

A Decongestion Framework for Addressing Patients' Self-Referral Crisis within a Health Facility: Case of Kisil Teaching and Referral Hospital, Kenya

¹Bisieri Lydia, ²Omollo Richard

¹Department of Information Systems and Technology, Jaramogi Oginga Odinga University of Science and Technology, Kenya

²Department of Computer Science and Software Engineering, Jaramogi Oginga Odinga University of Science and Technology, Kenya

Abstract - This paper focuses on addressing the crisis advanced by patient's self-referrals through a proposed decongesting framework. Observably, a referral framework enables control of client health demands that cannot be met locally. It is a common occurrence that patients walking into referral hospitals increases thus resulting in the overuse of available services and a deterioration of the facility's standard of care. In this work, a descriptive research design was adopted where self-referral patients who visit the outpatient department at Kisii Teaching and Referral Hospital were interviewed. Purposive random sampling was used to pick interviewee from the facility. Respondents were provided with questionnaires to answer, and the data was analyzed quantitatively using the Statistical Package for Social Sciences (SPSS). Quantitative data were presented in the form of tables and pie charts, quantitative methods (descriptive and inferential analysis) such as frequencies and percentages were used. The resulting framework is expected to aid in the decongestion of patient self-referrals. The findings established a significant positive relationship ($r=.7438$) between Socio-Demographic Factors and hospital decongestion in the referral hospitals. The study highlighted a positive relationship ($r=.703$) between primary health facility characteristics and hospital decongestion. The study established a positive relationship between Referral Facility Characteristics ($r=.431$) and hospital decongestion. The study established a positive relationship between Referral Facility Characteristics ($r=.431$) and Decongestion Framework. The study findings highlighted that a unit increase of 0.01 by Referral Facility Characteristics could increase hospital decongestion of referral hospitals. The study findings also revealed that the administrative factors also influenced the level of referral hospital congestion. The study recommends the need to strengthen the referral mechanism and linkages between the various levels of the facility by having a healthcare provider coordinate referral processes through the provision of healthcare services in remote areas via mobile

clinics. Increase collaboration between all levels of care and introduce the use of technology in communication, such as the use of EHR and mobile phones for receiving feedback and sending referrals to enhance proper communication within the health care system. The public and the healthcare providers are to be updated on the referral guidelines.

Keywords: Self-Referral, Decongestion Framework, Patient.

I. INTRODUCTION

Primary care clinics, health centers as well as hospitals are commonly found in many nations. A well-designed healthcare plan would typically include provisions that help caregivers focus on locating and receiving primary care in the first place, and then if possible direct them to higher levels of care. The caretaker's health care costs will be insignificant if they follow the referral scheme. However, many countries (primarily in the developing world) prefer to avoid primary care facilities altogether and instead only use referral care clinics (i.e. those that refer patients to other healthcare facilities, especially for diseases that can be effectively treated in the primary care facility). Referral centers bear an unnecessary financial burden because of this. This also increases caregivers' costs and the overall healthcare system (Edosa et al., 2019).

People who refer patients to themselves may not be using all the primary healthcare resources and maybe overburden hospitals, leading to higher healthcare expenses. Because of this policy, a lot of patients have to wait a long time before they visit a healthcare provider, and as a result, their cases get mishandled, which limits vulnerable patients' access to well-trained health specialists. The facilities frequently run out of human and physical resources, which results in hospitals losing the treatments they provide to patients (Wolkite et al., 2015).

An even higher proportion of self-referred patients exists in several nations. 62.8% of patients in England are self-

referrals. In the United States, there are just a few general practitioners (GPs) for every hundred thousand people; therefore, patients frequently refer themselves to specialty care. 30% of patients self-refer to primary care, and self-referred patients should receive primary care. In the study that was done in Sri Lanka, it was discovered that approximately two-thirds of people who sought treatment in rural areas passed the basic level of treatment (Kraaijvanger et al., 2016).

After China implemented its health reform in 2009, a surge of investment was made to improve primary care because it was revealed that Chinese patients were using higher-level hospitals as their primary care destinations (Meng et al., 2019). Instead of making efforts to boost lower-level service usage, the implementation of higher-level service-usage policies saw self-referrals to the top hospitals rise while primary healthcare visits fell.

The majority of patients self-referred to referral hospitals because of a lack of an effective way to rapidly move them to emergency care facilities, along with a shortage of medical staff members to help care for patients (Padmore, 2017).

To put it another way, approximately 60% to 90% of patients in Nigeria utilize direct-care facilities instead of referring hospitals, with the net result being a reduction in referral hospitals (Koce et al, 2019).

With these results, it appears that self-referrals in Tanzania, Zimbabwe, and South Africa, along with patients who accepted self-referrals at referral hospitals and believed their cases could be handled at a lower level of treatment, were given 72.5 percent, 60 percent, and 50 percent of the total referrals used in these respective countries (Edosa et al, 2019).

There are some referral system issues the Kenyan health system is confronting. By creating a consistent referral system for patients, they will first seek primary care, and then more specialist care will be offered if needed. Doctors and other healthcare providers must provide advice and carry out operations. Patients are expected to receive therapy progressively under Kenya's traditional health system: they receive it in primary care, secondary care, and, if necessary, tertiary care (MOH, 2012). GOK in 2012 surveyed patients who were treated at Kenyatta National Hospital and found that just 3.6 percent of patients got referral letters from the lower-tier clinics. The majority of patients have come to the clinic without referral letters, indicating that they are not following the established referral guidelines.

Four important variables lead patients to self-refer, according to Mahinda (2013). These include a hospital's

location, great reputation, high quality of care, and employee friendliness.

An increase in cost for health care may occur because of using self-referrals, resulting in underutilization of primary health care and overuse, congestion, as well as overburdening of hospitals. This limits patients' access to highly skilled health workers because it compels patients to wait lengthy amounts of time to be seen by health personnel in hospitals since patients use up all available human and physical resources (Wolkite et al., 2015).

Aliyu et al. (2015) devised an appointment framework for improving patient throughput, yet current hospitals have not improved, suggesting the poor scheduling mechanism has made little difference. To better alleviate traffic congestion, a patient flow frame has been implemented in various service points. When various improvement approaches have been packed and repackaged, organizations might design their interventions by using these bundled and repackaged methods. Flow initiative interventions, however, have yielded little evidence (Kreindler, 2017). Kenya's referral service framework comprises four groups of elements including patient movement, expert movement, specimen movement, and patient parameter movement. The client movement agenda focuses on reducing self-referrals in referral hospitals (KHSRS, 2014-2018). To avert the aforementioned issues, hence this research was created to design a patient self-referral decongestion framework. The main aim of this paper is to address patient's self-referral crisis through a proposed decongestion framework for referral hospitals.

II. RELATED STUDY

Health is a basic human right. WHO (2007) notes that effective referral networks have been identified as being important to a health system since the Alma Ata Declaration, which called for community involvement in primary health care. While all this is true, it is critical to have a good referral system in place to ensure that quality of treatment is guaranteed at all levels of care. This form of referral system allows efficient management of client health requirements by employing the resources that are already accessible. It is also possible that several of the decongestion concerns with existing referral programs have to do with service consumers' lack of awareness, socioeconomic issues, patient wait times, physician shortages, and pharmaceutical, amenity, and equipment shortages.

According to (Koce et al., 2019), those who sought treatment at the secondary levels might have done so because they lacked knowledge of the various levels of healthcare services' activities. Service users had inadequate knowledge of the healthcare system and were ignorant of other resources as

claimed by Craker (2014). (Durand et al., 2012) clarify that emergency department visitors prefer to go to the emergency room at the clinic where they have a referral rather than go to the nearest hospital with all of the possible referral options accessible to them. Additionally, (Nanyonjo et al., 2015) write that people's confusion over health facility functions results in a reduction in the referral mechanism.

59% of patients in Limpopo over the age of 20 to 39 had recommended themselves to the referral hospitals, whereas a descriptive study which spanned the age range of 20 to 45 found that 79% of the self-referrals they received were under the age of 45. (Visser et al., 2015)

A research by the Ethiopian Ministry of Labor discovered that male employed people skip the referral system more frequently than female employees. Additional factors for men's health seeking behavior include pragmatic financial and behavioral incentives (Alberti, 2015). Unemployed patients avoid primary care institutions because of a lack of money, according to (Detollenaere, 2018). In addition, a third-party plan is in place to make healthcare more accessible to lower-income persons. Since these patients aren't highly educated, they continue to seek treatment at a higher level in the hopes of unconventional diagnostic testing. Rehman et al. (2014) found that both skilled and uneducated persons bypass lesser levels of healthcare even though both groups were well-informed. Confirms that residency of the patient, wealth position of the mother, and socioeconomic status are factors that influence where a woman would give birth in Kenya (Lewis, Kitui & Davey, 2013). The results of an investigation carried out elsewhere (Ogden et al. 2013) revealed that social contacts influence referral behavior among patients and health care workers. Additionally, when it comes to a person who is unwell, relatives from the social network impact their decision to use a specific health system and the decisions that are made before and after doing so.

A 2017 report (by Padmore) found that a majority of patients in Africa opt to self-refer for care, particularly family, culture, and peer-influenced reasons, in the early stages of illness. Relying on close and distant social networks, as well as confidence and perceptive components, as well as acceptance and conflation of multiple therapeutic practices and decisions outside of the referral system results in acceptance and incorporation of various forms of clinical practice and choices.

