INFLUENCE OF HEALTH INFORMATION SYSTEM (HIS) ON SERVICE DELIVERY IN PUBLIC HEALTH FACILITIES IN KENYA: A CASE OF IMENTI NORTH SUB-COUNTY, MERU COUNTY

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ABSTRACT

Kenyan healthcare system can be categorized into three in relation to where the funding for the facilities is acquired. Public hospitals are mainly funded by the Government of Kenya with minimal input from copay by the patients. Previous experience in these facilities revealed a slow pace of service delivery in public hospitals which was not witnessed in other categories of the hospital. A delay in offering services, frequent disputes between management and staff in relation to delayed payment of dues, inadequate working equipment and poor working environment formed part of disruptions of service delivery. These disruptions were not witnessed in private facilities as their operations were smoother and the process from admission to discharge had very minimal disruptions. This prompted the researcher to investigate what might be the reasons behind slow service delivery in public hospitals. Despite government efforts of bringing quality medical services closer to the people through devolution, the level of public health service delivery is still wanting. The purpose of this study was to investigate the influence of HIS on service delivery in government health centers in Kenya: a case of Imenti North sub-county, Meru County. Specifically, the study sought to determine the influence of record keeping systems, disease management systems, financial management systems and human resource management systems on service delivery in public medical health facilities in Imenti north sub-county. A descriptive survey research design was used. This research has employed stratified random sampling where a sample of 206 respondents was selected. The target population was 445 staff in the 25 health facilities in Imenti North Sub-County and these included medical and dental doctors, pharmacists, nurses, and laboratory technologists. A questionnaire was employed to collect data from the hospital staff. Data was analyzed using descriptive statistics such as frequencies, percentages, mean score and standard deviation with aid of SPSS version 22.0. The qualitative data from the open-ended questions was analyzed using conceptual content analysis and presented in prose form. Multiple regression analysis was used to establish the relationship between the independent and dependent variables. The data was presented using tables. This study found that there is a great influence brought about by record keeping systems on health service delivery in Imenti North sub-county. Under this, the study revealed that disease management systems greatly influence health service delivery. Concerning financial management systems, the study found that they greatly influenced health service delivery in Imenti North sub-county. Human resource management systems factors were found to greatly influence health service delivery. The study also concluded that record keeping systems, disease management systems, financial management systems and human resource management systems greatly and positively influences health service delivery. This study recommends the following; that patients' health records to be made available to health providers to aid in timely interventions, health personnel to be provided with continuous trainings in

technology to keep up with new technological advances.

facilities, Kenya, Imenti North Sub-County, Meru County

Key Words: *health information system (HIS), service delivery, public health*

INTRODUCTION

Health information system is an umbrella framework that describes the overall management of health information, its secure exchange between consumers and providers among others. It can be used to manage records, manage diseases especially in public health. It can be referred to as a tool that can improve overall quality of health care system (Sinha, 2010). Quality is when the inherent characteristics of a product meets the customer's requirements, and then the product can be rated as high and that is according to the International Organization for Standardization. The experience of the patient defines quality. Other aspects of quality in the health sector are affordability, newer medical technology and newer and effective medication (Housego & O'Brien, 2012). Quality service delivery can only be achieved if mechanisms are put in place to allow equal access to correct, relevant and timely health information regardless of distance to the health facilities. According to WHO (2014), health systems are fundamental in ensuring improved citizens' welfare and of nations as well.

Management style is important in service delivery in public hospitals and these calls for realistic view of the demands of employees as well as wellbeing of the patients who rely on these services. The basic infrastructure required to achieve the best out of the public hospitals need to incorporate implementation of information systems to aid on online admissions and discharges, however these systems are only utilized in registration in most public hospitals. Information systems have not been utilized to capture diagnosis and treatment of patients using modern technologies, admission and movement of patients, document management and record keeping, financial services including inline, mobile and card payments to achieve its full potential to reduce bureaucratic paperwork and enhance efficient service delivery (Housego & O'Brien, 2012).

Public hospitals have one of the best trained personnel but lack the necessary tools and equipment for regular update of the skills as there is a faster change in technology and treatment and diagnostic methods. A flexible and adaptable workforce is required to match the changing healthcare field through regular trainings. For efficient services, the hospitals also need to recruit and train highly specialized and talented team and regularly update their skills through training and development (Cordella & Tempini, 2015). There is inadequacy supply of drugs in public making the relatives of the patients to purchase the items from private pharmaceutical companies, worsening the already existing inefficiency (Saxena & Sharma, 2012).

Due to poor service delivery in south Africa the municipal government made an initiative ;the People First discourse aimed at positively transforming public (Radnor *et al*, 2014). It also to lays emphasis on the significance of the citizen focused ethos especially in public service delivery and monitoring. The *Batho Pele* (People First) sets crucial benchmarks for monitoring service delivery in all state entities and departments. It aims at achieving this ideal by establishing a baseline for customers to express their discontent when service standards are not met. The seventh principle, for instance, is quite clear about the nature of reparation customers are eligible to. It further states that if the standards of service promised are not provided, citizens should be offered an effective and speedy remedy, and when the citizens complain about poor quality in the services, citizens should receive a positive, sympathetic response (Radnor *et al*, 2014).

