UTILIZATION OF DISEASE CLASSIFICATION SYSTEMS AMONG HEALTH INFORMATION PROFESSIONALS IN 'SELECTED PUBLIC HOSPITALS' IN KIAMBU COUNTY, KENYA

DUNCAN MUTONGU MAINA (BSc. HRIM)
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A RESEARCH THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE (HEALTH INFORMATION MANAGEMENT) IN THE SCHOOL OF PUBLIC HEALTH AND APPLIED HUMAN SCIENCES OF KENYATTA UNIVERSITY

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DECLARATION

This research thesis is my original work and has never been submitted or presented to any school, college or other institution of higher learning for an academic award or for any other purposes.

Signature ..... Date 31/5/2021

Duncan Mutongu Maina
Q141/CE/27315/2014

University Supervisors:

This thesis has been submitted for review with our approval as university supervisors

1. Signature ..... Date 31.5.2021

Dr. George Ochieng Otieno
Senior Lecturer
Department of Health Management and Informatics
School of Public Health and Applied Human Sciences

2. Signature ..... Date .....

Dr. Kenneth Kibaara Rucha
Lecturer
Department of Health Management and Informatics
School of Public Health and Applied Human Sciences

DEDICATION

I dedicate this work to my loving dad, mum, wife and children for their unwavering support that has made this study a success.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

AHIMA	American Health Information Management Association
ICD-CM	International Classification of Diseases - Clinical Modification
CGoK	County Government of Kiambu
DCS	Disease classification system
DRG	Diagnosis-Related Groups
GOK	Government of Kenya
GVHD	Graft-Versus-Host Disease
HHS	Health and Human Services
HRIO	Health Records and Information Officer
ICD	International Classification of Diseases
ICD-10	The 10th Revision of the International Classification of Diseases
ICD-9	The 9th Revision of the International Classification of Diseases
KII	Key Informant Interview
NACOSTI	National Commission for Science, Technology and Innovation
NCHS	National Center for Health Statistics
OR	Odds Ratio
ORIF	Open Reduction with Internal Fixation
SCCA	Seattle Cancer Care Alliance
SCHRIO	Sub County Health records and Information Officer
SCMOH	Sub County Medical Officer for Health
WHO	World Health Organization

DEFINITION OF OPERATIONAL TERMS

Clinical Coders	All Health Records and Information Officers who take part in clinical coding or disease and medical procedure classification
Data Standards	The set rules throughout the data management for informing decisions and providing informative codes
Disease Classification	A system used to classify morbid entities based on pre-established criteria
Health Records and Information Professionals	Professionals in the field of health records and information management (Health records officers, health records and information officers, and health information managers)
Public Hospitals	Health facilities moderated by the government (hospitals and health centers)
Extensive use of ICD system	The use of ICD system either frequently (monthly) or always

	(more than once a month) as indicated by each participant
Limited use of ICD system	The utilization of ICD system fewer than once every quarter as indicated by each participant
Technology	A collection of systems that does not involve printed work; electronic
The systems	The collection of tools used for disease classification
Utilization	Use of ICD. Could be as basic as having been implemented or more sophisticated than this

ABSTRACT

Despite the globally acclaimed efficacy of the disease classification systems as a tool for health planning, reporting and reimbursement, not enough emphasis is laid on the quality of disease coding by the forerunners in the field. The starting point to sustaining the quality of disease coding is establishing its utilization. The purpose of the study is to establish the utilization of disease classification systems in Kiambu County, Kenya. Specifically, the study aims to determine health professionals' factors, health system factors and technological factors affecting utilization of disease classification systems (DCS) in Public Hospitals. This study was conducted in Kiambu County, Kenya, with a focus on public hospitals. Cross-sectional descriptive study design was used by employing total population sampling of the target population. The population of interest was the health records and information management professionals within the study area; as well as the key opinion leaders. Complete enumeration and purposive sampling designs were used to select the study participants, which included all 119 HRIOs in Kiambu County. Data was collected using self-administered questionnaires and key informant guides with the help of two research assistants. Data entry and analysis was done using SPSS v22. Data analysis included both descriptive (frequencies, means, percentages) and inferential statistics (Pearson chi-square with degrees of freedom), with the alpha level of significance set at 5%. Out of the 112 respondents, 75 (67%) indicated that the systems were utilized either frequently or always on average for the functions studied. Clinical coding was done at various locations within the hospitals and broadly depended on the layout of each facility. The study also found that greater age (X^2= 7.719; p=0.003), increase in length of coding experience (X^2= 3.7; p=0.027), and better DCS perception (X^2= 9.74; p=0.00) were significantly associated with frequent use of DCS utilization. Additionally, from the qualitative findings, resource allocation for health, and consequently for DCS was inadequate; International coding guidelines and policies were present as availed through the World Health Organization (WHO), although local or national guidelines were missing. The study found sufficient evidence to reject the null hypothesis that health professionals age, duration of disease classification experience, and perception of DCS were not statistically significantly associated with DCS utilization. The study concludes that, based on these findings, coding experience, positive perception, health facility budget and availability of disease classification technology were central to the success of utilization of DCS. The study recommends 1) County Health Management Team (CHMT) and Sub-CHMT to increase exploitation of the various uses of DCSs at facility level so as to improve the perception of the staff; 2) The HRIOs to emphasize on importance of DCS technology in the health facilities to increase utilization of the DCSs; and 3) The MOH should increase resource allocation for health, and consequently for DCS at all levels: national and county.

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

The International Statistical Classification of Diseases and Related Health Problems has a long history of development and refinement that can be traced back to the French physician J. Bertillon, who introduced the Bertillon Classification of Causes of Death in 1893. In 1946, the United Nations delegated the responsibility for the ICD to the World Health Organization (WHO), which conducts and issues periodical revisions of the ICD. Diagnostic information dates back the 1850's, where the focus was on death-related information capture. The International List of causes of Death was the first one to be developed at the time, leading to its adoption by the International Statistical Institute after a couple of decades. In 1948, the WHO started using the International Classification of Diseases (ICD) and was solely responsible for its further development. The WHO soon expanded the system and incorporated the classification of diseases. Two decades later, the World Health Assembly adopted ICD usage in member countries for the classification of morbidity and mortality causes (WHO, 2016).

The International Classification of Diseases, Ninth Revision (ICD-9) was designed in the late 1970s and was adopted by many countries around the world during the 1980s. Although this version was more detailed and inter-professional than the previous versions ICD-10, it did not meet the clinical needs of providers and payers in the United States. To make the application of ICD-9 appropriate to the American healthcare settings, the National Center for Health Statistics (NCHS) and the Council on Clinical Classifications jointly created the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). Since late 1970s, ICD-9-CM has been the

required standard for billing and clinical purposes by the most payers (such as the Centers for Medicare and Medicaid Services [CMS]) in the United States (Topaz, Shafran-Topaz & Bowles, 2013). Topaz et al. (2013) also reported that clinical coding was best when done after a patient is discharged from the hospital.

During the creation of ICD-9, WHO leaders realized that even bigger classification changes would need to be implemented in the near future. To address this issue, development of the 10th revision of ICD-10 was initiated even before the ninth version was completed. The WHO Collaborating Centers for the Classification of Diseases experimented with different models and structures for ICD. Multiple international users' and developers' appeals and requests postponed the publication of ICD-10 from 1985 to 1989. During this extended time, the WHO implemented changes and further developed ICD-10. As a result of this work, ICD-10, published in 1990, included significantly more codes and categories: while ICD-9 had only about 17,000 codes, ICD included more than 155,000 codes tracking a significant number of new diagnoses. ICD-10 was swiftly adopted and implemented by many international healthcare users (Caskey et al., 2014).

Globally, in the United States, the National Center for Health Statistics (NCHS) is charged with developing and updating the ICD. After the WHO authorization in the middle of 1990s, the NCHS went through a long, multistep process of adapting ICD to American healthcare needs and settings. First, the NCHS released the revised version of ICD for the public comments in 1998. Then, in summer 2003, ICD was field tested by the American Hospital Association and the American Health Information Management Association (AHIMA). Finally, public suggestions and the field-test results were

implemented to create an updated version, known as the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-CM) (Harris et al., 2014). According to the NCHS, the current "clinical modification represents a significant improvement over ICD-9-CM and ICD-10". The specific improvements include the creation of the diagnosis/symptom combinations that reduce the number of codes required to describe a certain medical condition, additional information relevant to the description of managed care and ambulatory encounters, and greater specificity in codes (Topaz et al., 2013).

After long discussions and debates, the US Department of Health and Human Services (HHS) published a final rule requiring the use of ICD-CM to replace ICD-9-CM in the Health Insurance Portability and Accountability Act (HIPAA) electronic transaction standards. Initially, the transfer to ICD-CM was scheduled to happen in 2011, but it was postponed by CMS to October 1, 2013. Most recently, HHS proposed that this date be set back one year from the postponed date, to October 1, 2014. Debates about adoption continue. The following sections provide an analysis of the views of the proponents and opponents of the upcoming change (Caskey et al., 2014).

Regionally in Africa, Nigeria reported that unmotivated and inadequate workforce coupled with hugely lacking political will are the main challenges of implementation of disease classification systems such as ICD. suboptimal clinical documentation were among challenges confronting the practice in Nigeria. In both South Africa and Nigeria, most healthcare systems had implemented ICD-10 for coding and classification of diagnoses and procedures. Coding education and advocacy with an aim of sensitizing the authorities and modifying their psychological orientation towards using clinical

coding to improve public health services and outcomes were potentially useful approaches (Adeleke et al., 2015).

In Kenya, more recently, Kiongo, Yitambe and Otieno (2019) established the effect of training on clinical coding. The study revealed specific gaps in accuracy and consistency of the clinical coding. The study, however, was specific to Nairobi City County, which leaves no previous study conducted and published for Kiambu County on disease classification (Kiongo et al., 2019). Besides these four studies, utilization studies are very few, and this is a gap that this study seeks to fill.

1.2 Problem statement

The growth in implementation and usage of disease classification in the past couple of decades has been exponential. More and more, health institutions have the support of global organizations such as the World Health Organization (Anker, Morley & von Haehling, 2016). Classification of diseases when properly implemented and fully utilized often translates into efficiency of the services offered in hospitals as well as better setup of evidence-based structures for disease management (Berglund et al., 2017). Despite the globally acclaimed efficacy of the ICD as a tool for disease classification, not enough emphasis is laid on the quality of disease coding by the forerunners in the field. The starting point to sustaining the quality of disease coding is establishing its utilization (Faiad et al., 2017). For instance, in Africa, only South Africa has properly structured standards for guiding the utilization of ICD in clinical coding whereas suboptimal documentation and lack of political will limited utilization of ICD in Nigeria (Adeleke et al., 2015). Kenya, therefore, falls under the many nations lacking genuine national standards for DCS usage, tailored to the local challenges. Additionally,

the training methodologies and programmes available locally leave gaps on the trainees that usually need to be filled on the job (Migowa et al., 2017). Whilst the quality of training is a concern to many in the field of disease and medical procedure classification who are already practicing, a more prominent problem is in the lack of information on the level of DCS usage within the local context (Etyang et al., 2014). The utilization of ICD in Kenya's public hospitals is still underwhelming given that most of facilities below level 4 hardly classify diseases, and Kiambu County is no different (Korir et al., 2015). Resultantly there is limited structured data available on specific diseases such as rheumatic and pediatric diseases (Korir et al., 2016). There is also a dearth in the information regarding utilization of disease classification systems (DCS) in the East African region. As such, this study aims to establish the various factors that influence the utilization of disease classification in Kiambu County, Kenya.

