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eHealth Benefits Realization at Public Health Facilities in Kenya: A User's Perspective

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Abstract: The emergence of ehealth systems has shown that there is potential for the improvement of quality of healthcare service delivery. Health facilities use Health Information Systems (HIS) to make their workflow more efficient as compared to the traditional manual operations. Ehealth systems encompasses all HIS tools and applications that are meant to improve user's experiences with the service. HIS tools are meant to enhance / improve collaboration amongst healthcare practitioners, facilities administration, commodities management, patient record keeping and hence quick evidence based decision-making. This paper investigated user's perspectives of ehealth in terms of service delivery. It provides the quantitative and qualitative methodology, which comprised of a random sample of key stakeholders and the use of questionnaire and interviews. The study found that there is a positive user perception on the potential benefits of ehealth systems based on user experiences and expectations.

Keywords: Ehealth, Health Information Systems, Healthcare Quality, Patient Centered.

I. INTRODUCTION

The use of Information Technology and Communication (ICT) to support healthcare services is known as ehealth: i.e. leveraging ICT and digital technologies into healthcare service delivery. Ehealth encompasses digital health telemedicine, mHealth, tele-care, tele-health and health information systems; more often different people use these terms interchangeably.

Through the use of ehealth, a number of benefits are envisaged for patients and the caregivers. Notably, with improved access to data processing through information technology, patients are able to make effective decisions about their health and lifestyles, which impacts on wellness. Further, with information designed around the patient, i.e. patient centered, healthcare providers can therefore have access to a wider patient base that they may offer focused attention, thereby increasing the benefits to the patients. The benefits realization process starts with access to information and sharing of knowledge as shown fig.1.

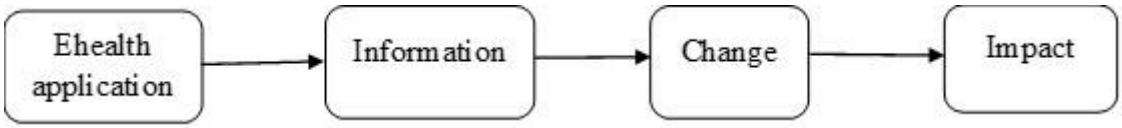

Fig 1: Benefit realization process: Source: [1]

The use of ehealth applications through information sharing has the potential to redefine clinical processes, work practices and workflow in healthcare and support service delivery. The information exchanges amongst care providers further has the potential to speed up or slow down the execution of similar procedures, depending on uptake of HIS or lack of HIS uptake. For example, the use of HIS will make the process faster; On the other hand, when HIS is not available requiring that information is retrieved from manual files, the process of decision-making becomes slower or is retarded. This in turn affects the caregiver's experiences with an eventual impact on timeliness, safety, access, efficiency and effectiveness as captured by [2].

While World Health Organization (WHO) has identified the use of ICT as an enabler, for achieving UHC globally, and various authors agreeing to the fact that ehealth has many benefits, there is however, little of these are reaching the intended beneficiaries [3]. In the Kenyan context, the national ehealth policy 2016-2030 [4], on priority one section six on health informatics, urges the government to ensure the availability of evidence on impact assessment of ehealth interventions. Therefore, the study identified the need to critically examine how users perceive ehealth interventions and whether these interventions have any positive impacts at public health facilities in Kenya, with a focus on the western region.

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II. RELATED STUDIES

The clinical interaction between the patient and the healthcare provider is an important aspect of ehealth (the clinical interaction has a number of other processes such as financial, administrative and clinical aspects). This section therefore, seeks to address these interactions as captured by previous authors as they viewed them in the context of ehealth uptake. A patient centered service provision is therefore fundamental in the clinical interaction. The impact would be a satisfied patient or improved wellness.