Due to expensive fees, long transit costs, and previous poor experiences with medical care, patients in Ghana avoided getting treatment for malaria, and other prevalent ailments. Abstaining from other useful activities could cause patients to use friends and family members as well as forego therapy.

Health problems often develop to the point where it is more cost-effective to seek medical treatment at a referral hospital than of undergoing regular primary care (Ansah et al., 2016). Regardless matter how terrible, costly, or accessible a health care option is for a rural citizen, if the quality of health facilities is acceptable, then they are more likely to consider seeking medical attention elsewhere.

Self-referral to higher level hospitals has been shown to occur due to a shortage of medical staff, which results in longer wait times for services (Lam et al., 2017). Additionally, (Beacheet al., 2016) found that physicians' failure to respond to patient recommendations was a significant contributor to self-referrals. Thus, it was preferable that physicians who were available to be seen by patients who had referrals were seen by them. Rebecca, in 2014, found that patient waiting times have an impact on the type of institution that patients want to visit, and many patients are not willing to make the trip to a certain hospital because of long wait times.

Similarly, Okoli et al. (2017) found that presenting to higher levels of treatment was frequently motivated by a preference for high-quality service and professional staff. The prior presence of patients with disabilities, as well as the prior visits to a tertiary hospital, was all discovered to impact on whether a patient chooses to bypass the basic level of care.

Services users rejected primary care because of limited appointment hours and the high cost of specialists' offices, according to a study published in 2014 (Bleaustin et al., 2014). As a result, patients with vital signs have little alternative but to use an email account or phone during non-business hours in order to raise the issue with a manager. Researchers found that due to schedule issues, service consumers presented to the referral center rather than to their primary health care institutions during business hours.

Patients frequently refer themselves to hospitals due to concerns about their own health. The ordering of one's health-seeking behaviors is dictated by the value one places on their disease condition. Minor problems will be handled by primary care facilities; but significant problems will be handled by large hospitals, where patients believe they will get superior care (Somasundaram et al., 2018).

Drugs and equipment availability have a substantial impact on decision-making at different levels (as proved by Oslislo et al., 2019). Although having some advanced equipment was thought vital, an absence of that equipment required self-referrals to higher level facilities, particularly during the diagnostic stage. The above was mentioned by Dr. Abdi, who added that patients who opt to self-refer for healthcare have found that they lack confidence in the proper

healthcare provider, don't have sufficient supplies in the first level of care, and don't have main laboratory tests available.

A lack of amenities such as light, water, and a pleasant ambiance in lower-level institutions negatively impacted patients' health care-seeking habits, and so resulted in a higher number of patients seeking care at higher-level facilities (Koce et al., 2019). Although (Kahabuka et al., 2012) state the opposite, it is explained in another study (Slee et al., 2013) that patients who were not originally investigated for the source of their ailments before obtaining treatment at primary care facilities later choose to self-refer to higher level hospitals.

It was discovered in a discussion conducted by Agarwal (2012) that people will self-identify at a higher facility, believing that the care they are receiving is of higher quality. While the aforementioned paper emphasizes the limitations of certain health facilities' communication tools, other studies (Naseriasl et al., 2017) contend that health facilities' lack of proper communication equipment promotes self-referrals. In order to correct this problem, it is imperative that customers be referred to facilities from other facilities without proper communication. Additionally, the paper-based referral procedure has some noteworthy disadvantages, such as incomplete paperwork, poor handwriting, and excessively long waiting times for specialist evaluation.

Without previous appointment, some patients are referred, which means that intermediate and tertiary care facilities are consistently lacking beds. There is also a lack of coordination and communication between different healthcare professionals, which results in a low recommendation acceptance rate for top-level facilities.

EMRs that are not incorporated in order to aid in referrals are creating concerns with self-referrals, according to the findings of (KHSSP, 2018). An inadequate integration in the health system makes patient information available in an unorganized and disorganized manner. To successfully treat patients, a general practice physician must collaborate and coordinate with various specialists in the field. When this occurs, general practitioners have the opportunity to actively connect with the referral system and provide two-way communication between health care providers. This, as a result, shows that bypassing basic health care has become the norm, resulting in inadequate and excessive usage at the lower and upper levels of health care delivery (Golalizadeh et al., 2011).

In (Scott and Mars, 2014), it was reported that there are huge differences in the ways that e-health and telemedicine are defined. This process ultimately results in the creation of a shared base of knowledge and understanding, as well as the

utilization of accessible technologies that assist in raising user and decision-maker awareness, as well as providing training opportunities.

Current Health Referral Systems

There are many referral systems in place, depending on the jurisdiction and country. Merging autonomous health systems at all levels into a comprehensive and coordinated National Health Service is implemented in South Africa (NHS). Primary health care practitioners should be used to deliver primary health care, and referral systems should be present at all three levels of health care to facilitate this goal (South Africa Ministry of Health, 2009). A qualitative study (Shams et al, 2015) demonstrated that the referral system is ineffective and inefficient and hence must be changed with regards to performance. There is no uniformity to the role delineation, monitoring, and referral patterns in Armenia's general healthcare referral system, as well as cases in which a patient should be referred for a certain ailment. Although there is no direct communication between the referral facilities, mostly due to the absence of referral and counter-referral procedures, Armenian physicians are very upset by this (Agola & Raburu, 2018). In another study (Eskandari et al, 2013) on barriers to referrals to health care in rural populations in Iran, the researchers discovered that the referral system has no hierarchical relationship. Due to lack of feedback, referral and follow-up processes are disrupted. He said that a substantial barrier to progress in the referral system was noncompliance with the hierarchy of the referral system and referring to the physicians and more specialist levels as self-recommendations. In Khiavi et al. (2012), the country's inadequate referral system contributed to overpopulation in hospitals. This led to overpopulation in hospitals and operating rooms because patients were referred to them when they did not go via the referral system and because the prestige of the hospitals attracted more patients. A large majority of Nigerian referrals are to higher-level referral facilities on their own, while in Tanzania, referral facilities of this type are most often employed as a form of primary care (Akpede et al., 2005). The study revealed that 84% of children admitted with meningitis to the two facilities were self-referred. To determine the best possible solution, the Ministry of Health commissioned a baseline study in eight counties (Garissa, Kakamega, Kilifi, Kirinyaga, Machakos, Nairobi, Nakuru, and Siaya) during June and July 2013, and the study found that the health referral system has to be strengthened.

E-Health Systems

An E-health system seeks to provide healthcare and information, locally and remotely, using the Internet and related technology (Mugo & Nzuki, 2014). A concept of e-

health is about using technology to increase access to and enhance existing health care. The physicians in this case can help patients who reside far away from the hospital by providing remote patient care through tele health as other health practitioners utilize this technology to monitor disease and other epidemic outbreaks in a variety of situations (Moerman et al., 2014). Health-related awareness activities and health initiatives can all be supported by using e-health. It is particularly effective in reducing medical errors, providing excellent care, lowering health service delivery expenditures, and empowering patients towards taking charge for personal healthcare treatment (Sheikh & Catwell, 2009). Further, virtual communication between patients and health care providers is also enabled through e-Health. Technology facilitates online appointments, distant specialist care tools that measure physiological records, and actual patient meetings, and allows this engagement to take place (Crock, 2016). It is possible that an increased focus on e-health can help lower health care costs while enhancing care delivery by encouraging people to be more involved in health decisions. The resulting consensus is that e-health tools will increase quality, patient safety, and care management while also optimizing health outcomes (Busagala & Kawono, 2013; Mugo, 2014). In order to describe Telemedicine as defined by Dantu and Mahapatra (2013), the authors note that this system enables access to health care services for both underserved rural, semi-urban, and distant locations as well as for a wider population that does not require a physical referral. On the other hand, general practitioners and specialists can conduct tele-consultations, with the benefits of this helping to maintain health issues in primary care rather than have them referred to secondary care. For minimizing secondary care expenses and helping to prevent excessive travel for senior patients, this is crucial. As well, the utilization of tele-radiology in primary care alleviates the issue of more patients referring to secondary care for radiology imaging. Working Together for Health claims that 4.3 million health workers are in short supply around the world, with 57 countries unable to deliver even the most basic health services. This confirms that a major health care practitioner shortage exists not only of doctors, but also of health care workers with diplomas or training in tele-health and other e-health-related sectors. The use of telemedicine to deliver multiple degrees of training and target different training levels is possible. The rate at which cell phones have progressed in the previous two decades has permitted the development of smart-phones and other sophisticated gadgets (sensor-rich and Internet-enabled). Additionally, the most simple gadgets on the market today possess significant multimedia functionality, which may be harnessed to generate powerful applications (for example, for surveillance or learning). Li et al. (2020), stated that "m-health" (the simple e-health provided by mobile devices) and

the extensive availability of smart phones have contributed to a significant rise in initiatives targeting rural and isolated community health workers (CHWs) in developing countries, many of which are designed to assist and improve the lives of this group of individuals. The Kenya eHealth Development Unit is part of the Division of Monitoring and Evaluation, Health Research Development and Informatics, which supervises the Kenya eHealth Development Unit. At the moment, the link between the MoICT and the Division of eHealth is not well-defined, which makes it impossible to gauge, oversee, and control health information systems (HIS) that are currently operational in Kenya. In addition, there is no centralized registration for all of the eHealth projects that are being implemented in Kenya (Kenya National eHealth Policy 2016-2030).