1.3 Study justification

In ideal scenarios, the standard requirements for the documentation of a patient's visit to the health facility are agreed before a system is put in place. However, in most developing countries, Kenya included, legacy systems exist, and disease classification only comes to be integrated with the systems already in place. The result is inconsistent codes with the records management system in place. Code reliability depends on the reliability of the data informing the disease code assignment. The health records, both physical and electronic ought to conform to the set standards, both in terms of form and structure. Inconsistent patient records documentation translated in codes that are not consistent, and when the documentation is incomplete, the reporting of the codes also becomes either inadequate or inaccurate (Harris et al., 2014). The applications of the

clinically coded data are wide and varied ranging from researchers to health insurers to hospital managers. While the potential for disease codes use is vast, the actual utilization is highly reliant on the knowledge of the user as well as the standards set for the management of the same (Allanson et al., 2016). The status of the ICD-110 utilization in most hospitals in Kenya is not yet determined.

Kiambu County is home to a host of renown towns such as Kiambu, Thika, Limuru and Kikuyu, with high population density, only second to Nairobi. Having well established towns is an urbanization concept that translates in many people and institutions, and consequently demands for the utilization. With a wide range of hospitals and medical training institution, Kiambu County offers a ready environment for the intake of the information on the use of disease classification systems within Kenya, and Africa at large. Kamau, Osuga & Njuguna (2017) reported that 52% of Kiambu County Hospitals had health information systems and structural challenges, with particular gaps in documentation. Given that a better understanding of the disease classification systems would strengthen the health system in the County, this study aims to assess factors that affect the utilization of disease classification systems in Kiambu County.

1.4 Research questions

1. What are the health professionals' factors that influence utilization of disease classification systems in Public Hospitals in Kiambu County, Kenya?
2. What are the technological factors associated with utilization of disease classification systems in Public Hospitals in Kiambu County, Kenya?
3. What is the influence of health system factors on utilization of disease classification systems in Public Hospitals in Kiambu County, Kenya?

1.5 Hypotheses

1.5.1 Null hypothesis

Health professional, technological and system factors do not statistically significantly influence utilization of disease classification systems in Public Hospitals in Kiambu County, Kenya

1.5.2 Alternative hypothesis

Health professional, technological and system factors statistically significantly influence utilization of disease classification systems in Public Hospitals in Kiambu County, Kenya

1.6 Study objectives

1.6.1 Broad objective

To assess utilization of disease classification systems in Public Hospitals in Kiambu County, Kenya

1.6.2 Specific objectives of the study

1. To determine the health professionals' factors that influence disease classification systems in Public Hospitals in Kiambu County, Kenya.
2. To determine the technological factors that influence disease classification systems in Public Hospitals in Kiambu County, Kenya.
3. To assess the health system factors that influence disease classification systems in Public Hospitals in Kiambu County, Kenya.

1.7 Delimitations and limitations of the study

As far as limitations are concerned, the study did not find any externally limiting factors (support, finances). As such, the study only explained delimitations (which are internal choices made) and how we controlled for these factors. The researcher covered only hospitals in Kiambu County. As such, the data collection tool was made comprehensive and specific to cover all aspects of disease classification systems usage within the county at the time of study. Additionally, the study targeted health information professionals in levels 4 and 5 at government hospitals as respondents. This approach ensured validity and consistency in the responses, as ICD systems were expected to be in place only in these levels of hospitals.

1.8 Conceptual framework

The study conceptualized the independent variables (health professional factors, health system factors and technological factors) and their respective interactions with intervening variable – County Government of Kiambu wealth and policies, to affect the outcome of Level of Disease classification systems. Health professional factors assessed included knowledge, perception and sociodemographic characteristics of the respondents. Health system factors studied included the facility-related budget and policies that influence the level of DCS utilization. The technological factors assessed included computer to HRIO ratio, as well as the type of DCS (whether manual or electronic). DCS utilization was assessed based on the number of functions for which the DCS was used such as reporting, reimbursement, and planning.

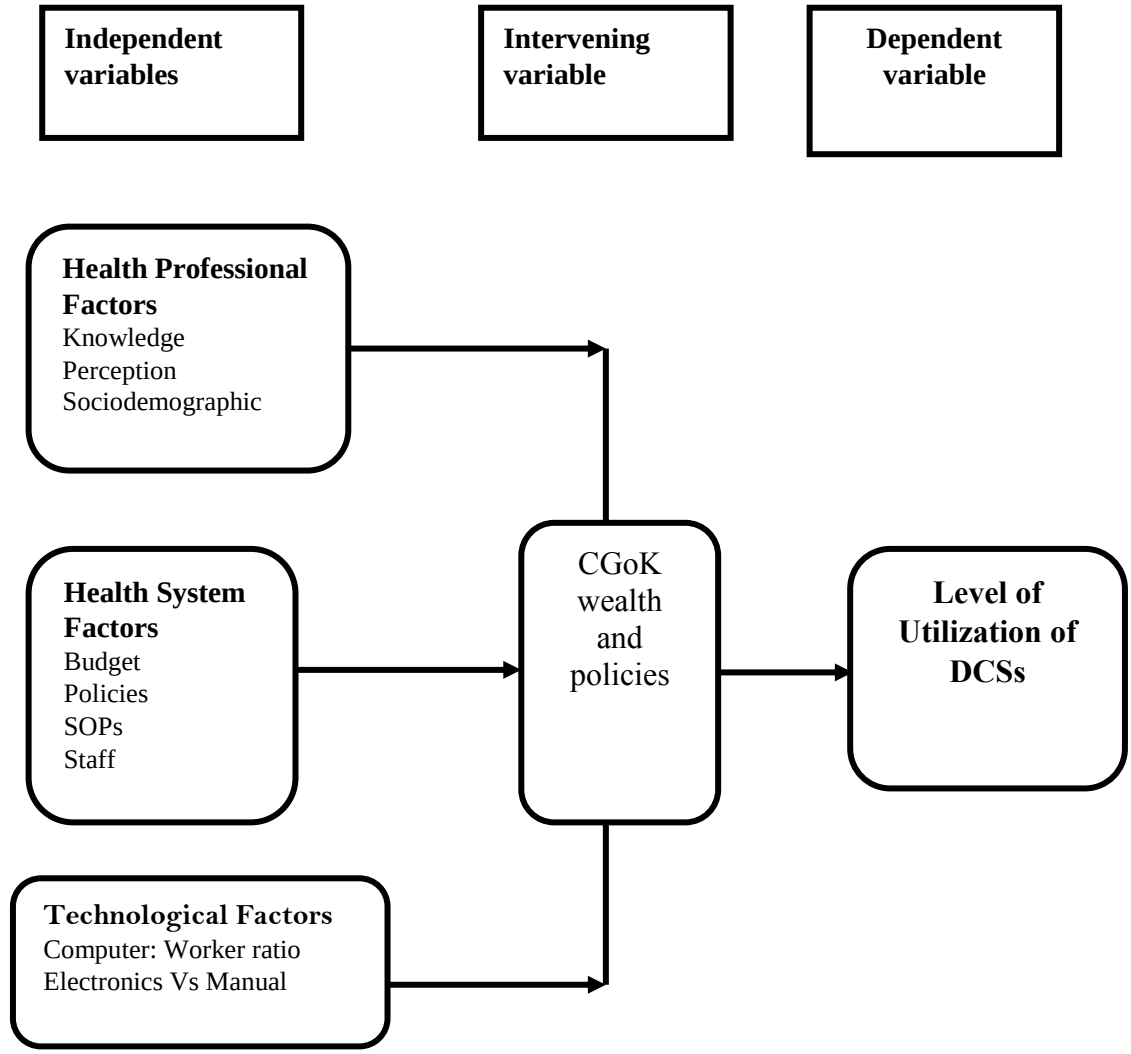

Figure 2.1: Conceptual Framework (Source: Adopted and modified from Caskey et al., 2014))

1.9 Significance of the study

Given that Kiambu County is one of the most populated counties in Kenya, the study results should be generalizable to other areas of similar characteristics. The study is useful to academicians, those in the biomedical fields, professionals in the clinical coding fields, as well as governments, both local and international. The real impact of this study should be felt in the locality of the study – Kiambu County – given that it is the primary area of focus. The medical training institutions within the County should benefit as they now have ready information that would be useful in justifying the need for and applicability of disease classification systems training. This study also provided an opportunity for advocacy, both in the county and national governments for the use of ICD in all hospitals.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

It is important to note that in the United States, ICD consists of two parts: ICD-CM for diagnosis coding and the International Classification of Diseases, Tenth Revision, Procedure Coding System (ICD-PCS) for inpatient procedure coding. According to the HHS requirements, ICD-CM will become a standard for all US healthcare settings, whereas ICD-PCS will be required in inpatient settings only. This article mainly focuses on ICD-CM to enable a broader overview of the recent debates (Quan et al., 2013).

The degree and accuracy of disease classification is hugely dependent on the quality of data collection. While it is one of the most basic steps in data management process, it is extremely vital in the long run. Improvement of service quality by policy makers, decision makers, and health providers all rely on timely and accurate data to inform their decision (Caskey et al., 2014). The impact that quality data has on the socioeconomic and environmental situations makes it a priceless entity in the disease classification process as well. The uses of input from health data span broad applications such as analysis and prediction of outcomes, policy creation and amendment, and trend establishment of mortality and diseases outbreaks (Harris et al., 2014). Barriers relating to social and economic status, as well as geographical, hinder the access to quality health data. Most of the challenges in heath data relate to their methods of collection, which are more often than not paper-based or manual. Additionally, there is often a lack of structure and standards for collecting data in manual systems, leading to difficulties in synthesis of that kind of data (Allanson et al., 2016).

Quan et al. (2013), presents that that just like it is possible to improve data collection methods and quality, improvement of disease classification is equally or even much more useful and possible. According to the authors, this improvement can be achieved through widespread campaigns and training on the same. According to Caskey et al. (2014), training is more of an approach geared towards improving people's skills especially in the process of executing their tasks. The ultimate goal of training would be to change in a group people, in terms of behavior and thinking, for the realization of a more efficient performance (Quan et al., 2013).

2.2 Health professional factors

Ahmad et al. (2017) define knowledge as understanding gained through experience or study. It is know-how or a familiarity with how to do something that enables a person to perform a specialized task. According to Quan et al. (2013), knowledge is defined as a "fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information". Hohl et al. (2013) also note that the need for proper training and ICD support structures is even greater given that medicine has an uncommon language which provides industry-specific concepts and terms. According to Feudtner et al. (2014), given the nature of job description for clinical coders, there are other factors outside of the coders' influence that can lead to poor quality of code assignment especially relating to clinician-related such as unclear, legible or ambiguous notes. As a mitigation measure, healthcare professionals ought to abide by the common terminology so as to

ease the process of coding whilst also ensuring that the codes assigned are as accurate as possible (Feudtner et al., 2014).

In a study conducted by Chen et al. (2015) at a single-institution, they evaluated the diagnosis coding accuracy, identified the most common errors contributing to inaccurate coding, and implemented a multimodality strategy to improve radiation oncology coding. All these factors were cited by Heron (2015) as determinants of the level of knowledge on using ICD. The author also observed that identifying common coding errors and implementing both education and systems changes led to significantly improved coding accuracy. This quality assurance project highlights the potential problem of ICD-9 coding accuracy by physicians and offers an approach to effectively address this shortcoming (Heron, 2015).

Chen et al. (2015) claim that proper disease classification by the coders depends on their knowledge of the anatomical features of the human body, each of which has a particular name whose code is also unique. The knowledge of the anatomy of the human body is therefore a critical aspect in disease classification. The authors observed that certain parts of the body such as the brain and the heart are easily known by virtually anyone, health professional or not. However, there are certain terminologies that are less intuitive, and therefore require a certain level of knowledge on the terminology, such as myocardium. The authors also suggest that most of the anatomical names stem from Latin and Greek word roots. In agreement with Chen et al. (2015)'s argument, Heron (2015) explained that the anatomical name for liver comes from its Greek synonym "hepato". The author also suggests that the medical terminology for Stroke is Cerebral

vascular accident (CVA) – which begins with a Greek word for the brain, implying that CVA is an accident in the brain (Chen et al., 2015).