[5] Argues that there are two parts to the barriers of ehealth impact. These are *patient related* and *practitioner related.* Among the practitioners, the main barrier is the patient participation and the desire to maintain control, lack of time, personal beliefs and insufficient skills, while the main barriers to patient participation is low health literacy and lack of subject matter knowledge. A more knowledgeable patient is more likely to have confidence and trust required for making decisions. Some school of thought such as [6], reported that giving patients access to health records could generate anxiety because the patients may monitor the practitioners' activities, which is not possible with traditional a face to face interaction.

[7], emphasizes on leveraging ICT in healthcare for benefits of users in developing countries which is in line with [8] claim, that ehealth systems can help, thus impacting significantly and positively on healthcare. These thoughts are in line with [9], ascertain that, ehealth offers pragmatic opportunities for distance care delivery to the needy, treatments and follow-ups. With the proliferation of mobile apps and web-based applications, patients can easily be alerted over health schedules or appointments and to get a number of lifestyle based information to guide them on maintaining a healthy lifestyle. This has an impact on quality of life, reduction on transfers and referrals, besides reducing travel costs and stress. [10], are of the view that ehealth services may also help health professionals to stay in remote facilities because of the support they will receives from the other health practitioners, thus giving assurance to both patients and health professionals in remote areas.

Impact can be assessed on a number of indicators. [11]Hadwich et al., (2010) identifies three dimensions indicators:

1. Potential quality (Example accessibility and competence)
2. Process quality. (Example usability or user friendliness, information, security, trust, and system integration).
3. Outcome quality. (Example, the degree of performance, reliability, and ability to respond).

[12], views ehealth goal as being about the expected benefits on healthcare service (service quality takes care of potential quality, process quality, and outcome quality). E.g. improved efficiency and convenience of patient care improved billing, effectiveness and increased patient participation in their care. [13], adds on the theory of cost effectiveness, which focuses on the issue of cost from the patient's perspective when provided by ehealth. This is also addressed in the context of geographical barriers being eliminated, thereby improving efficient services access through efficient consultation among medical practitioners.

[14] Are of the opinion that the use of information systems would improve legibility and reduce errors reductions thereby boosting the quality of healthcare. Thus, the use of ICT therefore saves significant amount of time in coordination and managing hospital operations. The fundamental focus of a healthcare system is safety, which is part of quality service to patient. It can be improved through centralized data base access of patient's data. For example, the people who need care providers can access them ant time, anywhere remotely or in a centralized health information system or through the internet.

III. METHODOLOGY

The study used a combination of qualitative and quantitative techniques (mixed method) to clarify and explain the inner relationships [15]. To ensure variability of data for maximum transferability and generalizability, the study instrument's consistency for data gathering was based on interviews, observations and questionnaires. The study sites (Kisumu, Kakamega and Migori counties, in the western region of Kenya), were selected based on the criteria; (i) rural, urban and semi-urban environment and (ii) the facility levels 1 to 4 according to the Kenya Essential Package for Health (KEPH), while the targeted key informants was anchored on decision makers professional roles (medical superintendent, clinicians, matron, county health records information officer, doctor, and administration). Cumulatively, 15 key informants and 21 patients (7 per county) were used.

The quantitative techniques covered demographic data that were analyses using confirmatory and exploratory analysis using IBM SPSS v25. Qualitative data collected through interviews and observations were analyzed thematically to extract the dominant and the emerging themes. In order to present this complex mixed approach, the results were methodologically triangulated [16] as per fig 2. This involved comparison of data discovered from related studies with expert's reviews from key informants and the questionnaires.

