

# Level of Information and Communication Technology Adoption in Health Facilities in Nairobi City County, Kenya

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## ABSTRACT

**Background:** Information and Communication Technology [ICT] has enormous potential of improving and transforming efficiency and effectiveness of health care systems. However there are limited studies on ICT adoption, use and integration in health care in Kenya.

**Objective:** To establish the level of ICT adoption, use and integration in health service delivery among Health facilities in Nairobi County.

**Methods:** A cross sectional descriptive study design incorporating quantitative data collection methods was used. Stratified sampling was used to randomly sample a total of 270 health facilities for the study based on levels of care using Kenya Master Facility list as the sampling frame. Managers working in IT and health records departments in the selected facilities were interviewed using self-administered questionnaires. Descriptive statistics were used to analyze data using SPSS version 22.

**Results:** Out of the 17 ICT application aspects of health service delivery studied, none of the facilities studied had achieved 100% computerization. Only 27 of the facilities had computerized at least one of the assessed service delivery aspects. Most hospitals did not have technological sophistication attributes in place. Satellite clinic connection/linkage was the main IT sophistication attributes found in 14% of the facilities. With regards to integration, 26% had integrated at least one of the four IT functionality assessed.

**Conclusion:** Kenya remains at infancy stage of ICT adoption, use and integration. No single health facility [public and private] has achieved optimal ICT functional use and sophistication. Technology and related leadership advocacy in health sector is essential for optimal technology application in the health sector.

## INTRODUCTION

Information and communication technologies (ICTs) refer to a wide range of digital technologies used to facilitate the information capture, synthesis, storage, retrieval and exchange of information. Over the years, ICTs have reduced health care costs, as well as significantly improved safety, quality and efficiency of health care (Bates et al., 2001). The reduction of medical errors and improvement of compliance certain formulas for managing care also can be realized using electronic prescribing. Until the recent past, ICTs used by healthcare providers were only available for established care givers and large health institutions. However, more recent advances in technology enable primary healthcare givers in smaller practices to make use of ICTs that were initially quite costly (McInnes, Saltman, & Kidd, 2006). Clinical Information Systems (CIS) among other Health Information Systems (HIS) types continue to grow in terms of strategic investment in many European Nations. In such countries, implementation projects, research

initiatives and e-Health strategies have been initiated. Other non-European states have ICT-enabled solutions at various levels of healthcare delivery (Kitsiou, Manthou, Vlachopoulou, & Markos, 2010).

In Africa, despite the increasing growth in availability and quality of ICTs, there is still no systematic way of tapping onto the potential of the technologies at hand. A number of ICT projects in Africa are ongoing and are aimed at effectively improving the quality of care using the technologies. However, most of those projects are pilots and therefore, there are no complete and comprehensive outlines of the usage of ICTs in Sub-Saharan Africa's health sectors for service delivery. Odiwuor et al. (2012) suggest that many of Africa's health systems are not e-ready and as such, decisions on the investment on implementation of ICT systems are a dilemma. Given that most decisions relating to healthcare management are often related to primary health care priorities, safe water supply and vaccination, eHealth is often overlooked.

According to Gagnon et al. (2012), more and more primary healthcare professionals have access to ICT without much cost incurred on hardware (HW) or software (SW) purchase and maintenance. The increasing creation and availability of the technologies for use in healthcare have led to formulation of policies in a number of countries all over the world, in a bid to ensure adoption of those technologies. Gagnon et al. (2012) identified a number of functionalities that ICTs have brought into the fold in recent years such as e-mail alerts, scheduled appointments, physician decision support, as well as monitoring of patient adherence to treatment. Telemedicine has ensured that geographical boundaries are no longer a hindrance when it comes to access to healthcare. Whilst this development has been realized and explored in some parts of the world, De Rosis & Seghieri (2015) suggest that a larger number of countries remain in the first stages of technological innovation in patient care. The authors describe first stage as relating to the development and computerization of the information systems and the transition from paper-based to electronic information processing (De Rosis & Seghieri 2015).

In Kenya, most hospitals have yet to fully computerize their operations within those facilities (Odiwuor et al., 2012). The Health System in Kenya currently struggles to cope with the ever-increasing demands for quality healthcare coupled with a rising cost of service delivery and the insufficient number of skilled healthcare personnel. Based on the premise that the health sector envisions provision of secure, efficient and equitable healthcare services by ICT, there is still a long way to go for the local health system. As such, it is necessary to establish mechanisms for bridging the gap between the vision and the reality with regards to fully integrating ICT in healthcare service delivery (GOK, MOH, 2011).