In a study conducted by Kiongo, Yitambe, and Otieno (2019) on improving the Quality of Clinical Coding through the Training of Health Records and Information Officers in Selected Hospitals, Nairobi City County, Kenya, the authors observed several individual factors that were significantly associated with better clinical coding. Coding experience and continuous education contributed to improved accuracy and consistency among individual hospitals (Kiongo et al., 2019).

2.3 Technological factors

The standard of the data used for code generation hugely depends on the quality of data input into the indexing systems as well as the records written in the patient files. Identification of data entry and collection issues are arguably the easiest. However, correcting the resultant errors could prove troublesome (Quan et al., 2013). In most cases, filtering or profiling of the data could be easy especially with query software, despite the difficulty in rectifying such issues especially if the codes were present (Ahmad et al., 2017). Quan et al. (2013) argue that the cost of data entry problems varies depending on its implication on use. The authors further clarify that if the intention of the coded data is merely for informational reasons, then the effect may not be hugely felt. However, they also indicate that codes that are used for research or tracing of records may be priceless (Quan et al., 2013). The resolution of code quality can usually be remedied easily once the source of the problem is identified. For instance, having an outsourced clinical coding tool translates in slow response to the

clinical coding issues. Chan et al. (2015) identifies that incentivising the personnel at the point of entry of the codes into the system would most assuredly go a long way in ensuring that there is more accurate codes, for more informative decision making.

Quan et al. (2013) explains that as far as other technological issues are concerned, there are a number of systematic issues that may arise due to the data flow processes. In their explanation, the authors indicate that such issues that may lead to unsystematic technological issues may range from lost files, system crashes, or interference by malware, adware or viruses. Chan et al. (2015) reckons that it is never an easy task to identify such kinds of problem especially if the data performs dynamic transformations between the source and the destination computers. A root-cause analysis is often useful in determining the source of the technological problem. With proper validation rules for entry into the system coupled with appropriate techniques for quality control, there is always a potential of completely eliminating the problems. Unfortunately, most ICD structures are built on legacy systems which are not easy to validate (Chan et al., 2015)

A standardization of the services offered across the hospital may also lead to another kind of problem referred to as an identification problem. The quality of identification of these kinds of problems is often a cause for concern in any environment (Ahmad et al., 2017). The authors provide an example of one service bearing different names based on the department which offers it. Resultantly the coding of such a service may result in double coding, or sometimes double billing. In instances where the ICD system is integrated with the local Electronic Medical Record (EMR), the system may end up double-mailing patients for the different services they sought from various departments within the same hospital. According to Chan et al. (2015) the most common implication

of identification quality issues relates to the associated costs. Through record matching, duplicate records identification as well as similarity index placement, the identification problems can be solved. Ultimately, the authors indicate that perfection is often unattainable but the best model for matching always varies from one institution to another based on the kind of output they are looking for (Chan et al., 2015).

2.4 Health System Factors

Toson Harvey and Close (2015) indicated that ICD systems codes were useful for reimbursement, mortality monitoring and planning or resource allocation. However, according to that study, the authors indicated that the ICD systems were most efficient when used for mortality or morbidity predictions. Lack of software and technology management policies and standards of operating procedures could as well be a safety risk factor given that the predefined procedures act as guidelines for operating or using the systems (Chan et al., 2015). Disease classification policies and procedures explain to staff and patients the importance of managing disease classification. Importance of these policies such as the security procedures and policies could go a long way to assisting staff training on issues relating to or bordering, safe email use, setting out processes for common tasks, ICD systems change management, among other crucial aspects of technology (Chen et al., 2015). Finally, Heron (2015) suggested that another risk factor could be in the form of an absence of a disease classification code of conduct. The code of conduct may otherwise be able to provide staff and customers with clear direction and definition of acceptable behaviours in relation to key disease classification issues, such as protection of privacy and ethical conduct. Other risks could come in the form of

human threats such as physical burglary as well as natural risks such as radiations (Martin et al., 2015).

There are a number of benefits that coding using ICD brings into perspective as identified in a study by Chen et al. (2015). For instance, there is the ability to measurement quality and reduction of medical error reduction leading to patient safety. The authors also identified outcomes measurement, clinical research; clinical, financial, and administrative performance measurement; Health policy planning; Operational and strategic planning and healthcare delivery systems design; Payment systems design and claims processing and Reporting on use and effects of new medical technology. In a different study, Martin et al. (2015) identified Provider profiling, Refinements to current reimbursement systems, such as severity-adjusted diagnosis-related groups (DRG) systems as well as Pay-for-performance programs as possible benefits of using the disease classification system. Besides agreeing with the various usages of ICD within the hospitals, Chan, Thurairajah and Colantonio (2014) reported benefits in the form of public health and bioterrorism monitoring; managing care and disease processes; and educating consumers on costs and outcomes of treatment options (Feudtner et al., 2014).

Adeleke et al. (2015) also reported that lack of automation and political will, and inadequate number of clinical coders in Nigeria hindered ICD-10 utilization. The authors also noted that continuing professional coding education and customization of the ICD tools to accommodate the local context were useful approaches to improving disease classification in Nigeria. Health information management professionals manage the process of clinical coding or disease classification thereby assuring quality of the

process (Adeleke et al., 2015). According to Hohl et al. (2013), there is need for professional medical coders to be trained so as to achieve high levels of performance. The authors also indicate that that as part of the requirement and objectives for the training, the professionals ought to be able to read through the clinician notes and patient records in order to be able to provide accurate code assignment. A more sustained quality in clinical coding emanates from a systemic decision to ensure that accredited medical academic institutions provide training on clinical coding. Both private and public institutions play an integral in ensuring sustainability. Korir et al. (2016) in their analysis of cancer incidence in Kenya, also highlighted on the growing investment and focus on two-year courses on medical coding and billing within the local context, coupled with multiple online courses for improvement of the same (Feudtner et al., 2014).

Chan et al. (2014) in their review of techniques for quality improvement in oncological settings observed that since oncology is a specialized field, it was imperative for the clinical coders to have an in-depth knowledge of the terminology used in patient management. The authors also highlighted that in ideal environments, clinical coders ought to read and understand the medical records.

According to Chan et al. (2015)'s narrative, clinical coding is a team process whose effectiveness is affected by the players from other departments. The authors provide an example of physician who may use terminology that may not be direct or intuitive given that they were developed from languages other than English. For instance, the use of "q.d." for prescriptions to imply "every day" stems from the Latin words *quaque die*.

The authors also provided examples of “a.c.” and “p.c.” which stand for before and after meals respectively (Feudtner et al., 2014). Chan et al. (2014) suggests that the decision to use medical abbreviations derived from English strings are mainly due to the ease of writing those strings in a shorter and quicker form. The authors provide examples of Open Reduction with Internal Fixation (ORIF) and Graft-Versus-Host Disease (GVHD) which are abbreviations for “open reduction with internal fixation” and “graft-versus-host disease” respectively. These two abbreviations are often used in place of their strings of words in most circumstances. Feudtner et al. (2014) note that the routine abbreviations of these kinds by clinicians assume that the professional coders are familiar with the terminologies employed. According to Hohl et al. (2013), at the end of their training, graduate trainees have a number of resources at their disposal, such as the user dictionaries which define the various vocabularies used in the ICD system, as well as the dictionary of abbreviations. Without proper, solid foundation, attaining the desired quality of coding often proves an uphill task (Chan et al., 2015).

Chan et al. (2014) also acknowledge that accurate and timely medical codes depend on the clinical coder’s understanding of the medical documentation. Feudtner et al. (2014) elaborated that one of the most vital facets of quality coding is accuracy. However, they also indicate that having the codes provided as soon as they are available is highly appreciable by decision makers. In their write-up, Chan et al. (2015), indicates that work overload could be a cause for poor accuracy and the inability to present the codes in time for prompt decision making. The authors indicated that in some organizations,

more than two hundred health records are translated into meaningful industry-standard code (Chan et al., 2015).

Hohl et al. (2013) observed that clinical code audit is an important aspect for ensuring that accuracy of the assigned codes is achieved. The audits are particularly important when it comes to claim submissions. According to the authors, the audit of clinical codes could be conducted by the health organization or a third party that acts on the interest of the health facility. Chan et al. (2015) recounts that claims filed without proper documentation may have some legal implication on the health facility, either for fraud or missing components of patient records. The authors further indicate that since the patient record is a legal document, that a court recognizes, all components of it have to be identifiable universally. In addition to the patient records themselves, the other billing information as well as clinical codes is also important for the completion of the legal document filed in court. Given their role in healthcare reimbursement, clinical coders ought to have the wherewithal to ensure transparency throughout the process (Hohl, et al., 2013).

2.5 Summary of Literature review isolating the gaps

The literature review revealed that identifying common coding errors and implementing both education and systems changes led to significantly improved coding accuracy. The review also showed that proper disease classification by the coders depends on their knowledge of the anatomical features of the human body, each of which has a particular name whose code is also unique. The knowledge of the anatomy of the human body is therefore a critical aspect in disease classification. The authors observed that certain

parts of the body such as the brain and the heart are easily known by virtually anyone, health professional or not. However, there are certain terminologies that are less intuitive, and therefore require a certain level of knowledge on medical terminology.

The review also revealed that the data used for code generation hugely depends on the quality of data input into the indexing systems as well as the records written in the patient files. Identification of data entry and collection issues are arguably the easiest. However, correcting the resultant errors could prove troublesome. In most cases, filtering or profiling of the data could be easy especially with query software, despite the difficulty in rectifying such issues especially if the codes were present. The review also revealed that the cost of data entry problems varies depending on its implication on use, and that if the intention of the coded data is merely for informational reasons, then the effect may not be hugely felt. However, the review also indicated that codes that are used for research or tracing of records may be priceless. The review also elaborated that as far as other technological issues are concerned, there are many systematic issues that may arise due to the data flow processes. However, unsystematic technological issues such as lost files, system crashes, or interference by malware, adware or viruses may also affect the quality and level of disease coding.

The review indicated that DCS systems codes were useful for reimbursement, mortality monitoring and planning or resource allocation. However, the systems were most efficient when used for mortality or morbidity predictions. Lack of software and technology management policies and standards of operating procedures could as well be a safety risk factor given that the predefined procedures act as guidelines for operating

or using the systems. Disease classification policies and procedures explain to staff and patients the importance of managing disease classification. Importance of these policies such as the security procedures and policies could go a long way to assisting staff training on issues relating to or bordering, safe email use, setting out processes for common tasks, ICD systems change management, among other crucial aspects of technology.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Study design

The study used cross-sectional descriptive research design where both quantitative and qualitative methods were employed. The cross-sectional approach was used given that the study aimed to capture a snapshot of the ICD coding characteristics. The use of mixed methods allowed for the assessment of distribution of the study variables among participants as well as a soliciting in-depth understanding of the focus of the study. Data was collected on various modifiable factors which were components of the independent variables (Ahmad et al., 2017).

3.2 Variables

3.2.1 Dependent variable

The dependent variable was DCS Utilization. Disease classification utilization was measured in terms of the extent to which the systems were utilized for retrieval, planning and research, morbidity/mortality reporting, and reimbursement by health insurance.

3.2.2 Independent variables

Independent variables were Health professional attributes, Health system factors, and Technological factors.

3.3 Location of the study

The study was conducted in Kiambu County, one of the 47 counties in Kenya – comprising a total of 12 sub counties, namely; Thika, Ruiru, Gatundu South, Gatundu North, Juja, Githunguri, Lari, Limuru, Kiambaa, Kikuyu, Kabete and Kiambu, as well as a number of state of the art hospitals – both private and public – as well as health

institutions of higher learning. Kiambu County has Nairobi and Kajiado Counties along its southern border, Machakos on the Eastern, Murang‘a on the northern and North Eastern border, Nyandarua on the North Western, and Nakuru on its western border. The county coordinates are 00 25', 10 20' S; and 360 31'; 370 15' E, respectively for latitudes and longitudes respectively (CGoK, 2021).