The whole idea of *Batho Pele* stresses on the establishment of a new style of handling citizens and customers; many public servants more often than not perceive complaints as an intrusion and irritation to their working lives. When complaints procedures are not instituted, they regularly tend to justify or defend a department's shortcomings. By offering redress, *Batho Pele* appeases unhappy or irate customers and also aims at changing the attitude of service providers from a fixation with the processes of service delivery to a focus on outcomes and deliverables. It therefore initiates a process of improving service delivery and in the long run continuous enhancement and quality service delivery (Akinboade, Kinfack & Mokwena, 2012).

In Kenya, there are over 4,700 health facilities however public sector only accounts for 51% of these institutions. Health sector is classified in levels starting from national, provincial, district hospitals and finally the dispensaries and health centers. There is integration of all these hospital levels as the hierarchy goes down from the national level (Chodzaza & Gombachika, 2013). Moi Referral and Teaching hospital in Eldoret and Kenyatta National Hospital in Nairobi are the two main national level hospitals in Kenya. The provincial level is the intermediary between the districts and the national central level. They are charged with the responsibility of maintaining quality standards, implementation of health policy at the district level and control all district health activities (Njuru, 2011).

In Kenya, like in most developing countries in Africa, premature deaths and preventable diseases still inflict a high toll in communities and its people because there inadequacy in access to basic health services is affecting distinct regions, areas, communities, and social groups in these countries. Most public hospitals in the recent past have witnessed employee dissatisfaction presented in terms of refusal to offer services due to failure of payment of dues, poor working environment, inadequate infrastructure and lack of commitment by the management to engage with employees. This gap in service delivery in public hospitals has led to unwarranted suffering by the patients who lay their hopes on the services offered by these hospitals (Ajayi & Tokon, 2009).

Medical professionals need updated information if they are to keep pace with new medical information and use of HIS becomes useful. There is little if any evidence that the majority of healthcare professionals in Kenya have better access to adequate and reliable information hence Kenya continues to be ravaged by preventable communicable diseases such as HIV/Aids, tuberculosis, child mortality, nutritional deficiency, deteriorating health facilities among others (Gatero, 2010). Health care providers include nurses, doctors, and pharmacists among other categories. Health care providers at different levels influence hospital strategy and plan nursing activities in order to provide a competitive environment. For example, administrative tasks (such as filling out forms and processing billing requests) represent a significant fraction of healthcare costs. Health Information Systems could streamline these tasks and significantly decrease costs, as well as reduce personal visits to doctors (Odiwour *et al*, 2015). In developing countries recording has been done on paper. This method of recording has limitations; among them illegibility, ambiguity, incomplete data, poor availability and data fragmentation and this impedes the continuity and quality of care of patients (Mugo & Nzuki, 2014).

Therefore, the already existing systems must be strengthened as health systems that are not well developed not only hamper individual's social and economic development but also they may cause detrimental effect on national economic prospects (WHO 2014). This can be evidenced by 2014-2016 Ebola out-break in West African countries that caused economic downturn and almost brought to halt economic activities in the affected areas. Many of the affected countries could hardly contain the outbreak due to inadequate health care services. The Ebola outbreak thus calls for improved health systems if African countries can register the required economic, social and political development (Mimbi & Bankole, 2015).

STATEMENT OF THE PROBLEM

Though the Kenyan government has been trying to build an effective health care system to meet the millennium development goals and vision 2030, quality health care has been below par. It is estimated that 60% of Kenyan populations live below poverty line, living on less than 1.25 dollars a day (Mohajan 2014). There was an increase of people living with HIV as well as mother-to-child transmissions between the years 2012 to 2015. The incidences of tuberculosis took an upward trend during the same period (Meru County, 2015). Meru county set up a committee to look into what ails the health sector and the findings were that there was poor remuneration of staffs and delayed salaries in public health sector due to delayed reimbursement of funds from central government, inadequate and late delivery of drugs from KEMSA and MEDS, inadequate health personnel both skilled and support staff (Meru County Government, 2014). Also, there are frequent health workers strikes, demonstrations and picketing that disrupt service delivery. The just concluded health workers strike (2016-2017) in the entire country (Meru sub-County included) which had paralyzed health services in public health facilities for 100 days has affected the health delivery services to a great extent. This is an indicator of poor performance of the health sector and service delivery is wanting. Banda (2006) discovered that public health institutions were facing challenges and competition from the private health

institutions. It has also been observed that the total government spending (per capital) in health has declined since 2012 (Meru county, 2015). This is according to county expenditure books 2014/2015.

Some patients have not been able to receive health services in Imenti North public hospitals due to malfunctioning and un-improved disease management technological facilities and staff level of incompetence and skills in the health service delivery technology. This prompts patient being referred to private hospitals for some procedures. Cases such as MRI are referred to private clinics though the machines are available in the referral hospital. There are no skilled personnel to operate and interpret the results. Biopsies are also sent to private hospitals for lack of equipment prompting long stay for patients while waiting for results. It also digs deep into the patients' finances. This delays the treatment and at times can result to loss of life. Despite government efforts of bringing quality medical services closer to the people through devolution, the level of public health service delivery is still wanting (meru sub-county is no exception). Githua (2006) noted that hospitals should have a specialized human resource unit which can coordinate all human resource practices. There is little information on influence of HIS on-service delivery in medical health in Imenti North sub-county hence prompting the researcher to undertake this project. According to Ahmad (2014), poor financial management skills, lack of transparency, ICT inefficiency despite high adoption mainly due to lack of skilled workers to use the machines well and finally, increase in under-qualified officers resulting to low efficiency in dealing with sicknesses, have led to poor service delivery in the health sector. The staff is also not well prepared for technological change judging by the usage of patients' paper files in Meru Teaching and Referral hospital. As such, it is clear that the problem that the Kenyan health sector mainly originates from within the medial institutions.

