than women in respect to kidney health.

Economic inequalities, gender bias by physicians and differences in health seeking behavior are cited as some of the reasons why men are more likely to be kidney recipients than women (Jindal, Ryan, Sajjad, Murthy, & Baines, 2005; McCauley et al., 1997) with others suggesting that women tend to prefer conservative treatment compared to men (Carrero et al., 2018) (Carrero et al. (2018). The relatively young age group among recipients in sub-Saharan Africa and other developing countries could be explained by the finding that the commonest causes of ESKD are glomerulonephritis and hypertension respectively which tend to affect young adults compared to the finding in other parts of the world where diabetes and hypertension are the leading causes of ESKD (Jha et al., 2013; Rizvi et al., 2011).

Social economic status has a great influence on transplantation rates with education, age and employment being highly predictive of good transplantation outcomes (Knight et al., 2015; McCauley et al., 1997). In our study, majority of the recipients were employed and had attained at least a secondary school education. An Australian study suggested that social economic status

influenced the uptake of kidney replacement therapy even when all patients are exposed to some level of healthcare (Grace, Clayton, Cass, & McDonald, 2012). Recipients with higher education level and private insurance were found to have an advantage in both graft and recipient outcomes in a study that looked at the role of social economic status in kidney transplant outcomes (Goldfarb-Rumyantzev et al., 2006; Schold et al., 2011b). One of the deterrents to increasing living related kidney transplants is an inefficient donor evaluation process with general delays and lack of coordination within the donor evaluation being blamed for donor drop out (Weng, Morgievich, & Kandula, 2018). The median duration it took a patient to navigate through our kidney transplantation program was 10.0 (IQR, 3.0-84) months. This just like the other durations studied was statistically significant and similar to findings in a multi-cohort study conducted in Australia and Canada that assessed durations of donor transplant evaluations (Habbous et al., 2018). In this study, the median total duration of transplantation evaluation (time from when the candidate started the evaluation until donation) was 10.3 months (IQR, 6.5-16.7).

Age, gender, race and social economic differences have been observed as important patient characteristics that influence the durations of assessment for kidney transplantation and on waitlist (Schold et al., 2011a). In our study we observed that although the duration of time taken to prepare a patient for kidney transplantation was statistically significant, age and employment status did not have influence to it in a statistically significant manner. The throughput in a kidney transplant program can be lengthy due to many variables often program specific and an attempt to understand them is needed in order to design initiatives to reduce the time (Habbous et al., 2018). An observational study conducted in Ireland reported that a streamlined 1-day assessment of living donors was associated with a nearly 8-fold increase in living donation in that geographic region (Graham & Courtney, 2018). Our findings suggest that it is possible to achieve as short a duration as 3 months (which was lowest in the study) if certain factors which are beyond the scope of this study are addressed.

Lack of sufficient funds to undertake the prerequisite pre transplant work up tests in time, donor drop out necessitating sourcing for another donor, program related challenges like temporary stoppage due to labor conflicts, unexpected poor outcomes among others may also have contributed to delays in throughput within the program given that the hospital had experienced several labor unrests during this time.

The turnaround time (TAT) is one of the most important key performance indicators used by clinicians to measure the quality of a laboratory service and directly influences customer satisfaction and average length of stay (Hawkins, 2007) and which has the potential of affecting through put time. The turnaround time to get the four serological reports is 1 hour as provided for in the service delivery charter at KNH but even when one day was considered to be a feasible turnaround time, only 6 (6.1%) patients managed to achieve this with a study mean duration in delay of 2 weeks and median of 3 days which was statistically significant at 95% CI,[2.26-25.32] p=0.02.Several factors have been identified that influence the turnaround time of a laboratory service with a study conducted in Nepal, identifying the cause of prolonged turnaround time as due to issues related to registration and billing , analyzer errors, inventory of reagents and sample handling respectively (Bhatt, Shrestha, & Risal, 2019). Our study did not investigate the local factors that affected the TAT for the selected laboratory tests. Delay in kidney transplantation by 2 weeks would mean prolongation of dialysis time by the same duration which would increase the expenses due to dialysis with unquantified loss of benefits in health terms accrued by receiving the transplantation. At the current rate of National Hospital Insurance Fund (NHIF) reimbursement for hemodialysis at almost Ksh. 20,000 per week, it would lead to the average increase in cost of care for these patients by not less than Ksh. 40,000 per patient and not considering the overhead costs and the cost on quality of life (QoL). This is the approximate monthly cost of immunosuppressive medications at the most intense regimen.