Framework for Decongesting Patients

To effectively increase efficiency, healthcare facilities have devised a variety of strategies that support both the patient and the staff. Numerous frameworks have been implemented to facilitate patient decongestion in these facilities. Among these systems are those for patient flow, patient appointment scheduling, and patient referral.

Patient Flow Framework

Patient flow pertains to the healthcare system's capacity to treat patients swiftly and efficiently from the moment they are admitted, screened, tested, operated on, placed in beds, and discharged. In the event that blockages develop in the flow, there will be a rise in waiting times and throughput, both of which will affect the service's overall quality of delivery (Abdelrahman et al., 2015). To meet the following objectives: For all intents and purposes, the emergency room was overcrowded, tense, and hazardous, as well as having overworked staff and delayed regular activities, causing patients to be classified as outliers and for the clinical results to worsen. Increased investment in ambulatory care services, clinical decision units, and labs and endoscopic units contributed to the rise in ambulatory care, clinical decision units, and other facilities (Carter et al., 2014). The findings of the study by Kreindler, et al. (2017) indicate that although some widely established flow approaches have been repackaged and bundled into organizational improvement methodologies, the data supporting these methods is lacking. A recent comprehensive review of ED overcrowding management measures could reveal that just a few strategies have real efficacy. Other than these methods, there is no reliable data to support the efficacy of the ED-based techniques, like ordering triage nurses, triage liaison doctors, minor treatment areas, and rapid evaluation zones. Additionally, according to Pines et al. (2011), most health

systems found it difficult to make timely access to needed treatment available.

Patient Appointment Framework

In response to concerns with health facilities endangering the quality of health care delivery, this type of framework was developed. Peak workloads for counter staff, lengthy wait times for patients, and extended hours for doctors and nurses during clinic sessions are included (Akinode & Oloruntoba, 2017). Improving patient scheduling improves quality of health service delivery, both through reducing medical errors hence lowering the number of dissatisfied patients. A wide variety of healthcare facilities around the world have adopted the framework for crowding, wait times, and lack of access to resources, and it's possible the framework will allow more people to receive the healthcare they need while at the same time cutting costs and increasing patient and staff satisfaction by decreasing waiting times and lessening strain caused by scheduling constraints such as patients, facilities, and providers (Tiago, 2017). Despite the fact that appointment systems fix the issue of overcrowding, hospitals are just as bad as they were before to the implementation of these systems, and that has been blamed on the inadequate scheduling mechanism that was put in place (Aliyu et al., 2015). According to Babes and Sarma (2012), single-block appointment systems create additional hectic time for clinicians. All patients were put into a block that allocated a particular date rather than a specific time period to the clinic session. Based on an individual appointment system, build a rule for scheduling outpatient appointments. This has been proved to be robust, as patients walk in personally at same time intervals in every single block. In a study published in the journal BMC Medical Research Methodology, Aliyu et al. (2015) identified aspects that affect the appointment scheduling system and then attempted to create a model that might be utilized to reduce patient wait times. The variables included the following:

1. Initial block, which refers to the number of arrivals at the start of every meeting.
2. Patient(s) who arrive in every single block.
3. Distance amid next arrival blocks in terms of time.

They classified appointment systems and decided to develop an alternative system that could help reduce patient time spent in hospitals' navigation processes, such as Waiting in the Doctor Queue, Doctor Diagnosing Process, and Lab Process, with the assistance of simulation software that can be used to model any given system by simulating its behavior. Though a simulated model was able to reduce patient wait times in comparison to the appointment classification method, delays were observed, sacrificing efficiency.

Patient Referral Framework

One of the referral framework guidelines' aims is to decrease patient self-referral to the highest level of treatment.

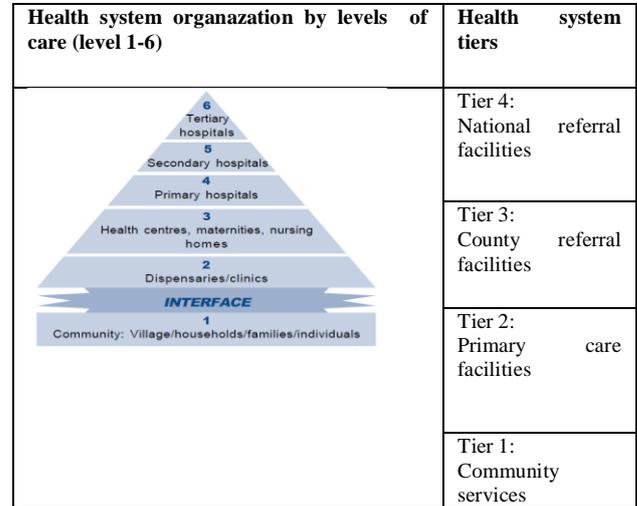


Figure 2.1: Kenya Health Care System with Four Tiers of Care Compared to the Previous Six Levels of Care

Source: (Overview of the Health System in Kenya, 2005)

The third tier consists of the county referral services, which include the former main and secondary hospitals. Both outpatient and inpatient care is offered at these facilities. Staffed by physicians, clinical officers, and nurses. In some secondary hospitals, clinical officers and nurses serve as educational institutions for interns and med students, while others are places for interns to gain some extra experience. National referral centers that provide highly specialized services are employed in the fourth tier, which functions as training and research support. The various levels of treatment include government-owned hospitals, faith-based organizations, and private health institutions. A massive network of services is made available by the public health system, which is the most widely used of them all. The second largest network is made up of faith-based hospitals, which are mainly located in urban areas, followed by private hospitals located mostly in urban areas.

In the referral chain diagram, a patient is referred from the community unit to primary health care, which then directs them to secondary care, where they will likely be referred to tertiary care if they have a more serious condition. Some health care facilities lack key components of the health system, such as information or referral services, which can disrupt the smooth operation of the referral system. These individual components include a communication network that's inadequate, financial resources that are insufficient, an unbalanced mix of healthcare workers, a shortage of equipment, and logistical inefficiency/scarceness.

Social Network Driven Traffic Decongestion framework

Predicting traffic flows in real time is a crucial issue because it allows transportation resources to be used more efficiently. A social network is a web of human activities and social events. To get a handle on how many people will be at an event in the near future, we can utilize social networks to determine which people will attend (Wynter, 2013). By creating a traffic management system, researchers have the opportunity to develop a tool that is capable of gathering valuable traffic parameters in the real world and serve as a testing ground for trying out new ideas. The theoretical underpinnings of this framework, as well as a method for simulating the transportation system, human population, and social network of a city, are presented in this paper. When determining the best parameters and the framework's modular architecture, we place a premium on finding the right choices. Experimental tests on a public transportation system demonstrate the framework's usefulness.

Optimization Framework for measuring spatial access over healthcare networks

The view that universal health care is both critical for dealing with both acute health issues as well as for promoting general care of people is widely accepted. Right to use is critical for public health decision makers, covering various dimensions such as accessibility, availability, affordability, accommodation, and acceptability. This approach focused on accessibility and affordability with spatial access models for patients and services that are located within a health network. In health service delivery, patients are classified as nodes of demand, while healthcare professionals are considered nodes of supply. An arc connects them if the healthcare professional is in a position to serve the patient (Swann, 2016). This system was developed to estimate how many people would have access to the resource if the community has the resources required for it and the required population and distance are taken into consideration. Realized access means resources that are actually being used, which is influenced by a variety of things such as financial constraints, behavioral patterns, and other variables.

The Optimization framework's objectives

1. It captures a patient's know-how rather apart and avoids overestimating patient demand.
2. It captures system effects due to change based on congestion, it also provide more elements of access than traditional catchment methods.

Optimization models have been used in healthcare decision-making and service research to determine the optimal location for a new clinic, to ensure that resource locations are

sufficient to meet demand across a network, to route nurses for home health services, to improve health outcomes among communities, and to evaluate policies for pandemic influenza, breast cancer, and HIV across a network, among other things. Wang discussed many instances in which optimization models could be used to enhance network access or operation (Serban, 2015).

Traffic Congestion Framework for Smart Riyadh City based on IoT Services

Researchers have found that the internet of things poses a complex problem because it seeks to link physical objects to the internet via a virtual identity that applies to all. As traffic increased on Riyadh's roads, residents began to complain (Ghanem, 2018). There are only a few services in the traffic department that provide residents with traffic information. To help with traffic congestion problems, a new system has been installed in Riyadh. In an all-as-a-service approach, Riyadh's existing road infrastructure and the Internet of Things (IoT) model are being used to gather traffic congestion data. A variety of possible services, such as vehicle counting, live streaming video, and rerouting, are deployed to sense traffic congestion. By connecting to the internet, these services are integrated with the publicly available map service, which means the mobile application. Users can locate congestion and offer an alternative solution by using the facilities. The ability to incorporate Business Process Execution Language (BPEL) is acquired through the implementation of a supporting system layer. Executable workflows were developed in order to combine the proposed services with the legacy Riyadh services, using the aforementioned new layer as a separate model. The proposed models will be described in greater detail using this methodology. A full evaluation will be done to show how useful the framework is.