Kiambu County occupied a total area of 2,543.5 Km^2 (CGoK, 2021). Kiambu has many medical institutions that would benefit from the findings of this study. Kiambu is among the counties whose level of disease classification systems utilization is not yet established. Kiambu has both urban and rural hospital setups with varied resource allocation relative to facility distance from Nairobi.

3.4 Study Population

Only participants from Public hospitals in Kiambu County were targeted. Critical data gaps/disparities (e.g. inconsistent structure of reporting of deaths) remain in public hospitals compared to private, hence only public facilities studied (Amani, 2018). Kiambu County had 14 public hospitals: 2 level 5 hospitals and 12 level 4 hospitals. A total government employee population in these hospitals is 2700 and comprised the study population. It is from this study population that the sample size was derived. Each of these hospitals had a facility in charge, and the county also has Health records and information officers who were not based in any particular health facility and took part in the Key informant interviews.

3.5 Sampling Techniques and sample size

3.5.1 Sampling Techniques

Purposive sampling method was used to select all the hospital. Complete enumeration method a non-probability sampling was used to the respondents since they had the characteristics required for the study (Feldmann, 2014).

A census sampling design was used to enlist all the 119 HRIOs in all level 4 and 5 public hospitals in Kiambu County for the self-administered questionnaires. Only HRIOs were considered for involvement in the study since the subject of the study was quite technical and demanded a targeted choice of participants. Additionally, the pilot test done revealed that potential non-HRIO participants were not as informed on the subject. In order to prevent data duplication by interviewing a respondent more than once, the study used unique codes that comprised the facility's MFL code and a systematic number which varied based on the number of HRIOs in a given facility. In most facilities, the number of HRIOs was below 5 making it easier to take note of all participants.

3.6 Sample Size

A census sampling design was used to enlist all the 119 HRIOs in all level 4 and 5 public hospitals in Kiambu County for the self-administered questionnaires (Table 3.1). The questionnaires provided technical information pertaining to the technological as well as health professional factors, whereas the Key informant interview guide was used to solicit data for health system factors as they concerned mainly the management-related questions.

Key informants were selected purposively **(x * n/N). Where x is proportionate number; n=sample size; N=Population** (Gubrium & Holstein, 2001)**.** A total of 20 respondents were purposively selected for the key informant interviews. As such, the facility HRIOs were excluded from the KII. For the KII, the saturation point was used to determine the maximum number of interviews to be held.

Table 3. 1: Distribution of Health Records and Information Officers

	Health facility name	**Hospital Level**	**Number of staff**
1	Gatundu	Level 4	23
2	Kiambu	Level 5	20
3	Thika	Level 5	26
4	Igegania	Level 4	5
5	Kiambaa-kiharu	Level 4	5
6	Tigoni	Level 4	12
7	Ruiru	Level 4	8
8	Karuri	Level 4	2
9	Wangige	Level 4	1
10	Kigumo- Githinguri	Level 4	5
11	Lusiget	Level 4	2
12	Karatu –Gatundu south	Level 4	3
13	Juja Gachororo	Level 4	4
14	Lari	Level 4	3
	Total		**119**

Table 3.2: Sampling of respondents by type

Type of Respondents	**Questionnaire**		**Key Informants**	
	Sampling Frame	**Sample**	**Sampling Frame**	**Sample**
Facility in-charges	0	0	14	7
SHRIOs	12	12	12	6
CHRIO	1	1	1	1
SCMOHs	0	0	12	6
Facility HRIOs	106	106	0	0
Total	**119**	**119**	**39**	**20**

3.7 Data collection tools/instruments

Self-administered questionnaires (appendix III) were used to collect both qualitative and quantitative data. However, additional qualitative data was collected using the structured informant interviews (appendix V) that provided more in-depth information. Observation checklists were used to collect health system related data (appendix IV). The questionnaires were developed based on the reviewed literature gaps identified. The questionnaire was organized into different sections based on the objectives of the study. The questionnaire had four sections, divided based on the study objectives: Section A obtained the respondent socio-demographic characteristics; Section B, C, and D answered to the second third and fourth objectives. The study established the level of utilization upon achieving those three objectives, and as such, objective one was attained indirectly (Etyang et al., 2014).

3.8 Pre-testing of data collection tools

A pre-test was conducted in Murang'a County Hospitals (2 Hospitals per level) which included 14 facility HRIOs for the questionnaires and 2 facility in-Charges – 1 SCHRIO and 1 SCMOH for the KII. Murang'a was chosen given it provides similar contexts to Kiambu County with a delicate balance of urban and rural hospitals. The aim of this analysis of the pre-test was to refine the data collection tools. According to Adeleke et al. (2015), pretesting involves testing your research instrument in conditions as similar to the research as possible, but not with an intention to report results. Instead, the objective of the pretest is to check for flaws in wording of questions, clarity or lack of which in instructions, or anything that could impede the instrument's ability to collect data in an economical and systematic fashion.

3.8.1 Validity

Two research assistants – HRIO by cadre – were trained prior to data collection for a couple of days to ensure they collect the desired data accurately and consistently. The researcher accompanied each assistant on different days to ensure accuracy and counter-checked all filled in questionnaires at the end of each day to address any mistakes or errors.

3.8.2 Reliability

The pre-test assessed the reliability of the data collection instruments where 50% of the sampled population was used in the test. After the issue of the pilot questionnaires, Cronbach's alpha was used where any value of more than 0.7 indicated the reliability of the questionnaires. All the items in the questionnaire were used in the calculation of this alpha (Etyang et al., 2014). Specific gaps were identified in the data collection tools such as the inclusion of the "<20 year olds", "the focus of the type of disease classification system type to ICD-10 and ICD-9, removing SNOMED CT which was also part of the options provided. These gaps were rectified prior to the data collection.

3.9 Data Collection Techniques

Two research assistants were recruited and trained on the purpose of the study in relation to the data collection tools. The data collection involved visits to the hospitals within the Sub County and was guided by the questionnaire and the KII so as to maintain focus on the study objectives. The observation checklist was filled solely by the researcher. Since all the available health records and information professionals were interviewed, there was no systematic pattern or criteria for selecting study participants, other than that outlined in the inclusion and exclusion criteria (Etyang et al., 2014).

3.10 Data Analysis

Data entry and cleaning was done in MS Excel. Pre-analysis was conducted to check for inconsistencies, incorrect and missing data. Quantitative data was compiled and coded in SPSS v22 software. Descriptive statistics comprising frequencies and percentages were used to describe variables used in the study. Pearson's Chi-square test was used to establish the significance between the categorical variables whereas correlation enabled the ascertaining of the association between various variables. Statistical significance of the relationship between variables was inferred at 5% level of significance. The results were then presented in form of pie charts, bar charts and frequency tables. Qualitative data from the key informant interviews (KII) were pre-coded and analyzed thematically, with the aim of developing grounded theories (Etyang et al., 2014). The health systems factors were collected qualitatively from the KII and on the observation checklists. In the analysis of the qualitative data, thematic analysis was used involving the use of preset and emerging codes where responses were coded into themes. These themes were then used to arrive at different conclusions accordingly.

3.11 Logistical and Ethical Consideration

Authority letter was issued from Kenyatta University Graduate School (appendix VIII), a research approval letter was obtained from Kenyatta University Ethical and Review Committee (appendix IX), research authorization letter and permit (appendix X and XI) was issued from National Commission for Science, Technology and Innovation (NACOSTI) and research authorization letter was issued from County Government of Kiambu (appendix XII). Participation was on voluntary basis, confidentiality was assured for all participants, and findings disseminated to all those in need of the same.

CHAPTER FOUR: RESULTS

4.1 Introduction

This section provides the data analysis and presentation of the findings from the study. The results are presented thematically (for each objective). The presentations are done through tables, graphs and text. Of the 119 study participants, only 112 had complete information, and were therefore used in these data analyses, revealing a 94% response rate.

Knowledge of disease classification utilization is a transferable skill, and as such, gaining experience in using it in one facility contributes to the capacity of the health system with regards to the resources for disease classification system use. Consequently, we looked at the individual's expertise in the DCS with or without it being present in the facilities of study. For example, if a professional was only recently transferred from Kiambu County Hospital where DCS is present to Wangige, where the DCS was absent, it did not affect the individual's expertise.

Table 4.1 presents a listing of all the facilities used for the study as well as a description of the facilities. Fourteen (100%) participant hospitals did not use ICD for coding outpatient services data. Six (43%) of the hospitals did not use ICD at all; two of whom had SVD type maternity services as their only inpatient service, prompting them to use memory-based coding.

Table 4.1: Summary of Study participants and coding status by Facility

Facility Code	Health facility name	Health facility level	No. of staff	DCS Available	Services for which DCS used
1	Gatundu	4	21	Yes	Coding IP Diagnosis
2	Kiambu	5	19	Yes	Coding IP Diagnosis
3	Thika	5	25	Yes	Coding IP Diagnosis
4	Igegania	4	5	Yes	Coding IP Diagnosis
5	Kihara	4	5	Yes	Coding IP Diagnosis
6	Tigoni	4	12	Yes	Coding IP Diagnosis
7	Ruiru	4	8	Yes	Coding IP Diagnosis
8	Karuri	4	2	No	Coding Maternity Diagnosis
9	Wangige	4	1	No	None
10	Kigumo	4	5	No	Coding Maternity Diagnosis
11	Lusiget	4	2	No	None
12	Karatu	4	2	No	None
13	Gachororo	4	4	No	None
14	Lari	4	1	Yes	Coding IP Diagnosis
	Total		112		

4.2 Sociodemographic Factors of the study participants

Table 4.2 below shows the univariate analysis of the socio-demographic factors, including frequencies and percentages. The socio-demographics studied were Age, Sex, and highest level of education. The majority (59%) of the participants were at least 30 years' old, whereas 69% (n=77) were female. For the highest education, most (48%) respondents had attained diploma level compared to those with certificates or undergraduate levels who comprised 22% and 32% respectively.

Table 4.2: Socio-demographic characteristics of respondents

Variables	Value labels	*Frequency*	*Percentage*
Age	**<30 years**	46	41%
	30+ years	66	59%
	Total	112	100%
Sex	**Male**	35	31%
	Female	77	69%
	Total	112	100%
Highest Education	**Certificate**	22	19%
	Diploma	54	48%
	Undergraduate	36	32%
	Total	112	100%

Table 4.3 below shows the association between sociodemographic characteristics of respondents and DCS utilization. Specifically, the Pearson's chi-square test for independence was used where the test statistic, degrees of freedom, and associated p-values are presented. Age was statistically significantly associated with DCS usage (X^2= 7.719 (1); p=0.003).

Age was the only sociodemographic characteristic significantly associated with overall DCS utilization in the hospitals. Sex, highest educational qualification, and DCS knowledge were all not statistically significantly associated with DCS utilization in the participant hospitals. Specifically, those aged 30+ years and above were more likely to use the disease coding system as informed by the 77% of them who frequently used the system.

Table 4.3: Influence of participant sociodemographic characteristics on DCS utilization

Variables	Value labels	Individual-level DCS Utilization status						Chi-square (d.f.); p-value
		Limited use		Extensive use		Total		
		n	*%*	*n*	*%*	*n*	*%*	
Age	**<30 years**	22	59%	24	32%	46	41%	**7.719 (1); 0.003**
	30+ years	15	41%	51	68%	66	59%	
Sex	**Male**	8	22%	27	36%	35	31%	2. 53 (1); 0.076
	Female	29	78%	48	64%	77	69%	
Highest Education	**Certificate**	8	22%	14	18%	22	20%	0.231 (2); 0.906
	Diploma	16	43%	38	51%	54	48%	
	Undergraduate	13	35%	23	31%	36	32%	
Overall DCS Utilization status		**37**	**33%**	**75**	**67%**	**112**	**100%**	

4.3 Utilization of ICD

Figure 4.1 shows the overall level of disease classification systems utilization in the study area. The overall utilization was computed based on the four main dimensions of DCS utilization: Planning, Reimbursement, Reporting and Decision making. The responses for these aspects were summed and divided by four so as to come up with a composite measure of the level of utilization. This composite measure was then recoded into two. Out of the 112 respondents, 75 (67%) indicated that the systems were utilized frequently on average for the functions studied, as shown in the figure below.