Kidney allograft ultrasound scanning after transplantation is very crucial not only as a baseline study but also for diagnosis in a poorly performing transplanted kidney (Jimenez, Lopez, Gonzalez, & Selgas, 2009; Sharfuddin, 2014). The protocol requires that it be undertaken within the first week after the transplantation and as needed especially if complications occur. The test for assessing the level of immunosuppression is similarly important and a program that cannot monitor the same would be incapable of following up patients effectively (McMaster et al., 1995). Adherence to the program protocol for these two tests was used as a measure of quality given their importance, the finding of which showed poor adherence with a median duration in delay of one day for each of them. Although the study was not designed to investigate the cause of the delays, ultrasound machines availability, lack of expertise to use the ultrasound machine, lack of reagents for drug assay could have led to the observed delays. These findings have negative impact on outcomes following kidney transplantation as there could be delays in diagnosis of complications. A similar observation was made in the selected specialized consultations for the recipients where there were delays in obtaining the consultations by two days beyond the desired time for both cardiology and anesthesiology. Besides causing anxiety to

the patient, delayed consultation could cause a prolonged average length of stay which not only have a cost implication but also result into delays in decision making (Majeed et al., 2012). Poor communication among colleagues taking care of a common patient has been cited as a common cause of delay in consultations (Benedict, Robinson, & Holder, 2006; Curley, McEachern, & Speroff, 1998).

Elective theatre cancellation could be due to various reasons which include poor scheduling, unavailability of personnel, medical illness of patients, and unavailability of operating room equipment among others. A study on the incidence and causes of cancellations of elective operations at a tertiary referral academic medical center in Ethiopia observed a cancellation rate of 31.6 % with most common reason for cancellation being surgeon related (35.8%), patient related (28.7%), management related (21.2%) and anesthesia related factors (14. 4%) (Melaku et al., 2018). In our study, 20% of the planned kidney transplant surgeries were cancelled due to, medical reasons (55%), financial reasons (15%), undiagnosed donor problems (10%), system problems (10%), recipient death (5%), and social problem (5%) respectively. Theatre cancellation cause delay in transplantation which result into customer dissatisfaction and increase cost of care and should be minimized especially when the cause is preventable like in our cases where medical reasons and financial and are both avoidable through counselling and rigorous patient assessment during evaluation.

Delayed discharge from hospital leads to increased length of hospital stay which not only increases cost of healthcare but is also associated with health related complications (Majeed et al., 2012). The median duration in delay to hospital discharge after kidney transplantation was 5 days which was statistically significant, $p < 0.001$. The cause of these delays should be determined in order to develop initiatives aimed at reducing them.

The study limitations include the retrospective design with use of recorded data which was missing in some files. Missing data reduced the number patients who were included in the study.

5.2 Conclusions

i. The throughput time by patients in the kidney transplantation program at Kenyatta National Hospital long
ii. There is delay in the turnaround time for routine diagnostic blood tests required for safety in kidney transplantation (Human immunodeficiency virus, Hepatitis B virus surface antigen, hepatitis C virus antibodies and cytomegalovirus antibodies)
iii. There is delay to access the consultations with two key specialists (cardiologists and anesthesiologists) within the kidney transplant program

iv. There is poor adherence to the kidney transplant pathway for two key processes (kidney ultrasound and serum drug blood levels)

v. There is an increase in the average hospital length of stay among kidney transplanted patients when compared to the timing in the protocol

vi. The frequency and reasons for cancellation of a planned kidney transplantation surgery is high and due to preventable causes.