Bus passenger flow congestion risk evaluation Framework based on the Pressure-State-Response framework

Although urban public transportation is an important mode of commuting for urban residents, traffic flow congestion risks occur in certain areas and times because of the unbalanced spatial and temporal distribution of passenger demand. At the same time, the risk cannot be quantified. The proposed index, which uses pressure, state, and response to assess traffic congestion, is based on three values: alternative pressure, traffic congestion severity, and transport performance. To estimate the risk, an entropy method is proposed and four risk levels are established based on K-means clustering (Zhang, 2012). According to the article, the 3rd Ring Road in Beijing serves as an example of the risk levels presented. This means that the risk is approximately 1.5 times greater during the weekday rush hours (i.e. between 6

and 9 a.m.) than it is on the weekends (i.e. 9 a.m. and 5 p.m.). Congestion risk is present in the morning peak hours from about 8 AM to 10 AM. The period severity of level 4 risk is 0.1 or lower on weekdays, making it simple to remove flow congestion. To rationalize the network flow distribution, the integrated passenger risk detection and assessment system will be proposed. The research offers help for keeping the public transit system safe.

Traffic Management Framework for ATM Networks

The networks of multiplexers and switches in a mesh configuration are commonly referred to as an ATM network. In order to investigate a mechanism for traffic management, we investigate a network partition in which a tandem link made up of boundary and internal nodes is present. In this case, the network used ATM interface parameters control

(UPC) and link admission control (CAC) together to establish a control mechanism for ATM traffic. An open-loop rate-reservation control mechanism is employed to ensure that cells are rendered useless for critical traffic; while a feedback adaptive control mechanism is utilized to ensure that network resources are utilized in an optimal manner. A new traffic control strategy, called a credit-based controller (CBC), is used to achieve the dual goal of increasing UPC and reducing CAC. Users can both tag and untag cells when using the CBC protocol. There are cells in the backbone network's nodes that are not tagged, and these cells are secured. On the other hand, cells that are tagged are discarded selectively when congestion occurs. Traffic load determines how much tagged traffic a user may send (Canetti, 2017). In order to best represent how different it is from other frameworks, we've included this section.

Table 2.1: Frameworks Applications, Strengths and Weaknesses

Framework	Application	Strengths	Limitations
Appointment system (Akinode and Oloruntoba, 2017).	Scheduling emergency patients	Reduces clinical mistakes and the frequency of dissatisfied patients. The framework has been widely sometimes used minimize patient wait times and waiting room congestion, and it has the capacity to develop access to medical resources thus reducing expenses in addition it lowers health practioners and patient frustration.	Does not fix self-referral problems
Patient flow (Abdelrahman <i>et al.</i> , 2015)	Managing the movement of patients through a hospital's different departments	It enhances clinical safety and alleviates workers strain. It is important in accomplishment of application of a national emergency care access standard.	Concentrate mostly on patient traffic, oblivious to patient overcrowding.
Patient referral (Kenya health care system 2005)	When referring patients to healthcare facilities	Ensures the proper flow of medication at the subsequent stage	Does not ensure the procedure is followed when patients are transferred from one stage to another.
Social Network Driven Traffic Decongestion framework (Wynter, 2013).	social network traffic control	Establishes a research field for developing a system for traffic management that can capture critical parameters of real-world activity and serve as a platform for iterating and evaluating novel ideas.	The framework is focused on traffic management, with little regard for data protection.
Optimization Framework for measuring spatial access over healthcare networks (Swann 2016).	Administration of healthcare networks.	This paradigm concentrated on spatial access models for patients and services in a health network, thus addressing accessibility and affordability.	The system placed a premium on usability and availability, while glossing over some dimensions of affordability.
Traffic Congestion Framework for Smart Riyadh City based on IoT Services (Ghanem, 2018).	Contributes to the growth of Internet of Things-based traffic congestion services (IoT)	It effectively eliminates traffic congestion with anything as a Service approach. Sensing systems are applied to detect the congestion of the traffic flow by delivering several proposed services such as a vehicle counting, live streaming video and rerouting services.	The language used to execute the process adds complexity.
Bus passenger flow congestion risk evaluation Framework, (Zhang, 2012).	Provides technological assistance in ensuring the safety of the public transportation system.	The system defines the risk level associated with passenger traffic and influences the network's flow distribution to be more realistic.	The framework is limited to flow risk.
Traffic Management Framework for ATM Networks (Canetti 2017)	The framework is being applied to control traffic in ATM networks.	It is simple to implement, efficient in terms of network resource utilization, flexible in terms of allowing an effective trade-off through cell damage and cell delay efficiency, and robust in that noncompliant users cannot interfere with guaranteed services.	It emphasizes on resource allocation versatility and productivity.

Conceptual Framework

The existing referral system faces a number of obstacles, including a shortage of understanding on the part of service users; socioeconomic challenges; patient wait times; a shortage of medical staff; unavailability of drugs, amenities, and equipment; insufficient communication tools; the essence of illness; and a lack of incorporation of electronic health records. The study will adopt an enhanced patient referral framework for decongesting self-referrals to referral hospitals. Using the developed framework, patients will easily and actively engage with their own health by way of digital services, hence helping address waiting time at referral health facilities, shortage of medical staffs and amenities. Depending on the nature of illness, it is expected that digital services provided by medical expert systems can give personalized diagnosis and curative recommendations, hence addressing quality of care and equipment unavailability issues. Moreover, digital services such as online stores can provide avenues for drug ordering from anywhere on the globe, hence countering the drug unavailability problem.

useful when examining the relationship between variables and explaining why events occur in the way they do.

This implied that a descriptive design was appropriate since the objective of the study was to develop a relation between service users' lack of awareness, socioeconomic issues, patient wait times, medical staff shortages, drug, amenity, and equipment unavailability, insufficient communication tools, illness nature, and care quality, and a lack of integration electronic health records. A target population is the complete group of subjects from which a study wishes to make inferences (Cooper, D. R., & Schindler, 2014). It is the whole group of objects / subjects to which the study is interested to generalize the research outcomes and conclusions. Patients who visited the outpatient clinics at Kisii Teaching and Referral Hospital without a referral were the key demographic. To determine who they were, the researcher I choose those who did not have referral letters from any of the lower healthcare facilities. The study targeted 345 patients who visited Kisii Teaching and Referral Hospital. According to (Kothari,2004), a sample means a number of objects to be chosen from the group. It should accomplish the requirements of effectiveness, portrayal and consistency. Sampling must be appropriate if reliable and valid inferences are to be made. Purposive sampling was used to pick respondents from the outpatient department at Kisii teaching and referral hospital. The sample size was confirmed through the following statistical computation propagated by (Yamane, 1967).

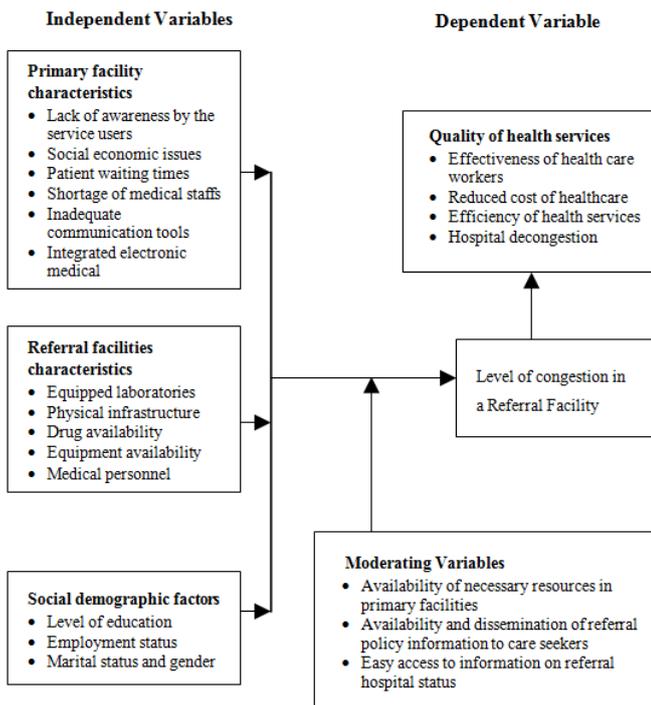


Figure 2.2: Conceptual Framework

III. METHODOLOGICAL APPROACH

The research design is described as the road map outlining how the issue under investigation is addressed (Nyanamba, 2018). Where it is necessary to include an accurate representation of the respondents' behavior and attitudes in relation to a specific person or circumstance, descriptive design is used (Sangalang et al., 2017). It is also

$$n = N / (1 + N(\epsilon^2))$$

$$n = 345 / (1 + 345(0.05^2))$$

$$n = 345 / (1 + 345(0.0025))$$

$$n = \frac{345}{1 + 0.9}$$

$$n = 182$$

Where;

n=sample size
N= population under study
ε=Margin error

Questionnaires were distributed to the respondents in the sector. Four parts were included in the questionnaire. The first part of questionnaire was an overview, in which the intent of the questionnaire was explained, emphasizing that the data collected was used purely for academic purposes. Additionally, it clarified how to react to the questions eliciting basic information about the participants and the government hospital. The remaining parts included questions designed to elicit information about the factors that influence self-referral patients to referral hospitals.

The clarification made by (Lancaster et al., 2012) states that in order to facilitate elevated pilot study. As a result, the analysis used a sample of 16 respondents percent of the sample) who did not partake in the final data gathering process. As such, a pilot questionnaire was distributed to establish the validity to a group of 16 respondents with similar demographic characteristics to the final respondents chosen for convenience, with the objective of fine-tuning the questionnaire and identifying potential issues. Piloting the research instrument was accomplished by the use of the test-retest process. The pilot study participants were not included in the final study.

IV. DATA ANALYSIS AND DISCUSSIONS

Response Rate

The study sampled 183 respondents whereby 172 questionnaires were fully filled and returned for analysis. A hundred and seventy two questionnaires represented 94.2% which is highly acceptable.