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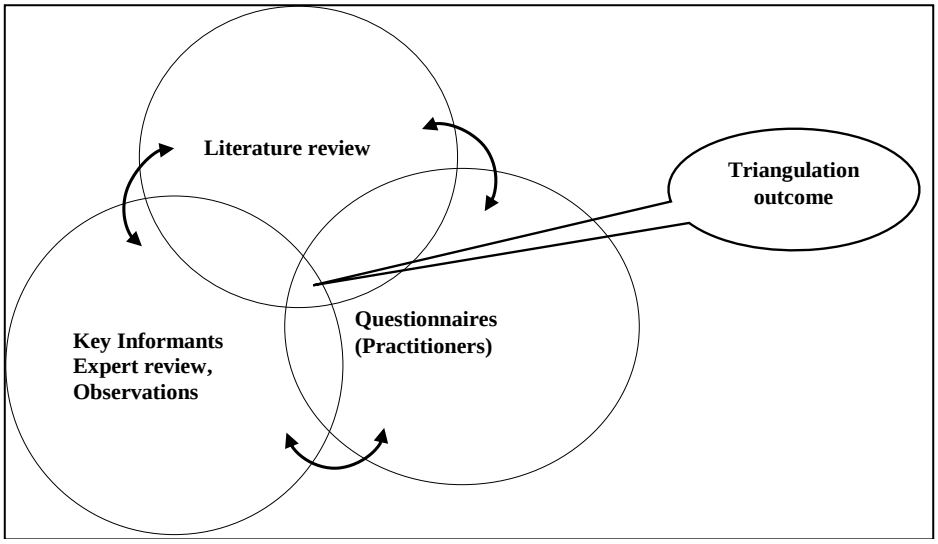

Fig 2: *Triangulation validation method. (Modified from Source:* [17]

Findings from observations

Based on the above stated methodology, the study highlights key findings or discoveries within the facilities. Nearly in all the facilities, the patient flow was such that, for example, through the casualty section and the outpatient's sections, and all other patient processes were manual except for the billing section. The patients buy their own files or prescription books, which are kept at the records office after they have been attended to or in some cases, patients to go back with them at home. The study also observed that HRIO's have access to computers but maintain manual MOH indicator logs across all KEPHS levels. There are rampant manual duty schedules being maintained by the service providers such as nurses, doctors and clinicians. From this, it can then be concluded that facilities do not have enough technologies in place or automation process. In nearly all the facilities, there was lack or poor infrastructure to support HIS. The computer to personnel ratio is very low.

The key informants (KI) and patients (PI) were randomly asked questions about their views on ehealth (leveraging the use of ICT in health) and other components that anchor it into health. Their perception on whether it improves efficiency, transparency, and their overall experience.

Thematic Analysis (qualitative data analysis)

The Patient Interviews (PI) and the Key Informants (KI) responses were recorded and later thematically analyzed. KI and PI were asked questions about their views on ehealth (leveraging the use of ICT in healthcare, availability, infrastructure and other components that anchor it into health. What their perception were and whether the use of ICT improves efficiency, transparency, and the overall experience.

The patients were randomly asked on how convenient the facility locations were, if they receive best quality healthcare, the efficiency of check in and check out process, the ease in getting referrals and their overall experience. On the other hand, key informants, were interviewed in the areas of patient's safety and MoH policy regulations concerning ehealth systems.

The patient's interviews (PI) provided thematic pointers on how patients perceive the impact of leveraging ICT in healthcare service delivery. There were varied perceptions concerning their understanding of ehealth. The varied perceptions were not necessarily the representation of what the patients see on the ground, but what they might have been exposed to elsewhere through reading or private undertakings. When prodded further, some patients acknowledged that these are some of the things they have read, seen in private facilities and expect to see. For example:

PI1: "Everything computer in healthcare is ehealth service".

PI2: "The use of internet at the hospital", while

PI7 said, "The storage and exchange of data".

The interviewees referred to such aspects like patient's medical records storage, limited use of the exercise books at the pharmacies, printed receipts for the payments made and ease of referral to other facilities, as some of the benefits they experience. One respondent who is managing a terminal illness mentioned the electronic bookings and reminders for picking the medications. The interviewees could site cases they deem would be implemented in government facilities to make a difference, e.g. mobile phone reminders. Some respondents acknowledged the automations at special clinics such as HIV/AIDS and Malaria, which operate within the facilities, but are donor funded in leveraging the use of ICT to support monthly reporting like DHIS2 from county health records information officer (CHRIO's).