5.3 Recommendations

i. The total time taken to go through the kidney pre -transplant process should be reduced

ii. The factors that lead to delays in the laboratory, consultations and at hospital discharge need to be determined and addressed to reduce the turnaround times, time taken between multidisciplinary consultations and in the discharge process respectively .

iii. The cardiology, anesthesiology, the laboratory medicine and diagnostic imaging departments in the Kenyatta National Hospital should evaluate their service charters in order to keep the turnaround time as displayed in service areas.

iv. The factors leading to theatre cancellations are mainly preventable, should be studied and reduced to a minimum

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APPENDICES

Appendix I: Data Collection Proforma

A. Demographic data

1. Serial number: ……
2. IP Number : ……..
3. Date enrolled into the program: ……. (dd/mm/yyyy)
4. Date transplanted: …… (dd/mm/yyyy)
5. Age in years at enrollment: …….
6. Sex: …… [1]=Male, [2] = Female
7. Marital Status at enrollment into the program: …….[1]= single [2] = Married
8. Highest level of education: …… [1] No formal education
   [2] Primary school
   [3] Secondary school
   [4] College
9. Occupation: ……..
   [1] Employed
   [2] Self employed
   [3] Not employed
10. County of residence: ……..

B. Major laboratory tests durations

11. HIV/HBsAg/HCV: Date requested: …… Date results received: ……
12. CMV: Date requested: ……. Date results received: ……..

C. Specialized consultations

13. Date cardiologist consultation was requested for: ……
14. Date cardiologist consultation was actually obtained: …….
15. Date anesthesiologist consultation was requested for: …….
16. Date anesthesiologist consultation was actually obtained: ……

D. Surgery rescheduling

17. Has the patient ever been admitted in hospital for transplantation surgery and discharged without having undergone the surgery? [1] Yes [2] No

If Yes*continue with question* ***21****, if* No*, jump to question***22**

18. (a) Date admitted: …….

    (b) Reason discharged……. ……..……..…….

(c) Date admitted: …….

(d) Reason discharged..……

(e) Date admitted: …….

(f) Reason discharged ……

(g) Date admitted: …….

(h) Reason discharged …….

E. **Perioperative tests timing**

19. Date kidney graft U/S scan was scheduled as per operative protocol: …….
20. Date the kidney graft U/S scan was actually performed:……
21. Date CNI 2nd plasma level was scheduled as per the operative protocol ……
22. Date the plasma CNI 2nd plasma level was received: ……

F. Discharge from the hospital

23. Date scheduled discharged as per the operative protocol: ……
24. Date the patient actually went home from the hospital: ……

Appendix II: Budget

s/no	Description	Cost estimate (Ksh)
1.	Stationary	5,000.00
2.	Research assistants (3X 10000)	30,000.00
6.	Data entry and cleaning	15,000.00
7.	Data Analysis	20,000.00
8.	Reports printing and binding	5,000.00
9.	Dissemination and publishing results	15,000.00
	TOTAL	**90,000.00**

Appendix III: Timeframe

s/no	Activity Description	Months				
		Feb '16	Mar '16	Apr '16	May '16	Jun '16
1	Protocol presentation and corrections					
2	Submission of protocol for ethics for approval					
3	Data collection					
4	Data analysis					
5	Results presentation					
6	Corrections and write up submission					
7	Final write up submission					

Appendix IV: Application for approval to conduct study

23rd November, 2017

To

The Director of Clinical Services, Kenyatta National Hospital

Nairobi

Dear Sir,

RE: APPROVAL TO CONDUCT STUDY IN THE RENAL UNIT

I am a physician and Nephrologist working in the renal unit of Kenyatta National Hospital and undertaking an MBA in Health care management at Strathmore University in which I have completed my course work. My MBA thesis is entitled;-

"An Assessment of Activity Completion Time in a Health Care Delivery Program: A Five Year Study of the Kidney Transplant Program at Kenyatta National Hospital, Nairobi, Kenya"

I am seeking approval from your office to conduct the study in the renal unit of KNH.