Respondents Gender

The study sought to determine the respondent's gender. The study findings are as presented below. The study results showed that 67% of the respondents were male whereas 33% of the respondents were female. This implies that both genders were fairly represented in the study.

Respondents Age Bracket

The researchers were interested to find out the age bracket of the respondents. The study findings were as tabulated below;

Table 4.1: Respondents Age Group

Age Bracket	Frequency	Percentage
Under 29 years	38	22
30 – 39 years	62	36
40 – 49 years	50	29
Above 50 years	22	13
Total	172	100

The study results showed that 36% of the respondents were between 30 – 39 years; 29% of the respondents were aged between 40-49 years, 22% of the respondents indicated under 29 years and 13% of the respondents indicated above 50 years.

Respondents Marital Status

The respondents were asked to indicate their marital status and results as shown below:

Table 4.2: Respondents Marital Status

Marital Status	Frequency	Percentage
Single	57	33
Separated	15	9
Widowed	21	12
Married	79	46
Total	172	100

The study findings revealed that 46% of the respondents were married, 33% of the respondents were single, 12% of the respondents were widowed and 9% of the respondents were separated. The study findings indicated that majority of the findings indicated that they were married.

Respondents Academic Qualification

The respondents were asked to indicate their academic qualification. The respondents results were presented below;-

Table 4.3: Respondents Academic Qualification

Academic Qualification	Frequency	Percentage
Primary	14	8
Secondary	89	52
Tertiary	65	38
Total	172	100

According to the respondent's academic qualification level, revealed that 52% of the respondents indicated they had reached secondary academic level, 38% of the respondents indicated they had tertiary, 8% of the respondents indicated they had completed their primary level of education. This shows that majority of the respondents were learned and could provide appropriate results in regards to the subject under investigation.

The study finding revealed that more male self-referred (67%) compared to female(33%) this finding were in line with the study carried in Ethiopia and us which confirmed that more male who were employed self-referred themselves to a higher level facility which could be because most of the rely on practical experiences. In terms of age bracket (36%) of the respondent were the highest in respondent rate and their age bracket was between (30-39) this findings conquered with (Visser et al, 2015).

Who in study in Limpopo asserted that 59% patients between the age of 20-39 years had self-referred themselves to referral hospitals while another descriptive cross sectional study revealed that majority of their self-referrals 79% were below the age of 45.

Respondents Referred From Facility

The respondents were required to provide their opinion on how they determined their referral facility and the findings are as tabulated below:

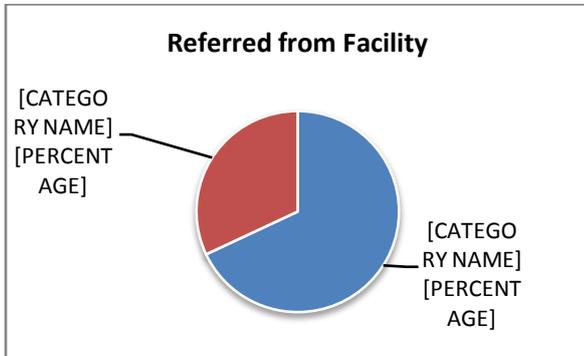


Figure 4.3: Respondents Referred From Facility

The study findings highlighted that 68% of the respondents indicated that they self-referred themselves and 32% of the respondents indicated they were referred by their healthcare provider. This finding was inline with (Wolk et al, 2015) who in is study confirmed that 2/3 of patients who seek for treatment in rural district by passed the lower level facility. The study findings are also supported by Padmore (2017), who confirmed that majority of self-referrals are based on peer induced factors which make individuals to bypass the lower level health services in favour of the higher level ones which outsets the health issue.

Primary Health Facility Characteristics

The study focused on identifying the primary health facility characteristics and the findings are as presented below:

Table 4.4: Primary Health Facility Characteristics

Statements	NO	YES	Mean	St.D
Fare to PHC affordable	78 45%	94 55%	2.89	0.031
PHC always open and accessible	123 72%	49 28%	4.00	.643
Waiting time is short at the PHC	146 85%	26 15%	4.06	.682
Drugs are always available in PHC	158 92%	14 8%	4.02	.850
Lab test available at PHC	138 80%	34 20%	4.11	.895
Primary Health Centre is clean	102 59%	70 41%	3.60	.568
I receive all services at the PHC	98 57%	74 43%	3.20	.785
Provider gives required information at the PHC	67 39%	105 61%	1.66	.8042

In Table 4.4 the study findings established that fare to PHC affordable affected access to primary healthcare whereby it had a mean of 2.89 and a standard deviation of 0.0310. This was attributed by the fact that the patients usually access a referral facility that they can easily access without incurring any extra costs. The factor that patients indicated PHC was always open and

Respondents Occupation Status

The respondents were required to provide their occupation status. The results are as shown below;-



Figure 4.4: Respondents Occupation Status

Figure 4.3 indicates that 69% of the respondents were unemployed while 31% of the respondents were employed. This implies that majority of the respondents were self-employed. This findings is contrary to(Lewis et al,2013) who in his findings in the study conducted on the factors influencing place of delivery for women in Kenya confirmed that residence of the patient, wealth status foresee the facility for delivery

accessible had a mean of 4.00 and a standard deviation of 0.643. This shows that majority of the respondents could easily access their primary health facility. The waiting time was found to be short at the PHC whereby it was denoted by a mean of 4.06 and a standard deviation of 0.682. This finding confirms that the patients do not consider the shortest time in the PHC. Unavailability of the drugs at the primary health facilities could have pushed the patients to seek medical care at the higher level health facilities. This finding is in agreement with a similar study conducted in five countries; Kenya, Ghana, Rwanda, Tanzania and Uganda which revealed that 18% - 41% of the primary health care centres lacked drugs, running water and electricity (Hsia, Mbembati, Macfarlane & Kruk, 2011). Majority of the respondents stated that there was unavailability of drugs in PHC whereby it had a mean of 4.02 and a standard deviation of 0.850. The majority of the patients decided where to get drugs from because the primary healthcare could not provide all the drugs required by the patients this findings conformed with. (Oslisloet al., 2019) demonstrated, that the accessibility of drugs or equipment has a significant effect on choice at different levels. Absence of certain drugs or advanced equipment prompted self-referrals to higher level facilities, especially during the diagnostic stage, when certain advanced equipment is deemed necessary the findings was similar to, (Abdi, 2015) who stated that patients' decision to self-refer was influenced by a lack of assurance about the appropriate healthcare provider, a shortage of drugs and laboratory services at the primary level of care, and a lack of laboratory services at the primary level of care.

The factor that lab test available at PHC had a mean of 4.11 and a standard deviation of 0.895. The decision on whether to use the laboratory tests of the primary healthcare facility highly relied on the patients' decision. Majority of the patients agreed that the primary health Centre is clean whereby it had a mean of 3.60 and a standard deviation of 0.568. This findings was contrary with (Kočet al., 2019) who revealed that lack of amenities such as light, water, and a pleasant atmosphere in lower-level facilities influenced patients to seek healthcare services at higher-level facilities. On the aspect the patients receive all services at the PHC had a mean of 3.20 and a standard deviation of .785. Patients decided which services to receive from the health care facility and when. Some patient and finally agreed on the statement that the healthcare provider gives required information at the PHC had a mean of 1.66 and a standard deviation of .8042. Majority of the respondents agreed that they did not received vital information which influenced their visit to referral facility.. This implies that lack of all health care provision services, lab test, drugs and knowledge of patients regarding the referral systems had a significant effect on influencing patient self referral.

The study results concur with the findings of Naseriasl et al., (2017) who noted that constraints of certain health facilities communication appliances determined the self-referral rates. The study findings are also in line with the study of Abdi (2015) who argued that patients decision in regards to self refers was based on lack of assurance concerning the availability of the drugs, lack of assurance from the healthcare staff, as well as incapacitated laboratory services at the primary level health care.

Referral Facility Characteristics

The study focused on determining the referral facility characteristics. The study results are as presented below;-

Table 4.5: Referral Facility Characteristics

Statements	NO	YES	Mean	St. D
It cost me little fare to come to this referral facility	109 63%	63 37%	3.78	.7235
Availability of the health care provider I want guides my decision on which facility to visit	60 35%	112 65%	2.59	.7232
I have confidence with providers working at the referral facility	19 11%	153 89%	3.77	1.033
Waiting time at this facility is short	78 45%	94 55%	1.66	.8042
Availability of medicine attracts me to this referral facility	24 14%	148 86%	3.72	.8132
Infrastructure attracts me to this referral facility	38 22%	134 78%	2.55	.7856
I am attracted to quality service in this facility	51 30%	121 70%	2.64	.7842
I got a lab order that brought me to this referral facility	98 57%	74 43%	1.67	.8265

Table 4.5 shows that on the statement that the respondents indicated that it cost them little fare to access the referral hospital had a strong mean of 3.78 and a standard deviation of 0.7235. Majority of the patients agreed that low cost of fare influenced on

their choice of referral facility. On the availability of provider guides decision on which facility to visit had a mean of 2.59 and a standard deviation of 0.7232. This implies that patients seek health care services at the referral facility because of availability of the provider they wanted. The finding area affirmed by Lamet, (2017) who revealed that inadequate medical staff lead to increased self-referrals amongst patients seeking healthcare services.