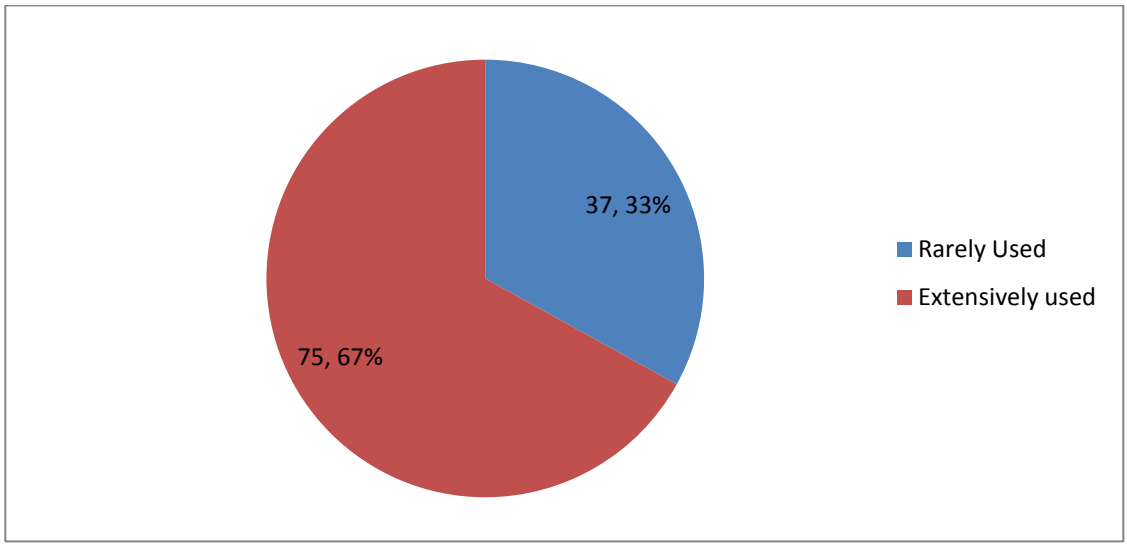

Figure 4.1: Utilization of ICD in the participant facilities

4.4 Health Professional factors influencing DCS utilization

Table 4.4 below presents results of the influence of various coding professional's factors and DCS utilization. Overall experience in years, experience in clinical coding, ICD knowledge and ICD perception by the staff were assessed against the outcome variable. Length of coding experience and DCS perception were the only personnel factors significantly associated with overall DCS utilization in the hospitals. Experience was a good indicator of utilization of the coding system although those who were routinely involved in DCS-related clinical coding had the statistically significant associations compared to those who had not much coding experience (X^2= 3.7 (1); p=0.027). Finally, those who had a positive perception of the DCS systems were more likely to use the systems compared to those who had poor perception of the systems (X^2= 9.74 (1); p=0.000).

Table 4.4: Influence of Health personnel characteristics on DCS utilization

Variables	Value labels	Individual-level DCS Utilization status						Chi-square (d.f.); p-value
		Limited use		Extensive use		Total		
		n	*%*	*n*	*%*	*n*	*%*	
Overall Experience	**<5 years**	27	73%	42	56%	69	62%	3.818 (1); 0.09
	5+ years	11	30%	32	43%	43	38%	
Coding experience	**1-5 years**	33	89%	55	73%	88	79%	**3.7 (1); 0.027**
	>5 years	4	11%	20	2%	24	21%	
Disease classification systems knowledge	**Poor**	8	22%	27	36%	35	31%	0.895 (1); 0.432
	Good	29	78%	48	64%	77	69%	
Disease classification systems perception	**Poor**	13	35%	8	11%	21	19%	**9.74 (1); 0.00**
	Good	24	65%	67	89%	91	81%	
Overall DCS Utilization status		**37**	**33%**	**75**	**67%**	**112**	**100%**	

4.5 Technological factors influencing DCS utilization

This sub-section presents findings of the technological factors. The levels of utilization assessed from an individual standpoint provided the more precise indication, compared to the overall assessment at facility-level. As such, Table 4.5 below shows the distribution of the number of ICD references available, the type of ICD present, as well as the number of computers with ICD installed. The figures, while not compared to the facility-specific level of utilization, provide a basis for establishing inferences.

Nine (64%) of the facilities observed had 2 or more ICD references. Given that 6 facilities had earlier been reported not to be using ICD, the implication of this finding is

that there is one facility with at least 2 references, yet these references are not being exploited or put into use. Generally, the implementation of the ICD system was observed to be ongoing in most of the facilities, and as such, it may be premature to expect them to be using the system while the implementation process is still not complete. However, when viewed in the perspective of the ratio between the technologies and the staff present, the indication is that there is a great need for greater resource allocation. As reported under health system factors, the procurement and installation, as well as maintenance tasks also lag behind when it comes to budgetary allocation. Manual systems for coding were present in 10 (72%) of the health facilities, although only 7 of them were functional. Only Thika and Kiambu Level 5 and Ruiru Hospital had an electronic ICD system for clinical coding in place and functional. Gatundu Hospital had electronic systems, but the ICD system was not functional. Twelve (86%) had less than one computer per staff. Given it is within the government-moderated or public health facility setup, it may be unrealistic to expect even a 1:1 ratio.

Table 4.5: Influence of technological factors on DCS utilization

Variable	**Values**	**Statistics**	
		Number	**Percentage**
ICD references available	<2 references	5	36%
	2 or more	9	64%
Type of ICD present	Manual	10	72%
	Electronic	4	28%
Computer: HRIO ratio	< 1:1	12	86%
	1:1 or better	2	14%
	Total	**14**	**100%**

Table 4.6 below shows the results of the Fisher's test p-value when technological factors were assessed against the outcome variable at facility level. None of the p-values revealed statistically significant differences across the various categories.

Table 4.6: Results of test of association between technological factors with the Facility level of utilization

		Facility-level Utilization status			
Variable	**Value labels**	**Utilized**	**Not utilized**	**Total**	**Fishers test**
Disease classification references available	<2	4 (40%)	1 (25%)	5 (36%)	p=0.671
	2 or more	6 (60%)	3 (75%)	9 (64%)	
Type of disease classification system present	Manual	7 (70%)	3 (75%)	10 (72%)	p=0.899
	Electronic	3 (30%)	1 (25%)	4 (28%)	
Computer: HRIO ratio	< 1:1	8 (80%)	4 (100%)	12 (86%)	-
	≥ 1:1	2 (20%)	0 (0%)	2 (14%)	
Overall DCS Utilization status		**10** (71%)	**4** (29%)	**14** (100%)	

4.6 Health System Factors influencing DCS utilization

The health systems factors were collected qualitatively from the KII and quantitatively on the observation checklists. The results of the observation checklists are summarized in table 4.7. Resource allocation (budget and staff) for DCS use is inadequate, although not significantly associated with utilization of DCS. Additionally, local or national SOPs on customizations of the ICD system were missing. The qualitative analysis involved coding of the responses into themes. The themes were assigned different codes and the results are outlined in Appendix VI.

The study revealed that clinical coding was done at various locations within the hospitals and broadly depended on the layout of each facility. Some hospitals reported that clinical coding took place during patient registration/clerking in the system; others indicated that coding systems were well integrated with the clinical care process so that the clinicians were also allowed to do coding, albeit with the help of the digital systems. This observation was synonymous with the more established health facilities that were able to afford electronic clinical coding systems or EMR. However, majority of the responses indicated that the clinical coding was done primarily in the records offices upon discharge of a patient. Responses regarding the location of the clinical coding included:

> "Here, we code at the time when the patients is being registered in the system" (KII 10).
>
> "The use of the electronic ICD system is usually helpful because we do not have to memorize the codes." (KII 15)

> "It is also quicker to use the electronic version of the ICD", added another informant" (KII 04)

Yet, other informants reported that clinicians were also involved in code assignment. For example:

> "Our clinicians assign disease codes during consultation, although I believe this approach is best for smaller health facilities, which have less workload and human resource to dedicate an individual for clinical coding" (KII 09)

It was interesting to observe that regardless of the location or who was conducting the clinical coding, all the respondents preferred the maintenance of the status quo as far as the process is concerned. The attitude of the staff at the facilities was also assessed revealed some positive responses such as:

> "It's standard and internationally recognized, therefore best" (KII 014)
>
> "There are not so many options really. We found professionals using it. We still use it and they keep updating it. So it may be the best solution for the moment." (KII 02)

And

> "Training enhances understanding and consequently encourages use" (KII 16).

Despite these feedbacks being rather positive, it may also be taken as an attempt by the staff to provide diplomatic responses. The suggestion that ICD system was good simply because of it being international perhaps may not hold true if the participants explored alternative clinical coding systems. Additionally, training was indicative of better utilization.

For the budget-related questions, resource allocation for health was viewed as inadequate based on the observation checklist although the differences were not statistically significant. This inadequacy was justified by claims from the KII that:

"Considering the general plight of resources, only so much is possible" (KII 04).

Other responses suggested that the resource allocation concerns are "a national issue" and therefore may not be solved by a simple local move within the county. With regards to the policy issues assessed, the study reported that "international coding guidelines and policies were present as availed through the WHO, although local or national guidelines were missing. Given the internationally-recognized nature of ICD, a modification of the codes may not really help as part of the objective of using the international classification of diseases is to present a globally-acceptable standard for sharing and use.

Table 4.7: Influence of Health system factors on DCS utilization

Variable	Value Label	DCS utilization status			Fisher's exact test
		Utilized	Not Utilized	Total	
Budget	Adequate	2	2	4	p=0.3516
	Inadequate	8	2	10	
Staff	Less than required standard	7	4	11	-
	At or more than required	3	0	3	
SOPs	Present	0	0	0	
	Absent	10	4	14	
Policies	Present	1	0	1	-
	Absent	9	4	13	
	Total	**10**	**4**	**14**	

CHAPTER FIVE: DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Discussion

The overall utilization was computed based on the four main dimensions of DCS utilization: Planning, Reimbursement, Reporting and Decision making. The responses for these aspects were summed and divided by four so as to come up with a composite measure of the level of utilization. The disease classification systems were used frequently by 67% of the respondents, although the most exploited avenue for use for the disease classification systems was in reporting. This finding is consistent with Toson et al. (2015) who reported that the DCS were most efficient when used for mortality or morbidity predictions.

5.1.1 Health Professional factors

Sex, highest educational qualification, and overall work experience period were not statistically significantly associated with DCS utilization in the participant hospitals. This observation was inconsistent with Quan et al. (2013) who defined knowledge as a "fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information". Based on this definition, they argued that knowledge influenced DCS adoption. This observation was consistent with Kiongo et al. (2019)'s report that improving the staff knowledge through training translates in better usage.

The study also found out that DCS knowledge was not statistically significantly associated with proper or frequent DCS usage. This finding was inconsistent

observations by Chen et al. (2015) who claimed that proper disease classification by the coders depended on their knowledge of the anatomical features of the human body, each of which has a particular name whose code is also unique. The knowledge of the anatomy of the human body is therefore a critical aspect in disease classification. The study also observed that good DCS knowledge translated in less utilization of the systems within the participant facilities. This could be explained by the fact that as more and more professionals code the diseases off head without referring, there is less reliance on the DCS manuals. Consequently, this issue becomes detrimental to the usage or implementation of ICD at the facilities given that some of the facilities overlooked the need for an DCS system. A classic example was in a facility that only coded spontaneous vertex delivery (SVD) given that that was the only procedure done at the facility. In that facility, the clinical coding was done without the DCS manuals since the code for SVD was known by all HRIOs as "Z37.0". This observation was also consistent with Kiongo et al. (2019)'s argument that memory-based coding is commonly used within the local context. The only difference between that study and our study was that Kiongo and colleagues undertook their study within an urban setup whereas this study was conducted in both rural and urban contexts (Kiongo et al., 2019). Additionally, this finding is consistent with reports by Chen et al. (2015) who claimed that certain conditions, procedures, or parts of the body such as the brain and the heart are easily known by virtually anyone, health professional or not. However, there are certain terminologies that are less intuitive, and therefore required a certain level of knowledge on the terminology, such as myocardium.