Attached is the abstract of the study

Waiting for your response.

Regards,

DR. JOHN NGIGI

Principal investigator

Appendix V: Approval to conduct study

Telephone: Nairobi
+254-20- 2726300-9/2726450/2726550
Fax: +254-20- 2725272
Email: knhdcs9@gmail.com
When replying please quote

KENYATTA NATIONAL HOSPITAL
Hospital Road, OFF NGONG ROAD
P.O. Box 20723- 00202- KNH
NAIROBI, KENYA

Ref. No. KNH/DD(CS)/30/VOL.IV/141 **Date:** 24/11/2017

The Secretary
KNH-UoN ERC
NAIROBI

RE: AUTHORITY TO CONDUCT STUDY IN THE RENAL UNIT - KNH FOR RESEARCH PROPOSAL REF. NO.P380/07/2017

Dr. John Ngigi has applied to conduct a study on **"An assessment of activity completion time in a health care delivery program; A five year study of the kidney transplantation program at Kenyatta National Hospital, Nairobi, Kenya".**

I have gone through the proposal and have no objection to the study being carried out in the hospital.

Dr. B. Githae
DIRECTOR, CLINICAL SERVICES

Appendix VI: Study registration certificate

KNH/R&P/FORM/01

KENYATTA NATIONAL HOSPITAL
P.O. Box 20723-00202 Nairobi

Tel.: 2726300/2726450/2726565
Research & Programs: Ext. 44705
Fax: 2725272
Email: knhresearch@gmail.com

Study Registration Certificate

1. Name of the Principal Investigator/Researcher

   .....

2. Email address: ..... Tel No. .....

3. Contact person (if different from PI).....

4. Email address: ..... Tel No. .....

5. Study Title

   .....

   .....

   .....

6. Department where the study will be conducted .....
   (Please attach copy of Abstract)

7. Endorsed by Research Coordinator of the Department where the study will be conducted.

   Name: ..... Signature ..... Date .....

8. Endorsed by KNH Head of Department where study will be conducted.

   Name: ..... Signature ..... Date .....

9. KNH UoN Ethics Research Committee approved study number _____
   (Please attach copy of ERC approval)

10. I _____commit to submit a report of my study findings to the Department where the study will be conducted and to the Department of Research and Programs.

    Signature..... Date .....