Majority of the respondents had confidence in the health care providers at the referral facility the whereby it was denoted by a mean of 3.77 and a standard deviation of 1.033, this influenced their decision on choice of the referral facility since their believed majority of the medical staff at the referral facility are professionals Similarly, (Okoli et al., 2017) established that a preference for high-quality service and professional workers were frequently cited as reasons for presenting to higher levels of treatment .In addition Beache et al., (2016) established that lack of specialist attending resulted to be the contributing factor in the case of self-referral which is according to the this study results. On the statement that waiting time at the facility is short had a weak mean of 1.66 and a standard deviation of 0.8042, this implies that majority of the respondents disagreed since there was congestion and long wait time experienced at different points of service. The findings differed, Rebecca (2014) who established that patient waiting times influence patient facility selection, with many patients declining to visit a particular hospital due to lengthy wait times.

Availability of medicine attracts the respondents to the referral facility had a strong mean of 3.72 and a standard deviation of 0.8132, this shows that the patients selected referral facility due to the assurance that they could access all drugs they may require. On the statement that infrastructure attracts the respondents to the referral facility had a mean of 2.55 and a standard deviation 0.7856. Infrastructure allowed the patients to seek better healthcare services thus making them to choose referral facility. This is similar to a study conducted in China by Jin et al (2017) found out that, availability of preferred health provider tend to play a part in patients’ decision to seek care. The study revealed that with the increased availability of specialized physicians at the health facilities that dealt with Diabetes mellitus, the number of patients seeking care in those health facilities greatly increased (Jin et al. 2017). On the statement that the respondents are attracted to the quality service in the referral facility had a mean of 2.64 and a standard deviation of .7842, this was due to the fact that the referral facility provided quality services which influenced many patients to access services from them. On the statement that the respondent got a lab order that brought the respondent to the referral facility had a weak mean of 1.66 and a standard deviation of 0.8265, this means lack of availability of lab orders highly influenced the patients decision on choosing the referral facility. This implies that the referral facility characteristics were crucial towards making vital decision of facility referral.

The study findings are in line with Abdi (2015) who stated that the decision of the client to refer himself or herself was based on the healthcare providers’ ability, assurance from the healthcare facility, the available drugs, and laboratory services among other services.

Administrative

Table 4.6: Administrative

Statements	NO	YES	Mean	St. D
D1: Is this your first time seeking health services in this facility? If No answer D3 and if yes answer the next question	133 77%	39 23%	2.78	1.133
D2: Did you know that you are supposed to seek for health services from the primary health care first?	137 80%	35 20%	2.68	.687
D3: Have you attended the primary health care facility before?	149 87%	23 13%	2.70	.1728
D4: Did you get all the services at the primary health care facility? If No, answer question D5	110 64%	62 36%	1.83	.843
D5: Were you referred by the health care provider to this facility? If yes answer question D6?	103 60%	69 40%	1.42	.307
D6: Were you given a referral letter to the referring facility?	105 61%	67 39%	1.38	.588
D7: When you arrived at the referral facility, did the health care provider tell you that they were aware about your referral?	97 56%	75 44%	1.26	.506
D8: When you seek for health care services in the primary health care, are you normally advised on what you can do in case you want to seek health services at the referral hospital? If No answer the next question	109 63%	63 37%	1.08	.478
D: At the primary health care, are there posters giving guidelines on how a patients are supposed to seek health services in referral hospitals?	115 67%	57 33%	1.56	.602

Table 4.6 shows that on the statement as to whether it was the first time to seek health services in the facility had a mean of 2.78 and a standard deviation of 1.133, this implied that it was not the first time the patients were accessing medical services at the health care facility.

On the statement that patient ever attended primary healthcare first had a mean of 2.68 and a standard deviation of .687. This indicates that some patients were aware of the primary care healthcare facility sought them first while the majority did not and ended up on self-referrals.

On the statement that the patient had attended the primary healthcare facility had mean of 1.05 and a standard deviation of 0.368, this implies that majority of the patients did not seek services at the primary care facility.

On the statement that patients accessed all services at the primary healthcare facility had a mean of 1.42 and a standard deviation of 0.307. This shows that for those who accessed primary care services did not get all services.

On the factor that some of the patients had referral letters to the referring facility had a mean of 1.38 and a standard deviation of 0.588. This shows that majority of the patients did not have referral letters.

On the factor that the health care providers were aware of the patient’s referral had a mean of 1.26 and a standard deviation of 0.506. Majority of the health care providers did not have any formal communication regarding the patients since majority were self-referrals.

On the factor that patients are normally advised when seeking primary health services about the referral hospital had a mean of 1.08 and a standard deviation of 0.478. This indicates that patients did not get sufficient information about the referral hospital at the primary healthcare. The finding conquer with Koce et al.,(2019), who revealed that service users lack knowledge of the functions of various levels of healthcare services, which could have influenced their decision to seek treatment at the secondary levels

On the factor that primary healthcare provided posters giving guidelines on how patients are supposed to seek health services in referral hospital had a mean of 1.56 and a standard deviation of .602. This implies that the majority of the patients were not given such guidelines regarding referral hospitals. These results conquered with (Craker’s, 2014) assertion that service consumers lack a thorough understanding of how the healthcare system works and are unaware of alternative resources.

Correlation Analysis

A correlation describes a number that shows the relationship between two study variables (Wilcox, D., 2010). Correlation analysis is applied in most studies since it brings valuable statistics. In the study, Pearson’s correlation analysis was carried out at 95%t confidence interval and 5% at a confidence level, which tailed between each of the study variables was adopted in determining the significance and association degree between dependent and independent variables. The table below indicates the correlation matrix obtained.

Table 4.7: Summary of Pearson’s Correlations

Correlations		Socio-Demographic Factors	Primary health facility characteristics	Referral Characteristics	Facility Hospital congestion
Socio-Demographic Factors	Pearson Correlation	1	.012	.080	.030
	Sig. (2-tailed)		.905	.445	.7172
	N	172	172	172	172
Primary health facility characteristics	Pearson Correlation	.012	1	.313**	.025
	Sig. (2-tailed)	.905		.002	.807
	N	172	172	172	172
Referral Facility Characteristics	Pearson Correlation	.080	.313**	1	.101
	Sig. (2-tailed)	.445**	.002		.332

	N	172	172	172	172
	Pearson Correlation	.030	.025	.101	1
Referral Decongestion framework	Sig. (2-tailed)	.7438**	.703**	.431**	
	N	172	172	172	172

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

The study findings established that there is a significant positive relationship ($r=.7438$) between Socio-Demographic Factors and level of congestion in the referral hospitals. The study also highlighted a positive relationship ($r=.703$) between primary health facility characteristics and hospital congestion. Lastly, the study established that there was a positive relationship between Referral Facility Characteristics ($r=.431$) and Hospital congestion.

Regression Analysis

Regression analysis is a statistical method of estimating the relationship among study variables. It constitutes both analyzing and modelling different study variables that focus on the relationship between the dependent and other independent variables as described by Marshall, C., (2012). When put together, the study applied multivariate regression analysis to ascertain the significance of the relationship between the dependent variable and all the other study independent variables. The regression analysis served to estimate the proportion of the dependent variable, which can be predicted from the independent variables (Socio-Demographic Factors, primary health facility characteristics, and Referral Facility Characteristics). The findings from the regression analysis highlighted that there is a significant positive relationship between the dependent variable and the independent variable. The independent variables R were found to have the value of 0.691a which indicates that there was a perfect relationship between dependent and independent variables. In the study, when the R square value is at 0.768 this implies that 72.1% of the corresponding variation in hospital congestion which can be expounded on or predicted by (Socio-Demographic Factors, primary health facility characteristics and Referral Facility Characteristics) which shows that the technique was fit for this particular study data. The study findings regression analysis clearly shows a significant positive relationship between the study dependent variable and independent variable at ($\beta = 0.757$), $p=0.000 < 0.05$).

Table 4.8: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.691 ^a	.768	.721	1.21626

a. Predictors: (Constant), Socio-Demographic Factors, primary health facility characteristics, Referral Facility Characteristics

Analysis of Variance (ANOVA)

Analysis of variance is type of statistical technique applied in testing the difference between two or more means. When testing the significance level, the statistical significance is usually significant in the event the p-value is less or equivalent to 0.05. In the current study, the p-value is at 0.00 which is less than 0.05. This implies that the regression model is statistically significant in predicting the frameworks for referral hospitals.

Table 4.9: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
	Regression	5.324	12	2.072	5.298	.000 ^b
1	Residual	36.784	160	.391		
	Total	42.108	172			

a. Dependent Variable: Frameworks For Referral Hospitals

b. Predictors: (Constant), Socio-Demographic Factors, Primary health facility characteristics, Referral Facility Characteristics

Coefficients of Determination

Table 4.10: Coefficients of Determination

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	3.542	.341		4.401	.000
1					
Socio-Demographic Factors	.050	.057	.107	.887	.377
Primary health facility characteristics	.227	.059	.425	3.845	.000
Referral Facility Characteristics	.010	.057	.018	.172	.864

a) Predictors: (Constant), Socio-Demographic Factors, Primary health facility characteristics and Referral Facility Characteristics

b) Dependent Variable: Patient Self-Referral Decongestion Framework

The formula illustrated below was used.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Where;

Y = the dependent variable (Patients Self-Referral Decongestion Framework)

X1 = Socio-Demographic Factors

X2 = Primary health facility characteristics

X3 = Referral Facility Characteristics

The regression equation is therefore;

$$Y = 3.542 + 0.050X_1 + 0.227X_2 + 0.010X_3$$

The regression model above noted that taking all factors into consideration (Socio-Demographic Factors, primary health facility characteristics and Referral Facility Characteristics) to be constant zero, the level of hospital congestion will be an index of 3.542. The study results taking into consideration of the independent variables to be zero then a unit increase in Socio-Demographic Factors can lead to an increase of 0.05 in the scores of level of hospital congestion; a unit increase in primary health facility characteristics of 0.227 can lead to an increase in hospital congestion and lastly a unit increase of 0.01 by Referral Facility Characteristics can lead to an increase in hospital congestion in referral hospitals. This implies that the three study variables had a strong positive relationship to the dependent variable which was level of hospital congestion.