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PI6: "I regularly pick my medicine from the clinic, but I am not sure who else can see my status data from the specialized clinic's computer".

Health service quality indicators from the literature were supported by through the patient interview classification on quality attributes such as; efficiency, reliability, and cost reduction. The patients however, had doubts or were unaware about their data security and patient safety attribution to ehealth systems. The interviewees, expected that computerization (ehealth), will enable the health practitioners to be more reliable and responsive in a timely manner whenever there is a disease outbreak or emergency. The feedback from PI19 emphasized the need for a quicker response to patients' questions as one of the responsiveness expected.

PI19: "largely most of the calls are made on personal cellphones of the service providers and facility lines are rarely picked if not working.

IV. DESCRIPTIVE ANALYSIS

The views by various healthcare providers on current ICT impact on care delivery showed that 29% of total respondents strongly agreed that there is efficiency, while 32.9% agreed. This is can be attributed to the billing processing of NHIF and the financial transactions. Administrators generally agreed because, more often than not, the administration offices have computers to process a number of paper work and links billing section and administration sections.

As much as there were rampant manual processes, users were positive and looking forward to a time when their operations would be automated. This came out clearly during the qualitative interviews after further prodding. Therefore, it can be deduced that, experiences and expectations of the respondents aided in the positive trend as observed within the different professional cadres.

Table 1: *Efficiency of healthcare delivery.*

		Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
Profession	Physician		11.1%	66.7%	22.2%	
	Administrator	42.9%	14.3%	28.6%		14.3%
	Medical Director	100.0%				
	Manager	50.0%		16.7%	16.7%	16.7%
	Technician	27.3%	27.3%	27.3%	9.1%	9.1%
	Medical Engineer	25.0%	25.0%	25.0%	12.5%	12.5%
	Clinician	11.5%	34.6%	34.6%	7.7%	11.5%
	Pharmacist	23.1%	38.5%	30.8%	7.7%	
	Lab Technician	75.0%	25.0%			
	Nurse	35.0%	45.0%	5.0%	10.0%	5.0%
	Radiologist	11.1%	55.6%	22.2%	11.1%	
	Accountant		100.0%			
	Health Records	38.9%	38.9%	5.6%	16.7%	
	NHIF		100.0%			
	P.Educator					100.0%
Total		29.4%	32.9%	21.7%	9.8%	6.3%

Normally, computer processing is associated with accuracy, qualitative and relevant information. A number of users, who have interacted with computers elsewhere, were able to give very strong indicators (table 2). Being an information technology age, the doctors, administrators, clinicians, use this too make references or search on some information they need or verify experiences they get. Therefore, a number of times, they use their personal computers to search for references to get added information for conclusive decisions making.

Table 2: *Accurate, quality and relevant information use.*

		Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
Profession	Physician	11.1%	33.3%	22.2%	33.3%	
	Administrator	28.6%	42.9%		28.6%	
	Medical Director		100.0%			
	Manager	50.0%	16.7%	16.7%		16.7%
	Technician	27.3%	18.2%	18.2%	27.3%	9.1%
	Medical Engineer	25.0%	12.5%	37.5%	25.0%	
	Clinician	30.8%	26.9%	15.4%	11.5%	15.4%

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	Pharmacist	30.8%	15.4%	46.2%	7.7%	
	Lab Technician	33.3%	41.7%	25.0%		
	Nurse	40.0%	30.0%	15.0%	15.0%	
	Radiologist	44.4%	55.6%			
	Accountant	100.0%				
	Health Records	44.4%	22.2%	16.7%	5.6%	11.1%
	NHIF	100.0%				
	P.Educator		100.0%			
Total		34.3%	28.7%	18.9%	12.6%	5.6%