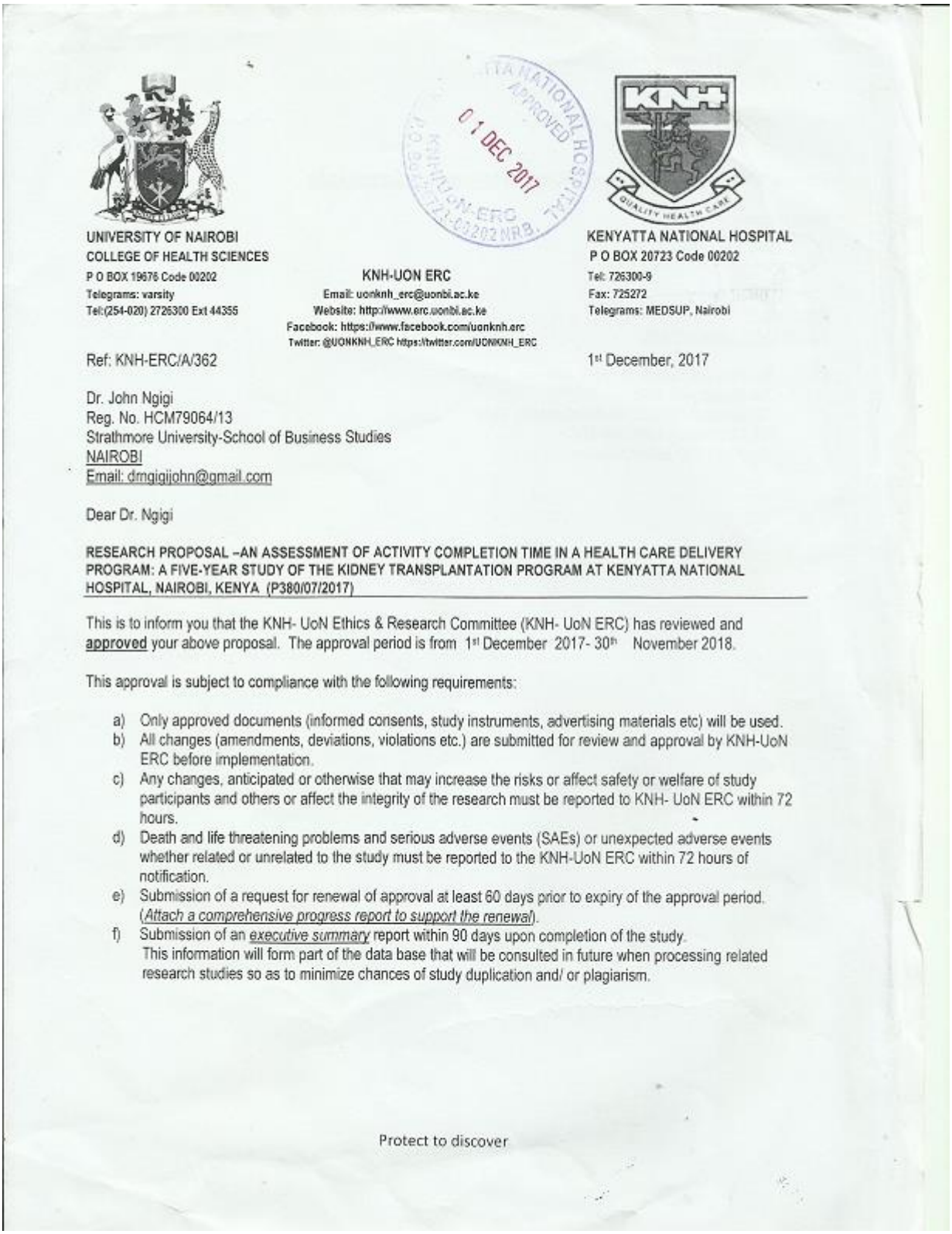
11. Study Registration number (Dept/Number/Year)_____/_____/_____
    (To be completed by Research and Programs Department)

12. Research and Program Stamp _____

All studies conducted at Kenyatta National Hospital **must** be registered with the Department of Research and Programs and investigators **must commit** to share results with the hospital.

Version 2: August, 2014

Appendix VII. Ethics and Research Committee Study Clearance



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Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

Ref: KNH-ERC/A/362

1st December, 2017

Dr. John Ngigi
Reg. No. HCM79064/13
Strathmore University-School of Business Studies
NAIROBI
Email: dmgigijohn@gmail.com

Dear Dr. Ngigi

RESEARCH PROPOSAL –AN ASSESSMENT OF ACTIVITY COMPLETION TIME IN A HEALTH CARE DELIVERY PROGRAM: A FIVE-YEAR STUDY OF THE KIDNEY TRANSPLANTATION PROGRAM AT KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA (P380/07/2017)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and **approved** your above proposal. The approval period is from 1st December 2017- 30th November 2018.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
c) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
d) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
f) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

Protect to discover

For more details consult the KNH- UoN ERC website http://www.erc.uonbi.ac.ke

Yours sincerely,

PROF. M.L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Principal, College of Health Sciences, UoN
The Director, CS, KNH
The Assistant Director, Health Information, KNH
The Chairperson, KNH-UoN ERC
Supervisor: Prof.Gilbert Kokwaro