GENERAL OBJECTIVE

The purpose of this study was to investigate the influence of HIS on-service delivery in government health centers in Kenya: a case of Imenti north sub-county, Meru County.

SPECIFIC OBJECTIVES

1. To determine the influence of record keeping systems on service delivery in public medical health facilities in Imenti North sub-county.

2. To assess how disease management systems, influence service delivery in public medical health facilities in Imenti North sub-county.
3. To determine the influence of financial management systems on service delivery in public medical health facilities in Imenti North sub-county.
4. To examine the influence of human resource management systems on service delivery in public medical health facilities in Imenti North sub- county.

THEORETICAL FRAMEWORK

A theory is a set of statements or principles devised to explain a group of facts or phenomena, especially one that has been repeatedly tested or is widely accepted and can be used to make predictions about natural phenomena. This study is based on the technology acceptance model, change theory and the theory of professions.

Technology Acceptance Model

One of the famous models connected to technology approval and utilization is the technology acceptance model (TAM) which was proposed by Davis in 1986. TAM has demonstrated to be a theoretical model in enabling explanation and prediction of user conduct of information technology (Yoon, 2016). TAM is regarded as a significant expansion of theory of reasoned action (TRA). Ashraf, Narongsak (Tek) and Seigyoung (2014), proposed TAM to elucidate why a user agrees to or discards information technology by acclimatizing to TRA. TAM offers a foundation with which a person traces the way external variables affect the principle, thoughts, and objective to use. Two cognitive principles are posited by TAM. These are apparent usefulness and ease of use (Holden *et al,* 2016).

In accordance to TAM, individual's real utilization of a technology system is affected directly or in some way by the user's behavioral objectives, thoughts, apparent usefulness of the system, and apparent ease of the system. In addition, TAM suggests that external aspects influence objective and real use through mediated consequences on apparent usefulness and apparent ease of use (Mortenson & Vidgen, 2016). This study will assume this model to give details on the adoption of information technology in Kenya's health sector, therefore it gives a theoretical understanding on how ICT through record keeping, disease management, financial management and human resource management technologies can enhance service delivery in health sector.

A study done Japan found out that the respondents need expanded EMR capability to include decision support systems and that diffusion of EMR is influenced by attitudes of health care workers (Ochieng & Hosoi 2005). Therefore this theory is relevant to this study in helping understand adoption of disease management technology that is focused in this study.

Change Theory

This study was informed by the change theory of Kurt Lewin (Orr & Davenport, 2015). It is based around the process unfreeze, change and freeze, providing a higher level approach to the change process. With this theory, a manager or other change agents have a chance on a framework for implementing change effort however sensitive but seamless as possible. It follows three steps namely implementing a radical change; reduce disruption of operations structure and permanent adoption of change.

The change theory can be well adopted by a variety of change agents to ensure that the devolution of health services to the lowest levels is well executed, operational and function to the

greater good of the people. The changes will come with resistance due to the initial centralized system but with good understanding of the process of change, most administrators will be able to pass this through to their team members in terms of change in management, implementation of ICT, regular training and streamlining the procurement process (Leach *et al*, 2016).

Habits and routine naturally settled in where structures have been in place for a while. People in an organization may staff off course in as much as the organization may be headed in the right direction. Unfreezing is simply a means of getting people to understand a perspective on their daily activities, reject their undesirable habits, and be open to new ways of achieving the objectives. It sets the wheels of change in motion. With open minds, change can then start. The process is very dynamic and for effectiveness, it has to take time which involves a transition period. People take new tasks and responsibilities so as to gain efficiency, but has to be gradual and sometimes bring slowness to the organization before it can steady. In refreeze, making change permanent can then reach the full desired effect. The new organization become standard after the change has been cemented and all effort should be made to ensure that it succeeds (Orr & Davenport, 2015).

Lewin's force field analysis is a model that describes restructuring and making decision between driving and restraining forces and finally equilibrium where the forces match. The analysis investigates where power concentrates, decision makers, those for and against change and finally ways to influence dissenting voices. In an organization, driving forces are looking for opportunity to improve while resisting (restraining) forces are pro status-quo. The goal is to achieve equilibrium. This theory is relevant to this study as it will tend to understand the relationship between management and junior staff in terms of handling of disputes and conflict resolution and it will give guidelines on how best to introduce and manage the use of technological change in health institutions for quality health care.

This will also determine the factors at play that usually fail to reach a consensus leading to labor unrest in these hospitals and how they can best be understood. Finally, the theory will assist the researcher to best understand how implementation of change and consider challenges that the management may face in the processes (Leach, 2016). Therefore this theory is relevant to this study because it involves information technology system that brings change to the operation of the organization through financial management technologies that are addressed in this study.

Theory of Professions

A profession is a disciplined crowd of people who heed to increased moral principles and support of themselves to, and are acknowledged by the public as having particular understanding and abilities in an extensively accepted, organized body of learning. This body of learning is derived from a high level of training, and is equipped to exercise this understanding and these abilities in the interest of others. Part of this explanation is the concept that the duty for the wellbeing, health and security of the society shall take priority over other deliberations (Leach *et al*, 2016).