Juma et al. (2012), reported that despite the availability of several policies, guidelines and standards for ICT utilization in the healthcare sector, Kenya still lags behind many nations, especially when compared with countries which have established health sectors. According to Karuri, Waiganjo, Orwa & Many (2014), a number of policies had been released to guide ICT adoption in Kenya's health sector such as Kenya ICT policy (2006), Kenya Communications Act (2009), Strategic Plan for Health Information Systems (HIS) (2009 – 2014), and Standards and Guidelines for Electronic Medical Records (EMR) in Kenya (2010). Despite these developments, there seems to be low adoption of ICTs in the local health sector – majority of which are at their infancy (Juma et al., 2012). For much of the history of Kenya's health facilities, ICTs were neither available nor affordable. More and more, both of these issues are resolved, although not all departments have been computerized in those facilities so far.

According to Gagnon et al. (2012), despite developments in the ICTs in Africa, there is not yet a realization of systematic benefits from the same. World Bank (2013) appreciated the on-going developments in ICTs as far as implementation into the health care systems is concerned. However, the authors also noted that most of those ongoing projects are only but pilots. The World Health

Organization describes the health sector in most nations in Africa as lacking e-readiness, which is a quality that determines the amount of investment by the global health governing bodies. Odiwuor et al. (2012) also cited that when it comes to resource allocation, as a result of the perceived lack of e-readiness, e-Health loses out to other primary healthcare concerns such as safe water, vaccination as well as environmental hazards prevention (Shiferaw & Zolfo, 2012).

It is on this premise that, this study was designed to determine the level of information and communication technology adoption and integration in health facilities in Nairobi County, Kenya. Therefore, the findings can be used as a basis for seeking skills geared towards the adoption and utilization of information systems in different facilities. To the policy makers within the ministry of health, the successful completion of this study will set a ground for coming up with appropriate policies for the development of information system projects that support information sharing, effective diagnosis and thus improving service delivery in the health sector.

## METHODS

A descriptive cross sectional study design was used. The study was carried out in Nairobi City County which is one of the forty seven Counties in Kenya. It is the Capital city of Kenya located at 1° 17' S 36° 49' E. The County had a population of 3,138,295 according to the 2009 census. A sample size of 270 Information Technology managers was used to represent the 913 Health Facilities in the study area.

The research adopted interview schedules for personal contact to permit clarification of questions. Structured questionnaire was developed in respect to the objectives of the study. Open-ended and closed ended questions were used to provide quantitative data. The quantitative data provided data for provision of inferences and test hypotheses. The data collected was entered, cleaned and analyzed using SPSS version 22. Descriptive statistics involving measures of central tendencies and measures of dispersion was used to summarize the data. The summaries led to the establishment of the overall and specific level of adoption of ICTs. Inferential statistics chi-square was used to establish the factors that influence the adoption of ICTs.

## FINDINGS

### Socio-Demographic characteristics

A total of 270 respondents (n=270) participated in the study. Female respondents comprised 58% of the respondents. More than half, (58%) of the respondents were female. Diploma holders constituted 62% of the respondents. Majority of the respondents [59%] had over 5 years of experience.

**Table 4.1: Socio-demographic Characteristics of the Respondents**

Variables	Value labels	Frequency [n=220]	Percentage
Gender	Male	91	42%
	Female	129	58%
Education Level	Certificate	28	13%
	Diploma	138	62%

	Undergraduate	50	23%
	Postgraduate	4	2%
Experience (in years)	0-5 years	91	41%
	6-10 years	83	38%
	>10years	46	421%

**Level of Computerization [ICT Adoption]**

Only 27% [59] of the facilities had computerized at least one of the assessed service delivery aspects. None of the facilities studied had computerized all the 17 service delivery aspects. The main service delivery aspects computerized were case costing (46%), vital signs recording (38%) and facility inpatient discharges (38%) as shown in Figure 1. In all the facilities accessed there was no computerization of the patient transfer.