Appendix VIII. Kenyatta National Hospital Laboratory Department Service Charter

CUSTOMER SERVICE DELIVERY CHARTER

KENYATTA NATIONAL HOSPITAL IMMUNOLOGY LABORATORY **REF: KNH/LAB MED – IMMUNO/027/F1**

KNH Quality Policy

The Management and staff of Kenyatta National Hospital are committed to providing accessible specialized quality healthcare that in conformity with patient centered care, facilitation of medical training, research and participation in national health policy. The implementation of this quality policy and objectives shall be periodically reviewed to address health care dynamics and to continually conform to the requirements of ISO 9001:2008

SERVICES	CLIENT REQUIREMENT	CHARGES (KES)		WAITING TIME
Laboratory investigations offered **ROUTINE TESTS** I. HIV Test II. HBsAg III. HCV Antibodies IV. VDRL V. Rheumatoid Factor VI. ANF /ANA VII. Toxoplasma IgG / IgM VIII. CMV IgG / IgM IX. C- Reactive Proteins	• Investigation request • Payment for the request	**General** i. 500 ii. 500 iii. 500 iv. 300 v. 400 vi. 2,000 vii. 2,000 viii. 2,000 ix. 400	**Private** i. 1,000 ii. 1,000 iii. 1,000 iv. 600 v. 800 vi. 3,000 vii. 3,000 viii. 3,000 ix. 800	i. 20 Hours ii. 20 Hours iii. 20 Hours iv. 20 Minutes v. 20 Minutes vi. 7 Days vii. 7 Days viii. 7 Days ix. 20 Minutes
Customer feedback	Compliments/complaints	FREE		• Acknowledgement – 3 working days • Resolution – 21 working days

Abbreviations:

- Are written here the way they are often requested by the Clinician who shall explain the medical meaning and diagnostic importance to the client.

Notes

1. These charges apply to East Africa Community citizens. **Non-East African Community citizens shall pay double the charges.**
2. This charter excludes charges for **KNH Prime Care Centre (Private Wing).**
3. **Private** implies clients with request forms from private doctors and other health facilities.
4. **Waiting time:** The entire duration taken to complete the process of providing the service required by a client after the analysis specimen has been received in this Laboratory.
5. Terms and Conditions apply.

Feedback Channels:

- Inform the Team leader **(44005)** or write in the customer feedback register at the service point , Head Of Department **(44121 / 43456)**.
- Contact Customer Care Officers or Patient Affairs Department: paffaits@knh.or.ke or Tel: +254 2726300 Ext.43770/43445 Mobile: +254 715384470/708 277 621, Toll free 1521.
- Drop your written compliment/complaint in the suggestion boxes provided.
- Night/public holidays & weekends, contact Room 108 through: +254 2726300 Ext.43165, 0722825599
- The Chief Executive Officer (as a last option) through: +254 722 829 500/1/2 Ext. 44037, Email: knhadmin@knh.or.ke, Website: www.knh.or.ke, Facebook: Kenyatta National Hospital (with KNH official logo as the profile picture).

Date: 02 – 03 – 2018

ISO 9001: 2008 CERTIFIED Approved..... (AD Laboratory Medicine)

Appendix IX. Kidney transplant induction protocol

INDUCTION PROTOCOL AND POST OPERATIVE CARE FOR RENAL TRANSPLANTATION

IP NO: NAME: SEX:……. AGE:…….. Years

WEIGHT: kg HEIGHT: BMI: COUNTY OF RESIDENCE:…..BLOOD GROUP: ……

PERSONAL CONTACT:….. NEXT OF KIN CONTACT: …….

DIAGNOSIS: …….. DIALYSIS Hx……..