All through the 20th century, a practice of theory of professions has been built and applied in the social sciences, principally in sociology. This improvement should be understood in the case of the rising specialization in operational life in conjunction with the hastening of institutionalized proficiency in society (Chepkonga, 2015). Theory of professions concentrates on the relationships between professional groups, theoretical understanding and the probabilities for practitioners to completely use such understanding in their professional practice.

Until the 1970's theorists of experts held frequently a well-built interest in contrasting the characteristics of professional groups so as to differentiate professions from other professional groups (Lazarus *et al,* 2014). This trend has been illustrated as significant as it assumes a certain core in these professions. A number of the distinguishing characteristics are that proficient practice should be carried out with a basis in systematic theory, that the anticipated professional group is acknowledged as an authority in its domain, that community endorses the venture in question, that the practitioners operates according to moral system and that the professional body manages its own training agenda (Whyle & Olivier, 2016). The significant approach has been condemned, among other issues, for its view of community as rationalistic and liberated from quarrel, where professionals operate unselfishly without group interests, exclusively for the good of their customers and thus for the greatest interest of community (Holden *et al*, 2016).

In line with the theory, professionals have special understanding and expertise in an extensively renowned, organized body of education derived from a high level training (Yoon, 2016). Therefore this theory is relevant to this study because it involves doctors and other medical professionals giving a theoretical understanding and expertise connected to healthcare in terms of record keeping and human resource management technologies.

RESEARCH GAPS

Many studies have been done in relation to this study that include; Verbeke et al (2013) who dwelt on evaluating the impact of ICT-tools on health care delivery in sub-saharan hospitals, Bukachi and Pakenham-Walsh (2007) who studied on information technology for health in developing countries. Mimbi & Bankole in their study on ICT health systems performance in Africa: a Multi-Approach only focused on life expectancy and child mortality and therefore did not cover all aspects of health. Njau (2012) who established the challenges facing human resource management function at Kenyatta National Hospital. Muoki (2009) studied on the challenges of human resource planning at the ministry of public health and sanitation, Rajula (2016) explored the level of use of ICT in medical education in Kenyan public universities, Nyaggah (2015) did a study on factors influencing adoption of information and communications technology in public hospitals in Nairobi county, Kenya while Wasonga (2015) researched on Information and Communication Technologies and performance of electronic health projects in Kenya. Odiwuor *et al,* (2015) researched on utilization of ICT among health workers in Gatundu North- kiambu while Mugo &Nzuki (2014) did a research on determinants of electronic health in developing countries. Gatero (2010) researched on utilization of ICT's for accessing health

information by medical professions: a case of KNH. And Salte (2014) in her researched dwelt on ICT's and access to health care in Kenya.

Most of the reviewed studies in this chapter have been conducted in developed countries whose approach to ICT in health sector could be different from that of Kenya. Further, the studies have been conducted on other types of projects other than the public health sector. Again, most of the studies have focused generally on the factors affecting the service delivery on both the internal and external factors while this study narrows down to the ICT factors. Therefore there is scarce information regarding the influence of ICT in delivery of health services especially in Imenti north sub-county. This study therefore seeks to fill all these literature gaps by establishing the influence of ICT on service delivery in medical health facilities Imenti North sub-county, Meru County in Kenya.

RESEARCH METHODLOGY

Research Design

This research employed descriptive survey research design that describes the phenomena in its natural setting without interferences. Bryman and Bell (2011) assert that a descriptive survey design seeks to get information that describes existing phenomena by asking questions relating to individual perceptions and attitudes. It entails gathering information that describes happenings and then categorizes, tabulates, represents and describes the information. Since this research was to determine the influence of HIS on service delivery in government health centers in Kenya: a case of Imenti north sub-county, Meru County, descriptive research was then be the most excellent design to employ.

Target Population

Mugenda and Mugenda (2003) defined population as the whole group of people or items under reflection in any field of investigation and have a common element. In the year 2016, staff in the following categories; doctors, nurses, clinical officers, laboratory technologists and pharmacists in the entire sub-County of Imenti totaled to 445. The target population under the study was 445 staff working in the 25 outpatient public health institutions.

Sample Size and Sampling Procedures

A sample population of 206 was used in this study and it was calculated by using a target population of 445 medics with a 95% confidence level and an error of 0.05 using the below formula taken from Kothari (2004).

$$n = \frac{z^2.N.\partial_p^2}{(N-1)e^2 + z^2\partial_p^2}$$

Where: n = Size of the sample,

   N = Size of the population and given as 445,

   e = Acceptable error and given as 0.05,

   ∂p = The standard deviation of the population and given as 0.5 where not known,

   Z = Standard variance at a confidence level given as 1.96 at 95% confidence level.

Stratified proportionate random sampling method was applied to choose the respondents. In stratified random sampling subjects were selected in such a manner that the existing sub-groups in the populace are more or less represented in the sample. The method as well involved dividing the populace into a series of applicable strata, which means that the sample is expected to be more representatives (Saunders *et al,* 2009).