Level four and five where we find certain special clinics that are donor funded such as the HIV/AIDS and malaria, have automated operations that helps them in the analysis and reporting accurately. The respondents were very positive about the impact of HIS at the facilities. Based on the site selection criteria, it is noted that, the poverty index of an area, may influence the rate of ehealth utilization. A high poverty index implies that the facilities are dilapidated and with low levels of health information systems. Whereas, if the poverty index is low, a number of developments are bound to take place and gain acceptance of HIS much better. The rural urban poverty index will correspond with the development taking place and the acceptance of HIS is much better e.g. (Kisumu, Kakamega).
At level 4 and above facilities, the overall patient rating has been realized based on the medical care experience at level 4 and above facilities in fig. 4.

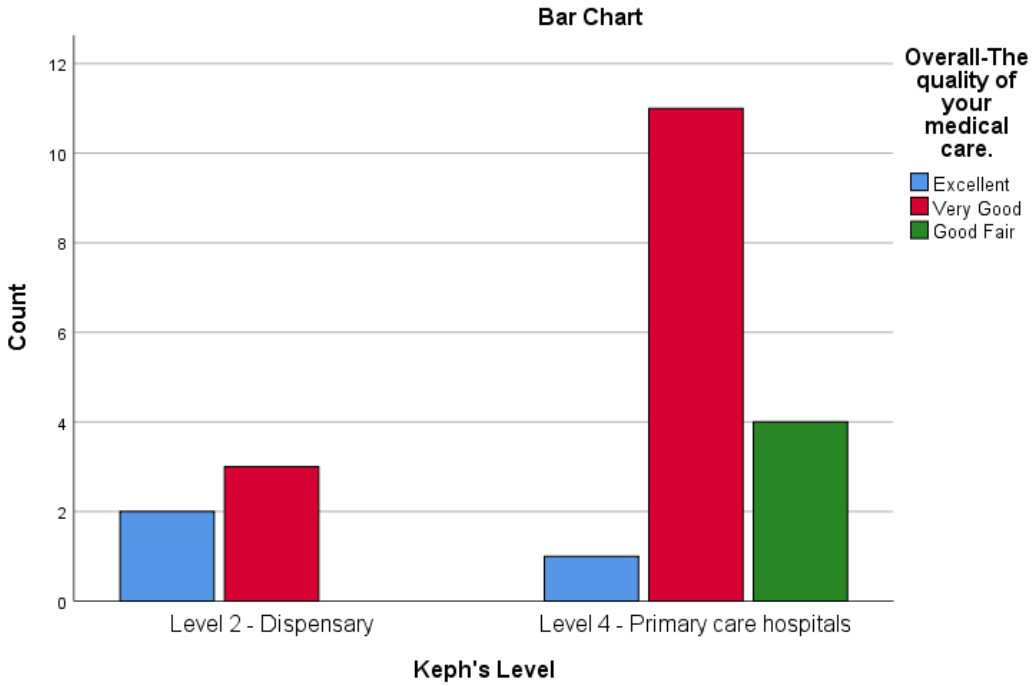

Fig 3: *Patient's overall quality rating.*

V. CONCLUSION

The study outcome shows a positive perception towards the use of HIS by participants. The impact of ehealth implementation can be seen in the three study sites (counties). Implementation is slow in the rural areas with high poverty index as compared to urban areas with low poverty index. Besides poverty index, another factor that has affected ehealth is the stable leadership (governor's ratings). The internal leadership turnover can retard the development of ehealth in a county. E.g. A site such as Kakamega, which has had stable internal leadership for a while, has seen ehealth get the much-needed attention and the implementation of ehealth is taking place at facility levels with ehealth infrastructure deployments courtesy of donor funding. At the time of this study, EMR rollout was ongoing with the funding from USAID, a development agency at one of the sites (Kakamega County). Largely, this has improved HIS visibility as an enabler, a situation that is missing from the other two sites (Migori and Kisumu counties). Actually, most of the other facilities have manual processing.

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