VASCULAR ACCESSES:……

TRANSFUSION Hx:……. USE OF LEUKOCYTE FILTERS: ……

HLA MATCH (HLA-A, -B and DRB1 first and second loci):

PRE-SURGERY		
DAY	**ACTIONS**	**MEDICATION, SUPPLIES & LOGISTICS**
5th day pre op. day	1. Admit to Renal Unit 2. Thorough clinical evaluation 3. Anesthetists & cardiologist review. 4. SP02 5. ECG 6. CXR **7. Updated laboratory works** 8. TBC 9. U/E/C 10. LFTs 11. INR/PTI 12. HIV/HBsAg. /HCV-ab 13. Urine M/C/S) 14. Haeomodialysis for 4 Hours **15. LEVOFLOXACIN 500MG PO OD X 5 DAYS** **16. PANTOPRAZOLE 40MG IV**	1. Levofloxacin 500mgs OD X 5days (subject to culture results) 2. MAKE SURE DRUGS HAVE BEEN ORDERED 3. Clear with accounts/Finance 4. Ensure LEUKOCYTE FILTERS available 5. Confirm drugs 6. Avail JJ stent 7. Clear any other logistical issues 1. IV Methyl prednisone (Solumedrol™) 500 mg in 250mg and 100mg 2. Albumin 20 gm per 100ml 3. Labetalol IV (2 BOXES) 4. Heamacel (2 bottles) 8. Nitroglycerin (5 boxes)

	BD	9. Cyclosporine 10. Mycophenolic acid 11. Pethidine 12. Paracetamol IV (Perfalgan™) 13. Plasil™ 14. Tramadol 15. Diazepam Oral 16. Buscopam™ IV 17. Opsite spray 18. Zinacef ™ 19. Leucocytes depleting filters
4th Day Pre-Op	**1. REVIEW RESULTS ABOVE.** 2. GXM 4 units of whole blood 3. Haemodialysis for 4 Hours 4. Update and confirm results and confirm surgery as per nephrologists, cardiologists, anaesthesiologists and surgeons reviews **5. LEVOFLOXACIN 500MG PO OD X 5 DAYS** **6. PANTOPRAZOLE 40MG IV OD**	
3rd Day Pre-Op	1. Haemodialysis for 4 Hours. **2.** Transfuse blood only if needed and **use a leukocyte depleting filter** **3. Start Cyclosporine 10mg/kg/day in two divided doses(300mg bd)** **4. Mycophenolic acid (**Myfortic **™) 360mg PO TID** **5. PANTOPRAZOLE 40MG IV OD** **6. Vancomycin 1 gram stat**	1. Cyclosporine 300mg PO BD) 2. Mycophenolic acid (Myfortic™) 360mg PO TID

2rd Day Pre-op	1. Haemodialysis for 4 Hours. (Ultrafitrate to dry weight) **2. Confirm grouped blood in BTU {4 units}** **3. Get INR/PTI results (both donor and recipient)** **4. PANTOPRAZOLE 40MG IV OD**	1. Cyclosporine A (Neoral™ ≈300mg PO BD) 2. Mycophenolic acid (Myfortic™) 360mg PO TID
1st Day(Pre-Op)	5. Haemodialysis for 4 Hours 6. Dialysis for 4hours(No UF) Unless transfused **7. Minimal heparin during** dialysis: To be done before 9:00 am 8. Coagulation Profile, review with results **9. Make Theatre Lists (10 copies)** **10. PANTOPRAZOLE 40MG IV OD**	1. Cyclosporine A (Neoral™ ≈300mg PO BD) **2.** Mycophenolic acid (Myfortic™) 360mg PO TID **3.** Sedation for good sleep as ordered by anesthetist
Day 0 (pre–op)	**1. CYCLOSPORINE TROUGH LEVELS AT 6AM** **2. BASILIXMAB 20mg STAT**	1. Sedation as per anesthetist 2. IV Solumedrol 500 mgs in 250 mls 5% DW over 10 minutes (**in theatre at the release of vascular clamps)** 3. Albumin 20 gm per 100ml **{in theatre}** 4. **Labetalol IV (2 BOXES)** 5. **Heamacel™ 2 bottles** 6. **Nitroglycerin (5 boxes)** 7. **Cyclosporine 300mg AM** 8. **Myfortic 360mg AM** 9. **Zinacef 750mg IV STAT in theatre**