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Challenges facing the Current Referral System

The study findings established that there is a significant positive relationship between Socio-Demographic Factors (r=.7438) and level of congestion in a referral hospital. The study results highlighted that socio-demographic Factors

influenced an increase of 0.05 in the level of hospital congestion. Most respondents who referral themselves were between (30 and 39), the majority of them were educated and were employed.

Primary Health Facility Characteristics

The study highlighted that there is a positive relationship (r=.703) between primary health facility characteristics and level of hospital decongestion. The study found out that a unit increase in primary health facility characteristics of 0.227 influenced an increase in level of hospital congestion. This is confirmed from the findings where the PHC lacked most of the services required despite the fact of it being near, taking less waiting time and being conducive in terms of hygiene.

Referral Facility Characteristics

The study established that there was a positive relationship between Referral Facility Characteristics (r=.431) and level of hospital congestion. The study findings highlighted that a unit increase of 0.01 by Referral Facility Characteristics can lead to an increase in congestion of referral hospitals because it's well-equipped.

Current decongestion framework

The finding in this study reveals that the level of congestion in the referral facilities is influenced by the administrative factors whereby most patients reported that it was not their first time accessing medical services at the referral facility. They were not given any advice of seeking those services at the PHC because they kept referring themselves back, meaning they were not even aware of the referral guidelines. Those patients who attended the primary facility reported that they did not receive all the services they wanted, and this made them refer themselves to the referral facility. Despite the challenge of not receiving all the services, they were not advised appropriately on where to get the services, and even those whom they referred to the referral

facility were not given referral letters; this shows that there was a communication challenge among the health care providers. Additionally, at the referral facility, the health care providers were not aware of their referral, meaning even the health care providers could be. They ignored the referral guidelines or were not aware of the same. Further, most of the participants accepted that there were no posters explaining the procedures for patients who wanted referrals on request, and this situation maybe if they were posters, patients could abide by the referral guidelines hence decongest the referral facility

Conclusion

One of the main factors influencing healthcare quality is the referral system. Reinforcements to the referral system's performance can hold it back from reaching its goals. The structure of the referral system must be improved through better coordination between the three levels of the referral system.

To reduce self-referrals, increase public awareness and knowledge of the referral system among caregivers. The implementation of a more robust health care system translates to citizens of a country having access to healthcare services. Among the indicators for strengthened health system is appropriate referral between facilities. Effective functioning of referral systems demands competency, availability, well-defined roles and functions, and finally referral back to the primary care facility after discharge.

Recommendation

1. There is a need to strengthen the referral mechanism and linkages between the various levels of the facility through having a health care provider coordinating referral processes, through the provision of health care services in remote areas via mobile clinics.
2. Increase collaboration between all levels of care and introducing usage of technology in communication such as the use of EHR and use of the mobile phone for receiving feedback and sending referrals to enhance proper communication within the health care system.
3. The public and the healthcare providers to be updated on the referral guidelines.

Proposed Framework

Referral frameworks are widely seen as key to providing successful health care delivery. Referral systems that are successful require preparation, which includes having a referral strategy, which is based on the assessment of population needs and available health system capacity, a suitable referral location, coordination with other stakeholders, established communications and transportation networks, and

agreement with referrer and recipient protocols. It is crucial to emphasize that ineffective self-directed reference leads to system inefficiency and patient payment difficulties, as well as the accumulation of unnecessary costs and a dearth of comprehensive patient health care information. Using this framework, I'd like to propose a decongestion strategy for referral hospitals. To lessen the crowding in hospitals by self-referrals, make them referral centers and give them excellent care to those who need treatment at healthcare facilities with highly skilled personnel and state-of-the-art facilities.

REFERENCES

- [1] Abdelrahman E. M., Ezzat, H.S., and Bader E.F.(2015) Factors affecting patient flow planning in hospitals.
- [2] Abdi, W. O., Salgado, W. B., &Nebek, G. T. (2015).Magnitude and Determinants of Self-Referral of Patients at a General Hospital, Western Ethiopia. *Science Journal of Clinical Medicine*, 4(5), 86-92.
- [3] Agarwal, S., Banerjee, J., Baker, R., Conroy, S., Hsu, R., Rashid, A., & Habiba, M. (2012). Potentially avoidable emergency department attendance: interview study of patients' reasons for attendance. *Emergency Medicine Journal*, 29(12), e3-e3.
- [4] Agola, J., & Raburu, G. (2018).Analysis of scheduling models applicable in referral health systems.
- [5] Akinode, J. L., & Oloruntoya, S. A. (2017).Design and Implementation of a Patient Appointment and Scheduling System. Department of Computer Science, Federal Polytechnic Ilaro Nigeria.
- [6] Akpede, G. O., Omoigberale, A. I., Dawodu, S. O., Olomu, S. C., Shatima, D. R., &Apeleokha, M. (2005). Referral and previous care of children with meningitis in Nigeria: implications for the presentation and outcome of meningitis in developing countries. *Journal of the neurological sciences*, 228(1), 41-48.
- [7] Alarakhia, M., Costa, A., & Roudsari, A. V. (2019, January). Axe the Fax: What Users Think of Electronic Referral. In *ITCH* (pp. 9-16).
- [8] Alberti H, Alberti B. The influence of gender on the primary care management of diabetes in Tunisia. *Pan Afr Med J*. 2015 Aug 22;3:2.
- [9] AliyuIsah Aliyu et al., *International Journal of Science and Advanced Information Technology*, 4 (1), January - February 2015, 01-06.
- [10] Amoah, P. A., & Phillips, D. R. (2017, December). Strengthening the referral system through social capital: a qualitative inquiry in Ghana. In *Healthcare* (Vol. 5, No. 4, p. 80).Multidisciplinary Digital Publishing Institute.
- [11] Ansah, E. K., Gyapong, M., Narh-Bana, S., Bart-Plange, C., & Whitty, C. J. (2016). Factors influencing choice of care-seeking for acute fever comparing

- private chemical shops with health centres and hospitals in Ghana: a study using case-control methodology. *Malaria journal*, 15(1), 1-9.
- [12] Beache, S. K., & Guell, C. (2016). Non-urgent accident and emergency department use as a socially shared custom: a qualitative study. *Emergency medicine journal*, 33(1), 47-51.
- [13] Busagala, L. S., & Kawono, G. C. (2013). Underlying Challenges of E-Health Adoption in Tanzania 1.
- [14] Cao, J. X., Zhu, K. Y., & Li, X. X. (2012). Calibration and Application of Passenger Parameters in Commuter Based on Social Force Model. In *CICTP 2012: Multimodal Transportation Systems—Convenient, Safe, Cost-Effective, Efficient* (pp. 1369-1380).
- [15] Carter, E. J., Pouch, S. M., & Larson, E. L. (2014). The relationship between emergency department crowding and patient outcomes: a systematic review. *Journal of Nursing Scholarship*, 46(2), 106-115.
- [16] Catwell, L., & Sheikh, A. (2009). Evaluating eHealth interventions: the need for continuous systemic evaluation. *PLoS Med*, 6(8), e1000126.
- [17] Craker, S. M. (2014). Influences on choices to inform a persuasive communications campaign to reduce non-urgent accident and emergency attendance. *Journal of Communication in Healthcare*, 7(3), 181-196.
- [18] Crock, E. (2016). Access to healthcare services for people living with HIV experiencing homelessness—a literature review. *Australian Journal of Advanced Nursing*, 34(1), 42.
- [19] Dantu, R., & Mahapatra, R. K. (2013). Adoption of Telemedicine—Challenges and Opportunities.
- [20] Detollenaere, J., Boucherie, J., & Willems, S. (2018). Reasons why self-referring patients attend the emergency department during daytime differ among socioeconomic groups: a survey from Flanders. *European Journal of General Practice*, 24(1), 246-251.
- [21] Durand, A. C., Palazzolo, S., Tanti-Hardouin, N., Gerbeaux, P., Sambuc, R., & Gentile, S. (2012). Nonurgent patients in emergency departments: rational or irresponsible consumers? Perceptions of professionals and patients. *BMC research notes*, 5(1), 1-9.
- [22] Eskandari, M., Abbaszadeh, A. and Borhani, F (2013). Barriers of referral system to health provision in rural societies in Iran.
- [23] Geta, E. T., Belete, Y. S., & Yesuf, E. A. (2019). Determinants of Self-referral among Outpatients at Referral Hospitals in East Wollega, Western Ethiopia. *BioRxiv*, 540476.
- [24] He, J., Shen, W., Divakaruni, P., Wynter, L., & Lawrence, R. (2013, June). Improving traffic prediction with tweet semantics. In *Twenty-Third International Joint Conference on Artificial Intelligence*.
- [25] Kahabuka, C., Moland, K. M., Kvåle, G., & Hinderaker, S. G. (2012). Unfulfilled expectations to services offered at primary health care facilities: experiences of caretakers of underfive children in rural Tanzania. *BMC health services research*, 12(1), 1-10.
- [26] Kangovi, S., Barg, F. K., Carter, T., Long, J. A., Shannon, R., & Grande, D. (2013). Understanding why patients of low socioeconomic status prefer hospitals over ambulatory care. *Health affairs*, 32(7), 1196-1203.
- [27] Kempe, D., Kleinberg, J., & Tardos, É. (2003, August). Maximizing the spread of influence through a social network. In *Proceedings of the ninth ACM SIGKDD international conference on Knowledge discovery and data mining* (pp. 137-146).
- [28] KENYA HEALTH SECTOR REFERRAL STRATEGY - Health Publications.(n.d.). Retrieved March 9, 2021.
- [29] Khiavi, F. F., Maleki, M. R., Momtaz, N. S., & Jafarian, K. (2012). The effect of extended work shift on performance of Farabi Eye Hospital in Iran. *Payesh (Health Monitor)*, 11(2), 181-187.
- [30] Kitui, J., Lewis, S., & Davey, G. (2013). Factors influencing place of delivery for women in Kenya: An analysis of the Kenya demographic and health survey, 2008/2009. *Biomedical Central Pregnancy and Childbirth*, 13(1), 40. Retrieved from <https://doi.org/10.1186/1471-2393-13-40>.
- [31] Koce, F., Randhawa, G., & Ochieng, B. (2019). Understanding healthcare self-referral in Nigeria from the service users' perspective: a qualitative study of Niger state. *BMC health services research*, 19(1), 209.
- [32] Kraaijvanger, N., van Leeuwen, H., Rijpsma, D., & Edwards, M. (2016). Motives for self-referral to the emergency department: a systematic review of the literature. *BMC health services research*, 16(1), 1-19.
- [33] Lam, M. K., Hines, M., Lowe, R., Nagarajan, S., Keep, M., Penman, M., & Power, E. (2016). Preparedness for eHealth: Health sciences students' knowledge, skills, and confidence. *Journal of Information Technology Education: Research*.
- [34] Lan, Y. J., Han, B. M., & Li, D. W. (2013). Research on safety risk assessment of large-scale railway passenger station. In *Applied Mechanics and Materials* (Vol. 361, pp. 1923-1926). Trans Tech Publications Ltd.
- [35] Lancaster, G. A., Campbell, M. J., Eldridge, S., Farrin, A., Marchant, M., Muller, S., ...& Rait, G. (2010). Trials in primary care: statistical issues in the design, conduct and evaluation of complex interventions. *Statistical methods in medical research*, 19(4), 349-377.