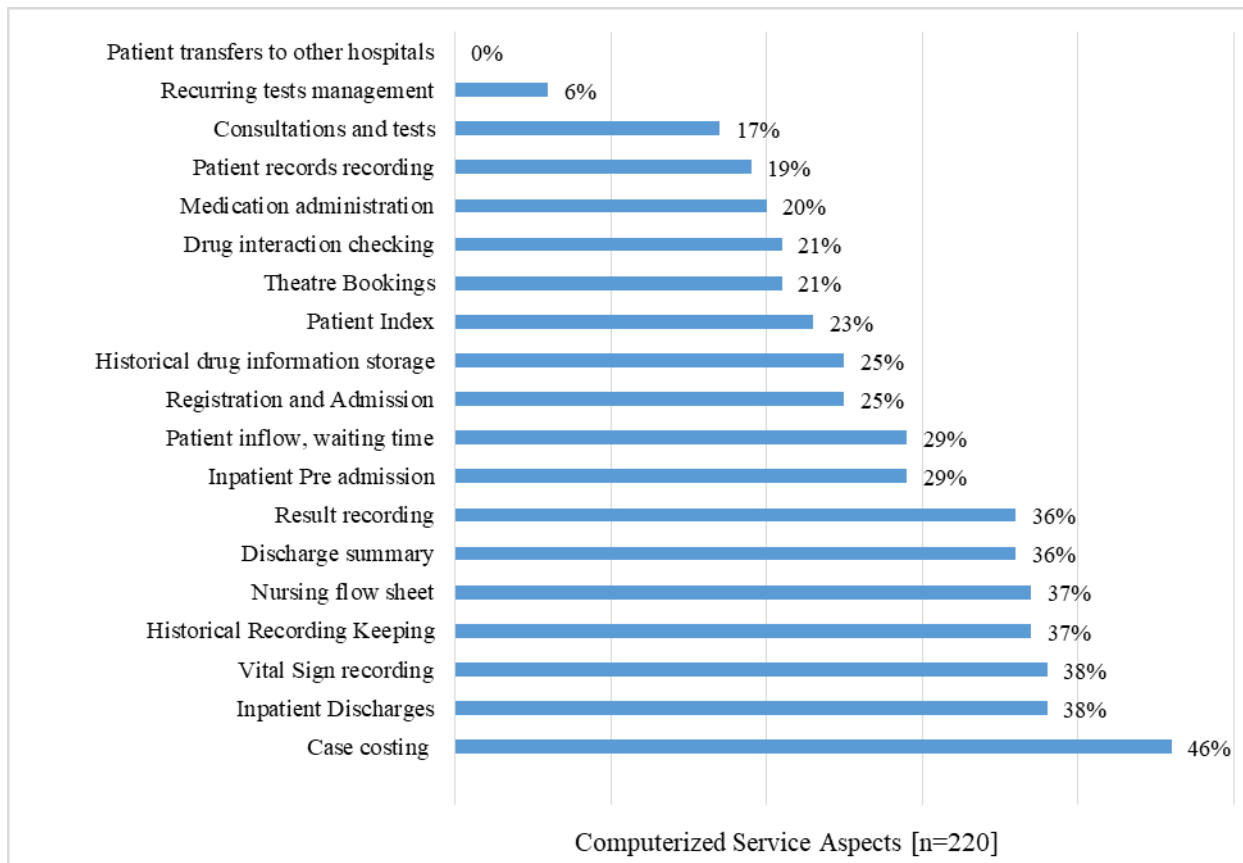


Figure 1

Computerization of the Health Service Delivery Aspects

**Use of technology in service delivery**

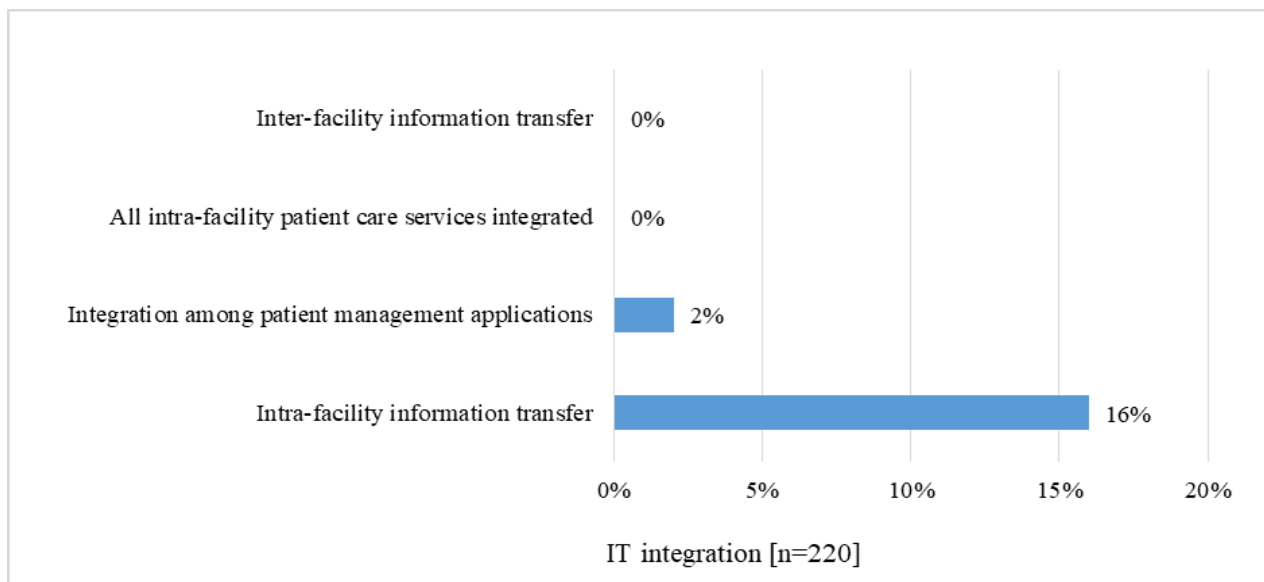
Most hospitals did not have their technological sophistication attributes in place. Technology was mainly adopted in Satellite clinic connection. Only 14% of the facilities had adopted technology for satellite clinic connection/inter-linkage. Telemedicine for evaluation of patients [1%], expert systems support for medical notes and history dictation [2%] and telemedicine for diagnostics were the least areas where technology was used as shown in Table 2.