Methods of Data Collection

This research used primary data meaning that it's collected for the first time. Primary data as defined by Creswell (2005) is the data gathered for the first time whereas secondary data is the data which has previously been gathered and taken through statistical procedure. A questionnaire was employed to collect data from the hospital staff. The use of questionnaires was the generally applied approach when respondents are accessible and are ready to respond appropriately. Cooper and Schindler (2003) noted that the questionnaire design states the problem and the specific research objectives. In this study, the questionnaires consisted of open ended as well as closed ended questions. The open-ended questions allowed the respondents to communicate their thoughts and behavior in line with the research questions. The questionnaires were distributed by use of drop-and-pick later method to the hospital staff. This method was applied where the respondents are away or are not in a position to fill the questionnaire right away due to limitation of time.

Pilot Testing

Pilot testing refers to putting of the research questions into test to a different study population but with similar characteristics as the study population to be studied (Kumar, 2005). Pilot testing of the research instruments were conducted using staff from Tigania East Sub- County outpatient hospitals since it has a similar setting. According to Mugenda & Mugenda (2003) a pilot study comprises of 10% of the actual sample size. In this study therefore the respondents were 20. After one day, the same participants were requested to respond to the same questionnaires but without prior notification in order to ascertain any variation in responses of the first and the second test. This is very important in the research process because it assists in identification and correction of vague questions and unclear instructions.

Validity and Reliability of Research Instruments

According to Golafshani (2012), validity is the accuracy and meaningfulness of inferences, based on the research results. The study used content validity which draws an inference from test scores to a large domain of items similar to those on the test. Content validity is concerned with sample-population representativeness. Gillham (2011) stated that the knowledge and skills covered by the test items should be representative to the larger domain of knowledge and skills. Expert opinion was requested from the supervisors from the university to comment on the representativeness and suitability of questions and gave suggestions of corrections to be made to the structure of the research tools. Reliability is concerned with the question of whether the results of a study are repeatable. The questionnaires were administered to a pilot group of 20 randomly selected respondents from the sample population and their responses used to check the reliability of the tool. This comprised 10% of the sample size. A construct composite reliability co-efficient (Cronbach alpha) of 0.7 or above, for all the constructs, is considered to be adequate for this study (Rousson, Gasser and Seifer, 2012). Table 1 shows the reliability of measurement scales.

Table 1: Reliability of Measurement Scales

	Cronbach's Alpha	Decision
Record keeping technology	.808	Reliable
Disease management technology	.792	Reliable
Financial management technology	.852	Reliable
Human Resource management technology	.892	Reliable

The results showed that the Cronbach Alpha associated with the variables of the study were above the 0.70 threshold as recommended by Leach (2016). The results of the reliability analysis are presented in the table 1.

Data Analysis Techniques

Data was analyzed using Statistical Package for Social Sciences (SPSS Version 22.0). All the questionnaires received were referenced and items in the questionnaire were coded to facilitate data entry. After data cleaning, which entailed checking for errors in entry, descriptive statistics such as frequencies, percentages, mean score and standard deviation were estimated for all the quantitative variables and information presented inform of frequency tables. The qualitative data from the open-ended questions was analyzed using conceptual content analysis and presented in a prose form. Inferential data analysis was done using multiple regression analysis. Multiple regression analysis was used to establish the relationship between the independent and dependent variables. Since there were four independent variables in this study the multiple regression model generally assumed the following equation;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where:

Y= Influence of ICT on health service delivery; β_0=constant β_1, β_2, β_3 and β_4 = regression coefficients; X_1= Record keeping technology, X_2= Disease management technology; X_3= Financial management technology, X_4= Human Resource management technology; ε=Error Term

RESEARCH FINDINGS

Multiple Regression Analysis

Multiple regression analysis was conducted so as to test relationship among variables (independent) on influence of health information system (HIS) on service delivery in public health facilities in Kenya. The researcher applied the statistical package for social sciences (SPSS V 22.0) to code, enter and compute the measurements of the multiple regressions for the study.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.834	0.696	0.687	0.958

The adjusted R^2 was found to be 0.687 inferring that variations on influence of health information system (HIS) on service delivery in public health facilities which are explained by record keeping, disease management, financial management and human resource management systems were 68.7%.

Table 3: ANOVA results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	302.34	4	75.585	80.665	1.79E-35
	Residual	132.12	141	0.937		
	Total	434.46	145			

In predicting the effects of record keeping, disease management, financial management and human resource management systems on health service delivery, the regression model test was found to be significant since p-value was less than 0.005 and the calculated F (80.665) was larger than the critical value of F=2.345.

Table 4: Regression Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.904	0.223		4.054	0.000
Record keeping technology	0.864	0.302	0.606	2.861	0.006
Disease management technology	0.594	0.116	0.445	5.121	0.000
Financial management technology	0.716	0.217	0.543	3.300	0.002
Human Resource management technology	0.654	0.236	0.531	2.771	0.008

The established model for the study was:

$$Y = 0.904 + 0.864X_1 + 0.594X_2 + 0.716X_3 + 0.654X_4$$

The results reveal that influence of HIS on-health service delivery will be 0.904 if all other factors are held constant. The study results also show that an increase in record keeping technology will lead to a 0.864 increase the influence of HIS on the health service delivery if all other factors are held constant. Again as shown by r=0.594, the study reveals that increase in disease management technology would lead to an increase in the influence of HIS on health service delivery if all other factors are held constant. Further the study showed that if there was a unit change in financial management technology, a 0.716 increase in the influence of HIS on the health service delivery would be realized if all other factors are held constant. Also a unit change in human resource management technology would lead to 0.654 increases in the influence of HIS on health service delivery if other factors were constant. Finally the study showed that all variables were significant since p-values were less than 0.005 with record keeping technology having the greatest effect and disease management technology having the least effect on influence of HIS on health service delivery.