- [36] Li, J., Zhang, C., Li, X., & Zhang, C. (2020). Patients' emotional bonding with MHealth apps: An attachment perspective on patients' use of MHealth applications. *International Journal of Information Management*, 51, 102054.
- [37] Li, Z., Serban, N., & Swann, J. L. (2015). An optimization framework for measuring spatial access over healthcare networks. *BMC health services research*, 15(1), 1-13.
- [38] Maeder, A. J. (2014). The spectrum of needed e-Health capacity building—towards a conceptual framework for e-Health 'training'. *Global Telehealth 2014*, 206, 70.
- [39] Magoro, S.M., (2015). Factors Contributing to Self-Referrals of Antenatal Women for Delivery at Dilokong Hospital, Greater Tubatse Local Municipality. PhD Thesis. University of Limpopo.
- [40] McGuigan, T., & Watson, P. (2010). Non-urgent attendance at emergency departments. *Emergency Nurse*, 18(6).
- [41] Meng, Q., Yin, D., Mills, A., & Abbasi, K. (2019). China's Health System Reforms: Ten Years of Progress: China's encouraging commitment to health. *The BMJ*, 365.
- [42] Ministry of Health (South Africa). (2009). White paper for the transformation of the health system in South Africa.
- [43] Ministry of Health Kenya (MOH). (2013). Referral Strategy and Investment Plan for Health Services – July 2012 – June 2017. Nairobi: Technical Planning and Monitoring / Coordinating Departments.
- [44] Ministry of Health Kenya (2013). Sessional Paper No. 6 of 2012 of the Kenya Health Policy 2012–2030 (Draft).
- [45] Ministry of Health Kenya. (2014) The Kenya Health Policy, 2014–2030: Towards attaining the highest standard of health.
- [46] Moerman, A. H. (2014). An explorative Delphi study to uncover knowledge, attitudes and skills for nurses using eHealth (Master's thesis).
- [47] MoH. (2012). Referral Policy and Guidelines; Ministry of Health (MoH), Ghana: Accra, Ghana.
- [48] Mugo, D. M., & Nzuki, D. (2014). Determinants of electronic health in developing countries.
- [49] Nanyonjo, A., Bagorogoza, B., Kasteng, F., Ayebale, G., Makumbi, F., Tomson, G., & Källander, K. (2015). Estimating the cost of referral and willingness to pay for referral to higher-level health facilities: a case series study from an integrated community case management programme in Uganda. *BMC health services research*, 15(1), 1-10.
- [50] Naseriasl, M., Adham, D., & Janati, A. (2015). E-referral solutions: successful experiences, key features and challenges—a systematic review. *Materia socio-medica*, 27(3), 195.
- [51] Nyanamba, S. O. (2018). Influence of Capital Structure on Financial Performance of Craft Micro Enterprises in Kenya (Doctoral dissertation, JKUAT-COHRED).
- [52] Ogden, J., Morrison, K., & Hardee, K. (2014). Social capital to strengthen health policy and health systems. *Health policy and planning*, 29(8), 1075-1085.
- [53] Okoli, H., Obembe, T., Osungbade, K., Adeniji, F., & Adewole, D. (2017). Self-referral patterns among federal civil servants in oyo state, South-Western Nigeria. *The Pan African Medical Journal*, 26.
- [54] Oslislo, S., Heintze, C., Schmiedhofer, M., Möckel, M., Schenk, L., & Holzinger, F. (2019). How to decide adequately? Qualitative study of GPs' view on decision-making in self-referred and physician-referred emergency department consultations in Berlin, Germany. *BMJ open*, 9(4), e026786.
- [55] Pines, J. M., Hilton, J. A., Weber, E. J., Alkemade, A. J., Al Shabanah, H., Anderson, P. D., ... & Schull, M. J. (2011). International perspectives on emergency department crowding. *Academic Emergency Medicine*, 18(12), 1358-1370.
- [56] Pittalis, C., Brugha, R., & Gajewski, J. (2019). Surgical referral systems in low-and middle-income countries: a review of the evidence. *PloS one*, 14(9), e02233.
- [57] Pollack, C. E., Rastegar, A., Keating, N. L., Adams, J. L., Pisu, M., & Kahn, K. L. (2015). Is self-referral associated with higher quality care? *Health Services Research*, 50(5), 1472–1490. <https://doi.org/10.1111/1475-6773.12289>
- [58] Rehman, A., Shaikh, B. T., & Ronis, K. A. (2014). Health care seeking patterns and out of pocket payments for children under five years of age living in Katchi Abadis (slums), in Islamabad, Pakistan. *International journal for equity in health*, 13(1), 1-6.
- [59] Sangalang, R.A., Siochi, J., & Plaza, M. (2017). Factors Influencing Consumers' Impulse Buying Behavior in the Fifth District of Cavite. Paper Presented at the DLSU Research Congress 2017.
- [60] Schmiedhofer, M., Möckel, M., Slagman, A., Frick, J., Ruhla, S., & Searle, J. (2016). Patient motives behind low-acuity visits to the emergency department in Germany: a qualitative study comparing urban and rural sites. *BMJ open*, 6(11), e013323.
- [61] Shams, A., Mofid, M. and Reijlian, F. (2015). Survey of referral system influenced factors from the perspective of referring of Isfahan Educational Management.
- [62] Somasundaram, R., Geissler, A., Leidel, B. A., & Wrede, C. E. (2018). Beweggründe für die Inanspruchnahme von Notaufnahmen—Ergebnisse einer

- Patientenbefragung. Das Gesundheitswesen, 80(07), 621-627.
- [63] Tiago, S. M., (2017). Reinforcement Learning for primary care appointment scheduling, Faculdade de Engenharia da Universidade do Porto Mestrado de Engenharia da Informação.
- [64] Visser, C.A., Govender, I., Ogunbanjo, G.A., Marincowitz, G.J., (2015). Reasons for and perceptions of patients with minor ailments by passing local primary health care facilities. South African Family Practice.
- [65] Wambui, M. F. (2013). Determinants of self-directed referral amongst patients seeking health services at Kenyatta National Hospital, Nairobi, Kenya (Doctoral dissertation). Kenya: Kenyatta University.
- [66] World Health Organization (2018). Quality in primary health care (No. WHO/HIS/SDS/2018.54). World Health Organization.
- [67] World Health Organization. (2013). Management of Patient Information, 6. Retrieved from http://apps.who.int/iris/bitstream/10665/76794/1/9789241504645_eng.pdf?ua=1

Citation of this Article:

Bisieri Lydia, Omollo Richard, "A Decongestion Framework for Addressing Patients' Self-Referral Crisis within a Health Facility: Case of Kisil Teaching and Referral Hospital, Kenya" Published in *International Research Journal of Innovations in Engineering and Technology - IRJIET*, Volume 8, Issue 4, pp 14-33, April 2024. Article DOI <https://doi.org/10.47001/IRJIET/2024.804003>