**Table 2 Attributes Assessed for Technological sophistication [N=220]**

Technological Sophistication	Not available	Barely used	Used
Voice Recognition systems	179 (81%)	24 (11 %)	17 (8%)
Satellite clinic connections	168 (76%)	11 (5%)	41 (19%)
Notes Dictation system	207 (94%)	9 (4%)	4 (2%)
Telemedicine for evaluation of patients	214 (97%)	4 (2%)	2(1%)
Telemedicine for diagnostics	202 (92%)	9 (4%)	9 (4%)
Patient triaging and pre-admission	207 (94%)	2 (1%)	11 (5%)
Expert systems through medical history	208 (94%)	4 (2%)	8 (6%)
Bar coding to track specimen	187 (85%)	11(5%)	22 (10%)
Electronic requisitions for medication	189 (86%)	11 (5%)	20 (9%)

**Information system integration**

With regards to integration, 26% had integrated at least one of the four IT functionality assessed. Intra-facility information transfer functionality was integrated in 16% of the facilities. None of the facilities had integrated intra-facility patient care services integration and Inter-facility information transfer as shown in Figure 2.



**Figure 2 Integration of information systems in health service delivery**

**DISCUSSIONS**

This study characterized ICT adoption, use and integration for health care service delivery among hospitals in Nairobi County. Among all ICT functionalities assessed, none of the hospitals had achieved optimal computerization and integration of ICT in service delivery. The study affirms the infant stage in ICT adoption in Kenyan facilities. Juma et al. (2012) acknowledged this finding in his study. He noted that despite new developments and emphasis on technology including in policies, there is low adoption of ICTs in the local health sector; majority of which are in their initial stages. Consequently, most hospitals did not have technological sophistication attributes in place. The level of ICT sophistication has been shown to have significant effect on the speed of ICT adoption. This is in line with the study by Desalvo (2014) which found evolution in the health IT to determine the speed of ICT adoption. The higher the integration of advanced technology in service delivery like use of telemedicine and medical diagnostics, the more the level of ICT adoption.

The study affirms the limited level of ICT integration in the health sector in Kenya and by extension, other low and medium income countries [LMICs]. Intra-facility information transfer was the main integrated ICT functionality in few of the sampled hospitals. The limited integration level reflects the low rate of ICT adoption and integration in most of the LMICs. This has been associated with limited leadership and resource support for ICT adoption and use in the health sector, especially in public health facilities (Boone & White (2015). These observations are consistent with De Rosis & Seghieri (2015) report that for most parts of the world, ICT adoption has been realized although it remains at the first stages of technological innovation in patient care. Based on the study findings, Kenya lies among the many nations whose level of ICT adoption is still at infancy. Michelsen et al. (2015), in their study of the effect of various technologies indicated that not one single technology suffices for all functions. As such, the use of more than one technology in place and the provision of creative and innovative ways for interaction between the various components of the information system is essential for optimal technology use and optimal performance of the health sector. Boone & White (2015) argued that ICT adoption and integration is inevitable, even in LMICs with limited resources, given that each new system will need to connect with the other systems. The authors also predict increase in interoperable systems which will require higher technical ability to manage the ICT sophistication and complexity.

## **CONCLUSIONS**

Kenya remains at infancy stage of ICT adoption, use and integration. No single health facility [public and private] has achieved optimal ICT functional use and sophistication. Technology and related leadership advocacy in health sector is essential for optimal technology application in the health sector.

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## **COMPETING INTEREST**

Authors confirm no known competing interest in this study.

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