DISCUSSION

Record Keeping Systems and Service Delivery

This study found that there is a great influence brought about by record keeping systems on health service delivery in Imenti North sub-county. This conforms to Akinboade, Kinfack and Mokwena (2012) who said that the purpose of health record management is to ensure quality, accuracy, accessibility, authenticity and security of information in both paper and electronic systems. Website and electronic mails and budgetary allocation were found to have influenced health service delivery greatly. These are in line with Chodzaza and Gombachika (2013) who report that many hospitals are incorporating ICT into health record management due to the high level of the shortcomings of manual health records management, such as misfiling of patients health records, enormous amounts of space, legibility of clinicians' handwriting, transfer of medical records or files from one department to another which requires involvement of more personnel. Performance evaluation was also indicated to moderately influence health service delivery. This correlates with Saxena and Sharma (2012) who argue that EHRs should be construed as comprising of retrospective, concurrent as well as prospective information which has the primary objective of supporting continuous, efficient and quality integrated healthcare delivery.

Disease Management Systems and Service Delivery

Under this, the study revealed that disease management systems greatly influence positively on health service delivery. On the same note, clinical outcomes and health care utilization were found to greatly influence health service delivery in Imenti North sub-county. These concur with Ortiz and Clanzy (2003) who claim that though HIS has a potential to improve the quality of

health care, the evidence that it improves health related outcomes is limited. Also quality of life was revealed to greatly influence positively health service delivery in Imenti North sub-county. This was similar to Yagos et al (2017) who found out that ICT can help monitor surgical operations, accessing knowledge of disease management and managing medical records among others. Economic outcomes were indicated to influence health service delivery in Imenti North sub-county moderately. This corresponds to Ogalo (2012) who argue that in absence of computerized HMIS, health sector hospitals face various problems such as problems in detection and control of emerging and endemic health problems, monitoring progress towards health goals, empowering the hospitals with timely and understandable health related information, and driving improvements in quality of services.

Financial Management Systems and Service Delivery

Concerning financial management systems, the study found that they greatly influence health service delivery in Imenti North sub-county. This contributed by electronic health records systems and payment application systems great influence on health service delivery in Imenti North sub-county. These were similar to Remlex (2007) who also agreed that using ICT in health sector largely reduces the cost of running hospitals. Mobile banking application moderate influence on health service delivery in Imenti North sub-county also contributed to the influence of financial management systems. This was in line with Singh *et al*, (2010) who say that the emergence of electronic health, which is ICT supported health provision, has reduced the cost of healthcare thereby increasing efficiency by data management and transfer, disease management and quality transfer of knowledge.

Human Resource Management Systems and Service Delivery

Human resource management systems factors were found to greatly influence health service delivery. This influence was as a result of compensation and benefits administration, training and development and performance management great influence on health service delivery. These correspond to Chodzaza and Gombachika (2013) who said that in addition to imparting requisite skills by training to all levels of employees, management also aims at changing the behavioral patterns of the employees in a direction which is in line to achieve the organizational effectiveness, sustainability and growth.

Again, employment equity and electronic recruitment greatly influence on health service delivery as well as pension administration low influence on health service delivery made a contribution to the influence. They all influence service delivery positively. This concurs with Juma *et al.* (2015) who argue that public and private healthcare organization therefore need to revamp their entire organizational strategy in view of the above, in respect of procuring, retaining, developing and grooming their human resources in a manner that they are not only useful and valuable but most important human assets for the present, and vital with uniqueness for the future.

CONCLUSIONS

This study concluded that there was a great and positive influence brought about by record keeping systems on health service delivery in Imenti North sub-county. In this case, the study deduced that website and electronic mails and budgetary allocation have influenced health service delivery greatly. Performance evaluation was also indicated to moderately influence health service delivery. The study also concluded that disease management systems greatly and positively influence health service delivery. On the same note, the study deduced that clinical outcomes and health care utilization greatly influence health service delivery in Imenti North sub-county. Also it was deduced that economic outcomes had a moderate influence on health service delivery in Imenti North sub-county. Concerning financial management systems, the study concluded that they greatly and significantly influence health service delivery in Imenti North sub-county. The study deduced that electronic health records systems and payment application systems greatly influence health service delivery in Imenti North sub-county.

Human resource management system factors were concluded to greatly and positively influence health service delivery. This influence was deduced to be as a result of compensation and benefits Administration, training and development and performance management great influence on health service delivery. Again it was deduced that pension administration low influence on health service delivery made a contribution to the influence. Service delivery can be made efficient, timely, affordable as well as acceptable if there is full adoption of technology in the operations within the health care system. This can be realized if there is a holistic approach to these operations.

RECOMMENDATIONS

The study recommends that patients' records should be made available to health workers to aid in timely interventions to improve service delivery while safeguarding privacy. The county government should ensure that all the people handling records at the health units should be trained and motivated. The staff registrars should also be trained to know importance of HIS. Community leaders should be aware of the situation because they are "our eyes in the community". They should be mobilized to appreciate and utilize the system.