DCS perception were significantly associated with overall DCS utilization in the hospitals. For every unit increase in perception towards DCS there is a 5-times likelihood of frequently or always using the coding systems than those that reported poor perception. This finding is consistent with Heron (2015) who claimed that DCS perception strengthening translated in better utilization. According to Heron (2015), improving perception through the identification of common coding errors, implementation education and systems changes led to significantly improved coding utilization. Age and DCS-related work experience were also statistically significantly associated with DCS utilization. With greater age and better experience, there was higher likelihood of using or embracing disease classification tool on a routine basis. This finding is consistent with Hohl et al. (2013) who indicated that training ensured not only better knowledge but also professionalism during coding experience. The authors indicated that professional medical coders achieve high levels of performance due to the years of work they acquire. The authors also indicate that that as part of the requirement and objectives for the training, the professionals ought to be able to read through the clinician notes and patient records in order to be able to provide accurate code assignment. A more sustained quality in clinical coding emanates from a systemic decision to ensure that accredited medical academic institutions provide training on clinical coding. Both private and public institutions play an integral in ensuring sustainability.

5.1.2 Technological factors

The majority of the participant facilities observed had 2 or more DCS references. This statistic is positive when each facility is observed individually. However, when viewed

in the perspective of the ratio between the technologies and the staff present, the indication is that there is a great need for greater resource allocation. This finding is in agreement with Chan et al. (2015) who reported that there was insufficient technology to help in the disease classification systems. The authors also indicated that a lack of software and technology management policies and standards of operating procedures were a hindrance to the effective use of DCS (Chan et al., 2015). As reported under health system factors, the procurement and installation, as well as maintenance tasks also lag behind when it comes to budgetary allocation. Most of the health facilities surveyed used manual systems whereas had less than one computer per staff. Given it is within the government-moderated or public health facility setup, it may be unrealistic to expect even a 1:1 ratio. Additionally, according to Lehr et al. (2016)'s study on "occupational e-mental health: current approaches and promising perspectives for promoting mental health in workers", there is an occupational risk of over-computerizing the workplace. The authors claimed that when every worker has a personal computer, there is some health risk, especially pertaining to fatigue and mental health. They also indicate the importance of sharing technologies so that individuals at the workplace do not over-engage the technologies.

5.1.3 Health system factors

The study revealed that clinical coding was done at various locations within the hospitals and broadly depended on the layout of each facility. Some hospitals reported that clinical coding took place during patient registration/clerking in the system; others indicated that coding systems were well integrated with the clinical care process so that the clinicians were also allowed to do coding, albeit with the help of the digital systems.

This observation was synonymous with the more established health facilities that were able to afford electronic clinical coding systems or EMR. However, majority of the responses indicated that the clinical was done primarily in the records offices upon discharge of a patient. It was interesting to observe that regardless of the location or who was conducting the clinical coding, all the respondents preferred the maintenance of the status quo as far as the process is concerned. The attitude of the staff at the facilities was also assessed revealed some positive responses such as: "It's standard and internationally recognized, therefore best" and "Training enhances understanding and consequently encourages use".

Despite these feedbacks being rather positive, it may also be taken as an attempt by the staff to provide diplomatic responses. The suggestion that disease classification system was good simply because of it being international perhaps may not hold true if the participants explored alternative clinical coding systems. Additionally, training was indicative of better utilization. This observation, however, was consistent with Topaz et al. (2016) that the current "clinical modification represents a significant improvement over ICD-9-CM and ICD". The specific improvements include the creation of the diagnosis/symptom combinations that reduce the number of codes required to describe a certain medical condition, additional information relevant to the description of managed care and ambulatory encounters, and greater specificity in codes. The NCHS conducts an annual update of ICD-CM, and the last update was released in December 2012

For the budget-related questions, resource allocation for health was viewed as inadequate. This inadequacy was justified by claims that "Considering the general plight

of resources, only so much is possible". Other responses suggested that the resource allocation concerns are "a national issue" and therefore may not be solved by a simple local move within the county. With regards to the policy issues assessed, the study reported that "international coding guidelines and policies were present as availed through the WHO, although local or national guidelines were missing. Given the internationally-recognized nature of ICD, a modification of the codes may not really help as part of the objective of using the international classification of diseases is to present a globally-acceptable standard for sharing and use.

5.2 Conclusion

The study benefited the body of knowledge by providing new information that utilization of DCS in L4 and L5 hospitals in Kiambu Hospitals was

The study concluded as follows:

1) Null hypothesis rejected. Positive staff perception increases utilization of disease classification systems.
2) Null hypothesis not rejected. Technological factors not associated with DCS utilization. There is limited adoption of technology and availability of IT resources in use of DCSs. *No sufficient evidence to reject null hypothesis*
3) Null hypothesis not rejected. Low utilization of DCS in facilities is driven by lack of enabling environment mainly inadequate resource allocation, limited us of clinical coding guidelines and policies

5.3 Recommendations

5.3.1 Recommendations from the study

Based on the conclusions, the recommends:

1) County Health Management Team (CHMT) and Sub-CHMT to increase exploitation of the various uses of DCSs at facility level so as to improve the perception of the staff. From the study findings, positive staff perception significantly influenced disease classification utilization.
2) The HRIOs to emphasize on importance of DCS technology in the health facilities to increase utilization of the DCSs as established in the study findings.
3) The MOH should increase resource allocation for health, and consequently for DCS at all levels: national and county

5.3.2 Recommendations for further research

The study recommends further studies to establish the strength of association between the factors that were found to significantly affect the level of ICT adoption. Additionally, a similar study should be done in other counties, and more importantly at a national level to establish the level of ICT adoption in Kenya.

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APPENDICES

Appendix I: Work Plan

YEAR	2018						2019						2020
ACTIVITY	Jan – Feb	Mar - April	May	Jun-Oct	Nov	Dec	Jan – Mar	Apr – July	Aug – Sept	Oct	Nov	Dec	Jan-July
Literature review													
Topic Identification													
Presentation of concept paper													
Proposal writing													
Proposal defense													
Data collection													
Data entry and analysis													
Final Report writing													
Final presentation and defense													
Submission of the thesis													

Appendix II: Budget

ITEM DESCRIPTION	**Unit Cost**	**No. of Items or days (Frequency)**	**AMOUNT**
Proposal Preparation	-	-	10,000
Research Permits and Ethical Approvals	-	-	8,000
Communication (internet and airtime)	100	100	10,000
Questionnaires	50	111	5,550
Research assistants	15,000	2	30,000
Transport & Communication	200	60	12,000
Data entry and analysis			50,000
Supervision	10,000	10,000	10,000
Sub Total			**135, 550**
Contingencies	10% of Sub Total		13,555
Total			**149,105**

Appendix III: Questionnaire

Respondent Code: _____

Questionnaire Item Code	**Item Description**	**Responses**
SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS		
1	What is your age (in years)	[1] < 20 [2] 20-29 [3] 20-29 [4] 20-29 [5] 20-29 [6] 35 or more
2	What is your gender	[1] Male [2] Female [3] Others
3	What is the highest Level of Education:	[1]Certificate [2] Diploma [3] Undergraduate [4] Post-graduate
4	Please state all the courses you studied in college/university?	**a.** _____ **b.** _____ **c.** _____
5	For how many years have you	1. _____

	worked as a HRIO?	
6	Have you ever been involved in disease coding?	[1] Yes [2] No If no, please SKIP to question 10.
7	For how long have you been involved in using disease coding systems?	[1] < 1 year [2] 1-5 years [3] > 5 years
8	Please name the disease classification systems that you have ever used.	[1] ICD-9 [2] ICD-10 [3] Others, please specify _____
9	Which disease coding system is currently in used at this hospital?	[1] ICD-9 [2] ICD-10 [3] Others, please specify _____
10	Have you received any training on disease coding in the last 12 months?	[1] Yes [2] No **If No, skip to Q12**
11	Where did you receive the training from?	[1] Workshop/seminars [2] Institution/on-job-training [3] During studies in

		school
SECTION B: HEALTH PROFESSIONAL FACTORS		
Indicate your level of agreement or disagreement with the following statements on knowledge on DCS usage		**Ratings are: [1] True, [2] False, and [3] Don't Know**
12	ICD is used to code medical procedures.	
13	The Alphabetical index is the place for finding disease codes	
14	Coding a fracture requires two codes	
15	For a disease with two codes (i.e. a dagger and an asterisks (*), select the code with a dagger.	
16	Diagnosis coding in DCS uses 3-7 codes.	
Indicate your level of agreement or disagreement with the following statements on perceptions of DCS usage		**Ratings are: [1] True, [2] False, and [3] Don't Know**
17	Disease coding systems are useful in this hospital	
18	Disease coding systems in this hospital are easy to use	
19	Disease coding systems are	

	beneficial to the staff	
20	Disease coding systems reduces workload	
21	Disease coding systems improve reporting	
OUTCOME VARIABLE MEASUREMENT: UTILIZATION OF DISEASE CLASSIFICATION SYSTEMS		
To what extent do you use disease classification systems in the following areas		**0 – Never Used;** **1 – Rarely Used;** **2 – Frequently Used;** **3 – Always):**
Planning		
Reimbursement by health insurance		
Morbidity/mortality reporting		
Decision making		

Appendix IV: Observation Checklist

Section B: Health System Factors

Facility Name: _____

Facility Level: _____

Facility Code: _____

Checklist Item	**Item components**	**Status or Evidence / Means of verification**
Budget and financial resource allocation	1. Budget present in the facility for: a. Training b. Procurement and Installation c. Maintenance	
Staff	Required per standard	
	Available per standard	
ICD and technological characteristics	Number	
	Manual/Electronic	
	How many installed in computers	
SOPs/Policies	Coding Manual	
	Coding guideline manual	
	Policies on coding standards manual	

Appendix V: Key Informant Guide

Interviewee Code: _____

Health system factors

At what point during service delivery is clinical coding done (to be asked to facility in charges)? Is this common in all areas of this institution? Do you prefer it like this or should this be changed? Why?

_____

_____

_____

_____

_____

_____

Health Professionals Factors

What do you think about the use of ICD? Is this the same view for the staff in the department?

_____

_____

_____

_____

From your experience, how does the knowledge and experience affect the utilization of ICD? Probe for real-life examples of occurrences in the facility/organization.

_____

_____

_____

_____

Technological factors

Is there an interaction between technology and disease classification systems in this institution? Describe why or why not?

_____

_____

_____

_____

_____

_____

_____

_____

Utilization of ICD

To what extent has ICD been utilized in this area (facility/sub-county/county)? (Probe for gaps in use e.g. which aspects are coded; types of systems in place e.g. ICD etc).