POST SURGERY		
Day 0 (post – op)	**IMMEDIATE POST OP TESTS** 1. ABG's 2. CXR(Portable) 3. TBC 4. UEC/LFT 5. INR/PTI as needed 6. Coagulation profile as needed **4-HOURLY TESTS** 1. RBS 2. K^+ (ICU LAB) Supplement K^+ to keep it at 4-5mmol/L **Other Instructions** 1. Monitor BP (call anesthetist if BP are consistently elevated/Dropping) 2. Monitor CVP & urine output hourly 3. Maintain CVP between 8 and 10cm H_2O): a. > 10: Rehydration fluid; 50 ml / plus urine output/ hr. b. 8-10: Rehydration fluid 50 mls/hr PLUS urine output/hr c. < 8: Rehydration fluid 50 ml PLUS urine output PLUS boluses	1. IM Pethidine 50 mg 8hourlyPRN 2. 40 % O_2 facemask **6PM medications:** 1. Cyclosporine A; adjust evening dose as per the **CYA leve**ls. **2.** Mycophenolic acid (Myfortic™) 720mg PO PM 3. Cefuroxime (Zinacef ™) 750mg TID IV TDS. 4. Tramadol(Tramal™) 300mg/Metroclopromide (plasil™) 30 mgs infusion over 24 hrs or as ordered by anesthetist 5. Paracetamol (Perfalgan™) 1gm TID 6. Reinitiate regular oral antihypertensives one by one starting with calcium channel blocker (titrate according to BP)
1st post op day	1. FBS 2. U/E/Cs 3. FBC 4. Initiate physiotherapy **5. REMEMBER TO ADJUST CYCLOSPORINE DOSE**	1. Cefuroxime (Zinacef ™) 750mg IV TDS. 2. IV Methyl predinisone (Solumedrol™) 250mg 3. PO Cyclosporine A adjusted dose BD 4. Mycophenolic acid Myfortic (Myfortic™) 720 mg BD →

		5. Pantoprazole 40mg IV BD 6. Nystatin 2 mls TID
2nd post op day	1. Physical examination. **2. CHANGE OF DRESSING /OPSITE spray** 3. Remove all lines if stable. 4. Graft ultrasound	1. IV Methyl predinisone (solumedrol™) 100mg (**tapered)** 2. Continue with other medications as above
3rd post-op day	1. FBS. 2. U/E/Cs 3. Remove Portovac if not active	1.Oral Prednisolone 30mg OD-(taper by 2.5mg OD to 20mg by day 7)
4th post op day	**1. CYCLOSPORINE A LEVEL 6AM** **2. BASILIXMAB 20mg STAT** 3. Remove Portovac once drainage < 50 ml/d. 4. Alert surgeon if Portovac drain is more than 100 ml/day.	1. Adjust CYCLOSPORINE A dose accordingly.
5th post op day	Remove urinary catheter unless patient polyuric. (Urine output more than 3.5L/24hrs) **<u>If polyuric:</u>** 1. Reduce intake to 2/3 of output 2. Reduce saline if still on saline-(use hypotonic solution) 3. Check blood and urine sugar 4. Do urine and serum osmolalities	1. As above

	and urine chemistry	
6th and 7th, post op day		1. As above
8th post op day	Discharge patient-**unless otherwise(CYA levels)**	1. PO Cyclosporine A (adjusted dose) BD → 2. PO Mycophenolic acid (Myfortic™) 720mg BD → 3. PO Prednisolone 20mg OD → 4. Cotrimoxazole 960mg OD for 1 yr 5. PO isoniazid 300 mg OD for 1 yr 6. PO Pyridoxine 25 mg OD for 1 yr 7. other medications as indicated