The study recommends that healthcare providers should be given access to continuous and regular healthcare training to cope with new technological advances in disease management. Programs should be put in place where patients are trained in self health care in collaboration with health providers to increase easy accessibility in order to improve service delivery.

The study also recommends that the central government should increase budgetary allocations to the respective counties to cater for maintenance and expansion of all aspects of health care. To maximize profits and avoid payment defaults the government should strengthen and emphasize the use of technology in their financial operations.

The study further recommends that the health sector should address issues pertaining to recruitment, employment equities and motivation among others to their employees to increase job performance and reduce employee turnover. The health management should ensure that there is interconnection of various databases for easy overall forecasting by program heads and decision making. This will make HIS to access online users in an authenticated manner (read only) hence allowing monitoring and evaluation for program data and commodity tracking.

REFERENCES

Ahmad, T. (2014). Improving Public Service Delivery Through Better Information Management. *Review Of Information & Communications Technology & Development In The Arab Region*, (20), 26-22.

Ajayi, O., Tokon, W. (2009). The advantage Project: Utilizing SMS to support evidence based medicine for health practitioners in complex settings. Baltimore, John Hopkins University.

Akinboade, A., Kinfack, C., Mokwena, P. (2012). An analysis of citizen satisfaction with public service delivery in the Sedibeng district municipality of South Africa. *International Journal of Social Economics*, 39(3), 182-199.

Ashraf, R., Narongsak, T., Seigyoung, A. (2014). The Application of the Technology Acceptance Model Under Different Cultural Contexts: The Case of Online Shopping Adoption. *Journal Of International Marketing*, 22(3), 68-93.

Banda, S. (2010). Health information on the Internet: accessibility, quality, and readability in English and Spanish. *Journal of the American Medical Association,* 285(20), 2612-2621.

Bryman, N. & Bell, T. (2011). *Survey research methods* (2nd ed.). Belmont: Wodsworth

Bukachi, M. (2015). Utilization of Information Communication Technology (ICT) Among Health Care Providers in Gatundu North District of Kiambu County, Kenya. *International Journal of Applied Research,*1(11): 1025-1029

Chepkonga, S. (2015). An Investigation of the Relationship of ICT Training of Principals in ICT Integration in Management Public Secondary Schools: A Case of Nairobi County, Kenya. *Journal of Education And Practice*, 6(18), 194-200.

Chodzaza, E., Gombachika, S. (2013). Service quality, customer satisfaction and loyalty among industrial customers of a public electricity utility in Malawi, *International Journal of Energy Sector Management*, 7(2), 269 - 282.

Cooper, D., Schindler, S. (2003). *Business research methods* (8th ed). New Delhi: Tata McGraw-Hill Publishing Company.

Cordella, A., Tempini, N. (2015). E-government and organizational change: Reappraising the role of ICT and bureaucracy in public service delivery. *Government Information Quarterly*, 32(3), 279-286.

Creswell, W. (2005). *Research design: Qualitative and quantitative approaches*. Thousand Oaks: CA Sage.

Fico, G., Fioravanti, A., Arredondo, T., Gorman, J., Diazzi, C., Arcuri, G. & Pirini, G. (2016). Integration of Personalized Healthcare Pathways in an ICT Platform for Diabetes Managements: A Small-Scale Exploratory Study. *IEEE Journal Of Biomedical And Health Informatics*, 20(1), 29-38.

Gatero, G. (2010). Utilization of ICT's for Accessing Health Information by Medical Professions: A case Study of Kenyatta National Hospital. *Journal of Health Informatics in Developing Countries,* 42(6), 687-693.

Gillham, B. (2011). *Developing a questionnaire*. A&C Black.

Githua, B. N. (2006). Secondary School Students 'Perceptions of Mathematics Formative Evaluation and the Perceptions 'Relationship to Their Motivation to Learn the Subject by Gender in Nairobi and Rift Valley Provinces. Asian Journal of Social Sciences & Humanities (1), 174-183.

Golafshani, N. (2012). Understanding reliability and validity in qualitative research. The qualitative report, 8(4), 597-606.

Gosford, L. (2011). The World Bank's ICT Innovations For Accountability And Service Delivery. *International Trade Forum*, 1, 32-33.

Holden, J., Asan, O., Wozniak, M., Flynn, E., Scanlon, C. (2016). Nurses' perceptions, acceptance, and use of a novel in-room pediatric ICU technology: testing an expanded technology acceptance model. *BMC Medical Informatics & Decision Making*, 16, 1-10

Housego, A., O'Brien, T. (2012). Delivery of Public Services by Non-Government Organisations1 Delivery of Public Services by Non-Government Organizations. *Australian Journal Of Public Administration*, 71(2), 211-220.

Juma, C., Sundsmo, A., Maket, B., Powell, R., Aluoch, G. (2015). Using information communication technologies to increase the institutional capacity of local health organisations in Africa: a case study of the Kenya Civil Society Portal for Health. *The Pan African Medical Journal*, 21(1), 23-61.

Kothari, R. (2004). *Research methodology: Methods and techniques.* New Delhi: New Age International (P) Limited Publishers.

Kumar, S. (2005). Research methodology (pp. 43-50). Springer US.

Lazarus, V., Safreed-Harmon, K., Nicholson, J., Jaffar, S. (2014). Health service delivery models for the provision of antiretroviral therapy in sub-Saharan Africa: a systematic review. *Tropical Medicine & International Health*, 19(10), 1198-1215.