Appendix VI: Summary of Qualitative data

Data source	Respondent type	Qualitative data	Code	Theme
KII	Hospital staff	During patient registration/clerking in the system	At Reception	Location
KII	Hospital staff	During consultation by clinician	At OPD	Location
KII	Hospital staff	HRIO-based in records office	After discharge	Location
KII	Hospital staff	Diseases displayed with codes	Best-practice	Approach
KII	Hospital staff	OPD is preferred	Best-practice	Approach
KII	Hospital staff	HRIO-based is preferred	Best-practice	Approach
KII	Hospital staff	It's standard and internationally recognized, therefore best	System-attitude	Attitude
KII	Hospital staff	Training enhances understanding and consequently encourages use	System-attitude	Attitude
Checklist	CGoK offices	Resource allocation for health inadequate, is a national issue not just county	Budgetary and financial	Financial
Checklist	Hospital staff	Less funds for training, procurement and installation, and maintenance	Budgetary and financial	Financial
Checklist	Hospital staff	Considering the general plight of resources, only so much is possible	Budgetary and financial	Financial
Checklist	Hospital staff	International coding guidelines and policies present in form of WHO publications; no national guidelines present	SOPs and Guidelines	Policies

**CGoK: County Government of Kiambu*

Appendix VII: Informed Consent

You are requested to participate in a study conducted by Duncan Mutongu Maina, a student in Kenyatta University pursuing a Master's of Science degree in Health Information Management (MIM). The purpose of the study is to assess the utilization of disease classification systems in public hospitals in Kiambu County.

If you agree to participate, the research team will request you to complete a questionnaire that will take about ten minutes to complete. The information will help the Kiambu County Health Management Committee and other stakeholders to identify and improve in any gaps in utilization of disease classification systems. The research team cannot guarantee that you will receive any direct benefits from your participation; however, the study is of much benefit to all employees and stakeholders of Kiambu County Health Management Committee.

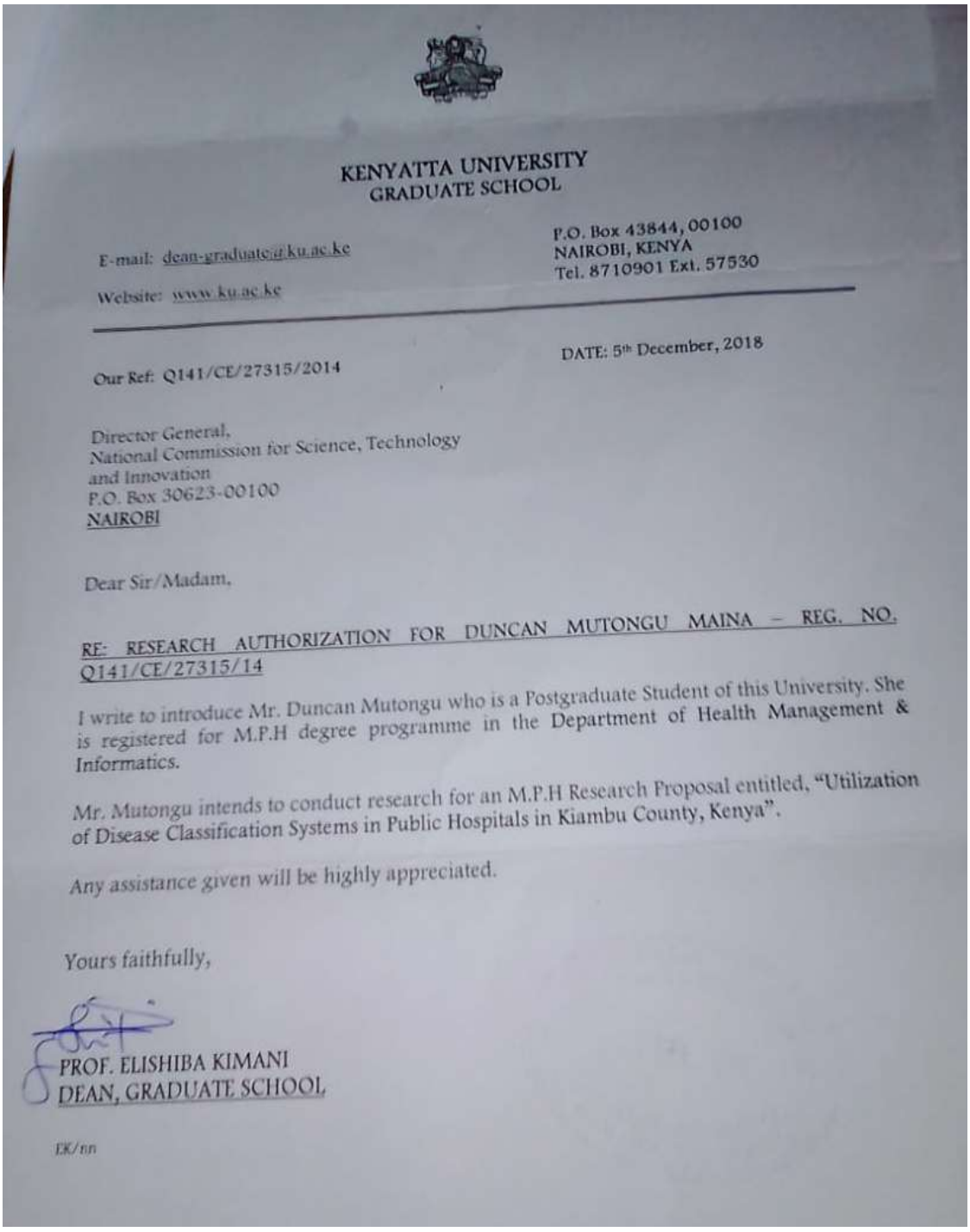
Any information that is obtained through this study and can be identified with you will remain confidential. The study is being done with the relevant approval from the Ethics and Research Committee of Kenyatta University and the Board of Examiners at the Department of Health Management and Informatics and Graduate school in Kenyatta University.

Your decision to participate or not to participate in this study will not prejudice your relationship with Nairobi City County Health Management Committee as your employer. The Kenyatta University Ethics and Research Committee has reviewed and approved this research. In case of concerns about your rights as a respondent, please do not hesitate to contact the secretary of the committee on telephone number 020 8710901/12.

If you have any questions, please ask the research team. In case of any questions later on, you can contact Mr Duncan on 0723167027 who is the lead researcher.
A copy of this form will be availed to you for your records.

Respondent Signature _____

Appendix VIII: Authority letter from Kenyatta University Graduate School



KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke
Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530

Our Ref: Q141/CE/27315/2014

DATE: 5th December, 2018

Director General,
National Commission for Science, Technology
and Innovation
P.O. Box 30623-00100
NAIROBI

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR DUNCAN MUTONGU MAINA – REG. NO. Q141/CE/27315/14

I write to introduce Mr. Duncan Mutongu who is a Postgraduate Student of this University. She is registered for M.P.H degree programme in the Department of Health Management & Informatics.

Mr. Mutongu intends to conduct research for an M.P.H Research Proposal entitled, "Utilization of Disease Classification Systems in Public Hospitals in Kiambu County, Kenya".

Any assistance given will be highly appreciated.

Yours faithfully,

PROF. ELISHIBA KIMANI
DEAN, GRADUATE SCHOOL

EK/nn

Appendix IX: Research Approval Letter from KUERC

KENYATTA UNIVERSITY
ETHICS REVIEW COMMITTEE

Fax: 8711242/8711575
Email: chairman.kuerc@ku.ac.ke
kuerc.secretary@ku.ac.ke
Website: www.ku.ac.ke

P. O. Box 43844,
Nairobi, 00100
Tel: 8710901/12

Our Ref: **KU/ERC/ APPROVAL/VOL.1** (249) Date: 20th March, 2019

Duncan Mutongu Maina
P.0 Box 43844-00100
Nairobi

Dear Duncan,

APPLICATION NUMBER: PKU/991/I1041: "UTILIZATION OF DISEASE CLASSIFICATION SYSTEMS IN PUBLIC HOSPITALS IN KIAMBU COUNTY, KENYA "

1. IDENTIFICATION OF PROTOCOL

The application before the committee is with a research topic **"Utilization Of Disease Classification Systems In Public Hospitals In Kiambu County, Kenya"** received on 28th February 2019, and discussed on 12th March, 2019

2. APPLICANT

Duncan Mutongu Maina

3. SITE

Kiambu County, Kenya

4. DECISION

The committee has considered the research protocol in accordance with the Kenyatta University Research Policy (section 7.2.1.3) and the Kenyatta University Ethics Review Committee Guidelines and **APPROVED that the research may proceed for a period of ONE year from 12th March, 2019**

5. **ADVICE/CONDITIONS**

i. Progress reports are submitted to the KU-ERC every six months and a full report is submitted at the end of the study.
ii. Serious and unexpected adverse events related to the conduct of the study are reported to this committee immediately they occur.
iii. Notify the Kenyatta University Ethics Committee of any amendments to the protocol.
iv. Submit an electronic copy of the protocol to KUERC.

When replying, kindly quote the application number above.
If you accept the decision reached and advice and conditions given please sign in the space provided below and return to KU-ERC a copy of the letter.

APPROVED
14 MAR 2019
OFFICE OF THE CHAIRMAN
ETHICS REVIEW COMMITTEE

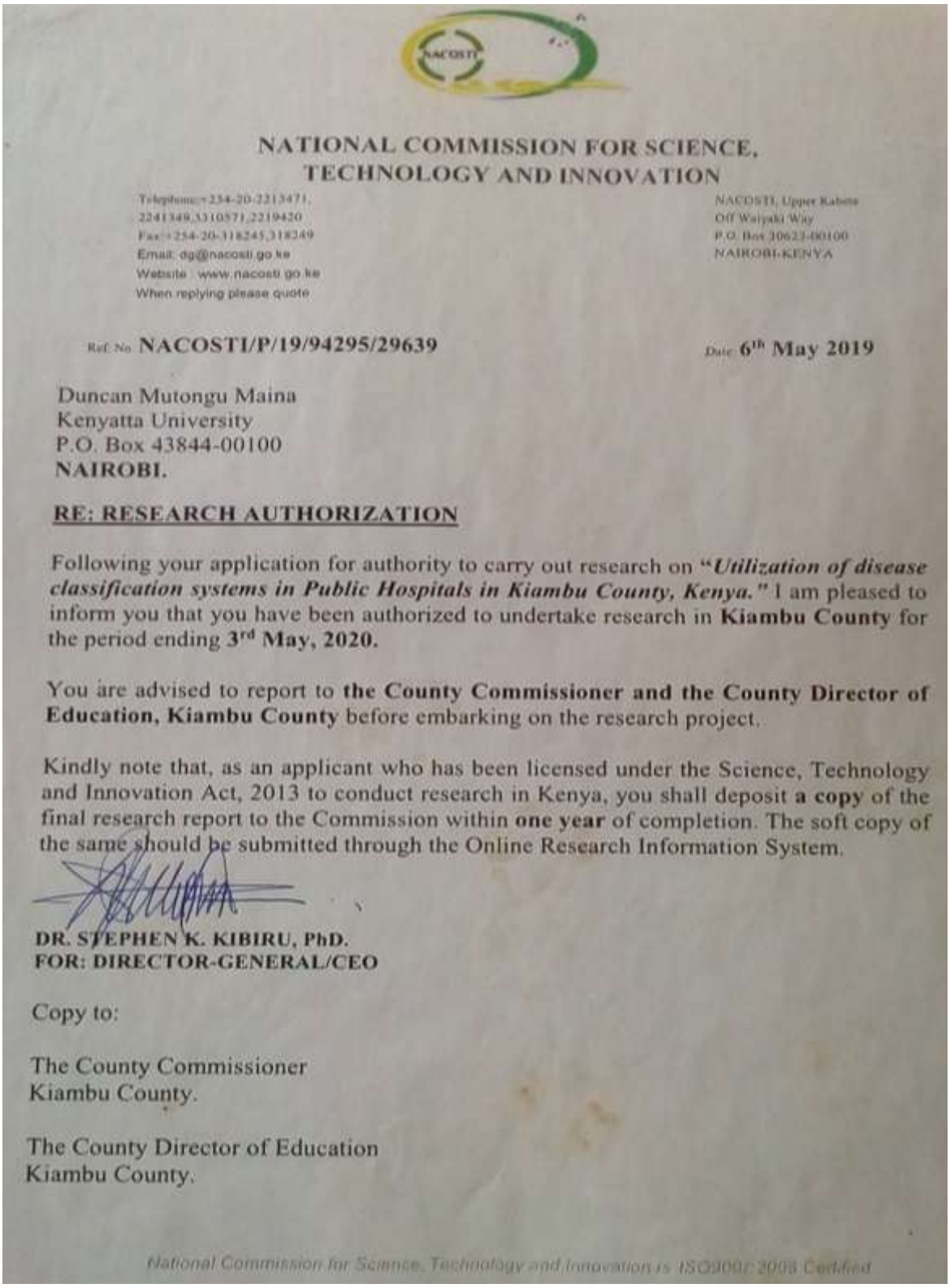
PROF. JUDITH KIMIYWE
CHAIRMAN ETHICS REVIEW COMMITTEE

I Duncan M. Maina accept the advice given and will fulfill the conditions therein.