Leach, V., Tonkin, E., Lancastle, D., Kirk, M. (2016). A strategy for implementing genomics into nursing practice informed by three behaviour change theories. *International Journal Of Nursing Practice*, 22(3), 307-315.

Meru County (2015). *Health at a Glance.* Retrieved from https://www.healthpolicyproject.com/pubs/291/Meru%20County-FINAL.pdf

Mimbi, L., Bankole, F. (2015). *ICT and health performance in Africa: a multi-method approach.* 26th Australian conference on information systems; Adelaide, Australia.

Mohajan H (2014). Improvement of Health Sector in Kenya. *American Journal of Public Research* 2.4(2014): 159-169

Mortenson, J., Vidgen, R. (2016). A computational literature review of the technology acceptance model. *International Journal Of Information Management*, 36, 1248-1259.

Mugenda, M., Mugenda, G. (2003). *Research methods: Quantitative and qualitative approaches*. Nairobi: Acts Press.

Mugo, D., Nzuki, D. (2014). Determinants of Electronic Health in Developing Countries. *International journal of arts and commerce* 3(3), 61-84.

Muoki, A. (2009). E-Governance and Public Service Delivery at the Grassroots: A Study of ICT Use in Health and Nutrition Programs in India. *Information Technology For Development*, 22(2), 306-319.

Njuru, W. (2011). Implications of E-Government on Public Policy and Challenges of Adopting Technology: The case of Kenya. *Journal of Global Affairs and Public Policy*. 1(1), 276-311.

Nyaggah, U. (2015). Correlates of and barriers to the utilization of health services for delivery in South Asia and Sub-Saharan Africa. *Thescientificworldjournal*, 21,423-403.

O'Brien, A. (2012). Young people's perceptions of youth-oriented health services in urban Soweto, South Africa: a qualitative investigation. *BMC Health Services Research*, 14(1), 195-207.

Ochieng, D. & Hosoi, M. (2005). P*ublic Health Sector Efficiency in Kenya: Estimation and Policy Implications.* Nairobi: Institute of Policy Analysis and Research.

Odiwuor, G. (2015). The role of knowledge management in enhancing government service-delivery in Kenya. *South African Journal Of Libraries & Information Science*, 75(1), 28-39.

Ogalo F. (2012). Public-Service Ethics and Accountability for Effective Service Delivery in Nigeria. *Africa Today*, 60(3), 119-139.

Orr, P., Davenport, D. (2015). Embracing change. *The Nursing Clinics Of North America*, 50(1), 1-18.

Ortiz F. (2016). An Examination of the Influence of ICT on Patient Co-Creation in Healthcare Service Delivery at the Micro Level. *AMA Winter Educators' Conference Proceedings*, 27, 45-46.

Radnor, Z., Osborne, P., Kinder, T., Mutton, J. (2014). Operationalizing Co-Production in Public Services Delivery: The contribution of service blueprinting. P*ublic Management Review*, 16(3), 402-423.

Remlex, D. (2007). Information and communication technology in chronic disease care. Medical Care Research and Review, 64(2), 123-147.

Rousson, V., Gasser, T., & Seifert, B. (2012). Assessing intrarater, interrater and test–retest reliability of continuous measurements. *Statistics in medicine*, 21(22), 3431-3446.

Salte T (2014). *ICT's and access to Health Care in Kenya*. Retrieved from https://www.duo.uio.no/bitstream/handle/10852/39794/SALTE_MT_2014final.pdf?sequence=7

Saunders, M. N. (2011). *Research methods for business students, 5/e*. Pearson Education India.

Saxena, A., Sharma, A. (2012). Challenges in converting to ICT-Based Public Service Delivery System from Manual Service Delivery System in Bilaspur city, India. *Journal Of E-Governance*, 35(2), 91-95.

Singh, G., Pathak, D., Naz, R., Belwal, R. (2010). E-governance for improved public sector service delivery in India, Ethiopia and Fiji. *International Journal Of Public Sector Management*, 23(3), 254-275.

Sinha , R. (2010). Impact of Health Information Technology in Public Health. Sri Lanka Journal of Bio-medical informatics 2010:1(4).

Verbeke, F., Karara, G., Nyssen, M. (2013). Evaluating the impact of ICT-tools on health care delivery in sub-Saharan hospitals. *Studies In Health Technology And Informatics*, 192 520-523.

Wasonga, T. A. (2015). Multicultural education knowledgebase, attitudes and preparedness for diversity. *International Journal of Educational Management*, *19*(1), 67-74.

WHO (2014). *The health of the people: what works: the African Regional Health Report 2014*. World Health Organization.

Whyle, B., Olivier, J. (2016). Models of public-private engagement for health services delivery and financing in Southern Africa: a systematic review. *Health Policy & Planning*, 31(10), 1515-1529.

Yagos, W., Olok, G., Ovuga, E. (2017). *Use of Information and Communication Technology and retention of health workers in Rural Post-war Conflict Northern Uganda*: Findings from a Qualitative Study. BMC Medical Informatics and Decision Making. Pdf

Yoon, H. (2016). User Acceptance of Mobile Library Applications in Academic Libraries: An Application of the Technology Acceptance Model. *Journal Of Academic Librarianship*, 42(6), 687-693.