Signature..... Dated this day of 20th March 2019

cc. DVC-Research Innovation and Outreach

Appendix X: Research Authorization Letter from NACOSTI



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471, 2241349,3310571,2219420
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/19/94295/29639**

Date **6th May 2019**

Duncan Mutongu Maina
Kenyatta University
P.O. Box 43844-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"Utilization of disease classification systems in Public Hospitals in Kiambu County, Kenya."*** I am pleased to inform you that you have been authorized to undertake research in **Kiambu County** for the period ending **3rd May, 2020.**

You are advised to report to **the County Commissioner and the County Director of Education, Kiambu County** before embarking on the research project.

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 Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.

DR. STEPHEN K. KIBIRU, PhD.
FOR: DIRECTOR-GENERAL/CEO

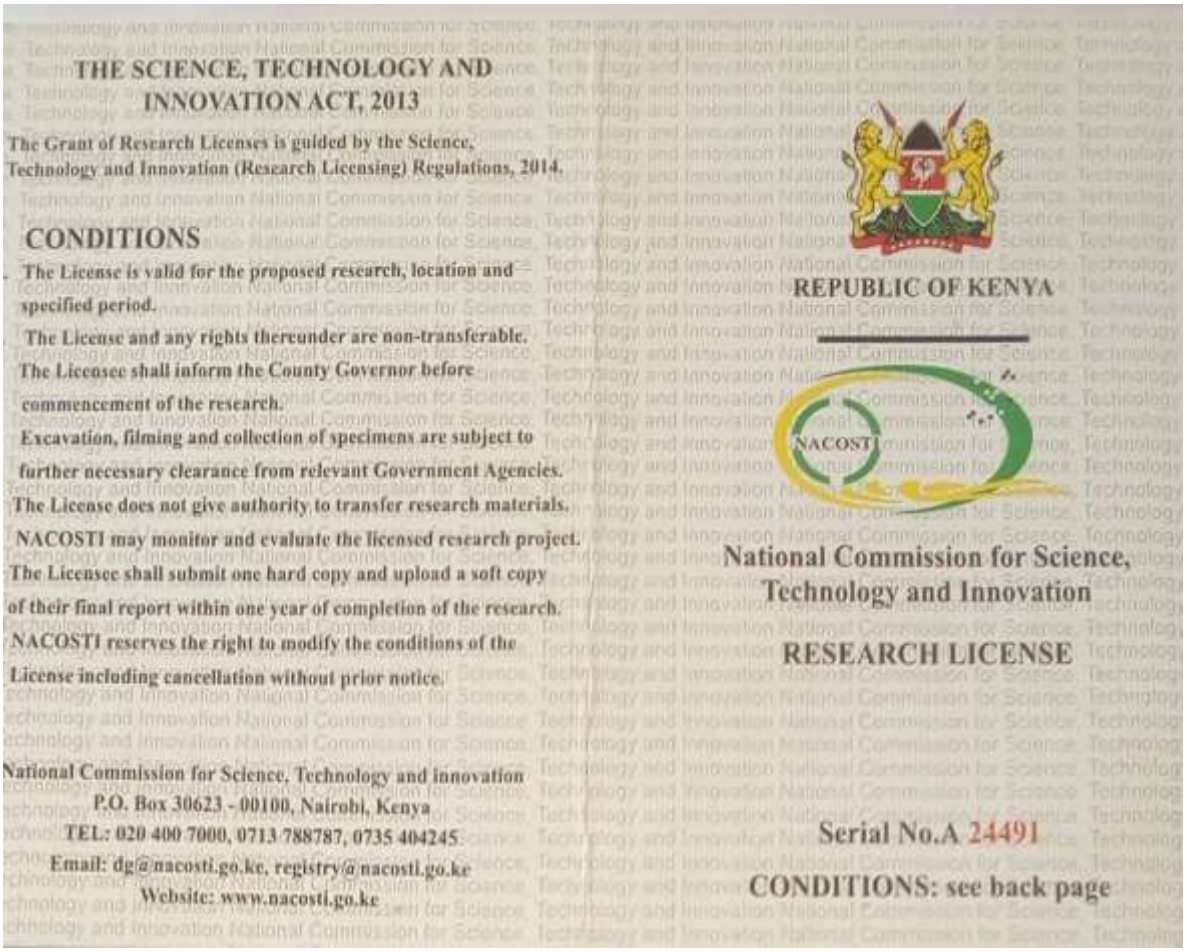
Copy to:

The County Commissioner
Kiambu County.

The County Director of Education
Kiambu County.

National Commission for Science, Technology and Innovation is ISO9001: 2008 Certified

Appendix XI: Research Permit from NACOSTI



THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013

The Grant of Research Licenses is guided by the Science, Technology and Innovation (Research Licensing) Regulations, 2014.

CONDITIONS

- The License is valid for the proposed research, location and specified period.
- The License and any rights thereunder are non-transferable.
- The Licensee shall inform the County Governor before commencement of the research.
- Excavation, filming and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
- The License does not give authority to transfer research materials.
- NACOSTI may monitor and evaluate the licensed research project.
- The Licensee shall submit one hard copy and upload a soft copy of their final report within one year of completion of the research.
- NACOSTI reserves the right to modify the conditions of the License including cancellation without prior notice.

National Commission for Science, Technology and innovation
P.O. Box 30623 - 00100, Nairobi, Kenya
TEL: 020 400 7000, 0713 788787, 0735 404245
Email: dg@nacosti.go.ke, registry@nacosti.go.ke
Website: www.nacosti.go.ke

REPUBLIC OF KENYA

NACOSTI

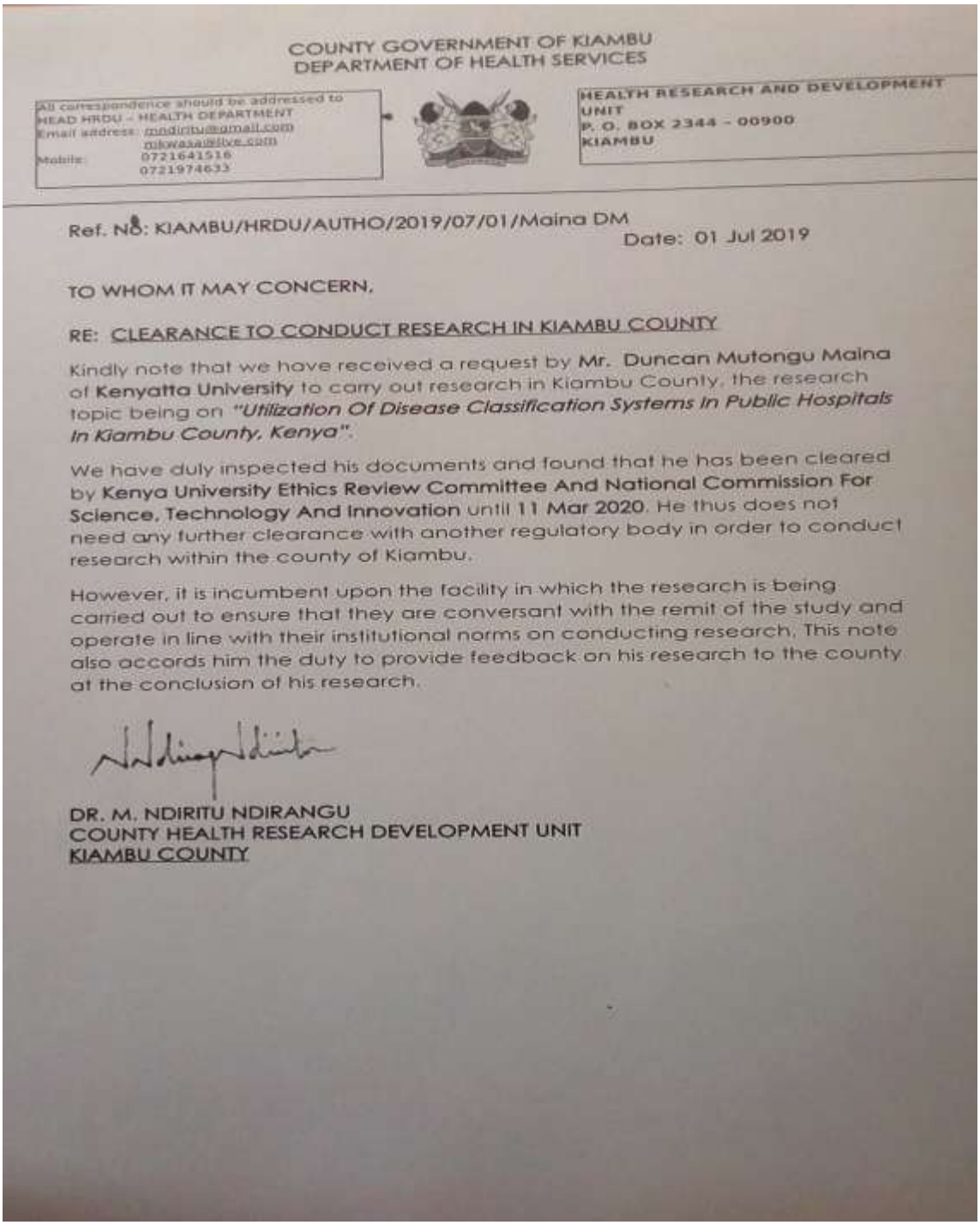
National Commission for Science, Technology and Innovation

RESEARCH LICENSE

Serial No.A 24491

CONDITIONS: see back page

Appendix XII: County Government of Kiambu Authorization Letter



COUNTY GOVERNMENT OF KIAMBU
DEPARTMENT OF HEALTH SERVICES

All correspondence should be addressed to
HEAD HRDU – HEALTH DEPARTMENT
Email address: mndiritu@gmail.com
nikowasa@live.com
Mobile: 0721641516
0721974633

HEALTH RESEARCH AND DEVELOPMENT UNIT
P. O. BOX 2344 – 00900
KIAMBU

Ref. NO: KIAMBU/HRDU/AUTHO/2019/07/01/Maina DM
Date: 01 Jul 2019

TO WHOM IT MAY CONCERN.

RE: CLEARANCE TO CONDUCT RESEARCH IN KIAMBU COUNTY

Kindly note that we have received a request by **Mr. Duncan Mutongu Maina** of **Kenyatta University** to carry out research in Kiambu County, the research topic being on ***"Utilization Of Disease Classification Systems In Public Hospitals In Kiambu County, Kenya"***.

We have duly inspected his documents and found that he has been cleared by **Kenya University Ethics Review Committee And National Commission For Science, Technology And Innovation** until **11 Mar 2020**. He thus does not need any further clearance with another regulatory body in order to conduct research within the county of Kiambu.

However, it is incumbent upon the facility in which the research is being carried out to ensure that they are conversant with the remit of the study and operate in line with their institutional norms on conducting research. This note also accords him the duty to provide feedback on his research to the county at the conclusion of his research.

DR. M. NDIRITU NDIRANGU
COUNTY HEALTH RESEARCH DEVELOPMENT UNIT
KIAMBU COUNTY

Appendix XIII: Study Area Map