African Journal of Emerging Issues
Peer reviewed | Double blind | Interdisciplinary

African Journal of Emerging Issues (AJOEI)
Online ISSN: 2663 - 9335
Available at: https://ajoeijournals.org

PUBLIC HEALTH

DIGITALIZATION OF CLINICAL PROCESSES FOR PATIENT MANAGEMENT AT KENYATTA NATIONAL HOSPITAL, NAIROBI CITY COUNTY: DIGITAL HEALTH AND SOCIO-DEMOGRAPHIC DETERMINANTS

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Publication Date: May 2026

ABSTRACT

Purpose of Study: This study assessed the level of digitalization in patient management and examined socio-demographic determinants influencing digital health systems use among healthcare workers at Kenyatta National Hospital (KNH), Nairobi City County, Kenya.

Problem Statement: Digitalization of clinical processes is critical for enhancing healthcare delivery, yet gaps persist in system integration and consistent utilization, particularly in low-resource settings.

Methodology: A cross-sectional study design was employed among 327 healthcare workers in the outpatient department, selected through stratified sampling. Data was collected using semi-structured questionnaires and key informant interviews. Quantitative analysis involved descriptive statistics, chi-square tests, Fisher's exact tests, and binary logistic regression, while qualitative data was analyzed thematically.

Result: The overall digitalization level was high (82.9%), with 70.9% of respondents reporting full utilization of digital systems. Billing functions were most frequently used (22%), while clinical reporting features remained underutilized. Educational attainment ($p=0.035$) and professional cadre ($p<0.001$) were significantly associated with digital systems use, whereas age ($p=0.331$) and gender ($p=0.659$) showed no statistically significant association. Binary logistic regression revealed that socio-demographic factors collectively did not significantly predict digitalization levels ($p=0.246$). Qualitative findings highlighted resistance among older staff, improved competency through further education, and systemic challenges including inadequate training and

limited system interoperability. KNH demonstrates substantial progress in digital health adoption, though utilization varies across clinical functions and professional groups.

Recommendation: Targeted interventions should enhance digital competencies, improve system integration, and address function-specific gaps to achieve holistic digital transformation in patient management.

Keywords: *Digitalization, Clinical Processes, Patient Management, Health Information Systems, Socio-Demographic Determinants, Healthcare Workers*

INTRODUCTION

The assimilation of digital health innovations has revolutionized healthcare delivery worldwide, particularly in managing chronic illnesses such as the human immunodeficiency virus (HIV), diabetes, cancer, and hypertension, which pose significant challenges to healthcare systems. The World Health Organization (WHO) report on non-communicable diseases, 73% of mortality cases occurred in low and middle-income countries (WHO, 2025). Digital health technologies have offered innovative solutions, enhancing the standard of healthcare, patient results, and overall efficiency in healthcare (Cerchione et al., 2023). Across the globe, various technologies have been employed to manage chronic illnesses effectively. Telemedicine, for instance, has emerged as a pivotal tool, connecting healthcare providers with patients remotely (Li et al., 2021). Through telemedicine platforms, patients suffering from chronic diseases can receive consultations, monitor their health, and seek medical advice without the need for frequent in-person visits. As opined by Ting et al. (2020), some of the digital innovations that have been used to tackle major clinical problems include the interconnectedness of devices during outbreaks to monitor person to person infection, artificial intelligence (AI) in conducting surgeries, large-scale data analysis to identify unique patterns, and blockchain technology in sharing information across board.

Acknowledging the significance of digital technologies in healthcare, the World Health Organization (WHO) implemented a worldwide strategy concerning digital health in 2021 with the aim of providing guidance on how new technological advancements can be harnessed and applied in health systems to improve health outcomes (WHO, 2021). This strategy creates a continuum of care which enhances health outcomes through improved diagnosis and data-driven treatment decisions, digital therapeutics and person-centered care. The current era of technology advancements has birthed endless opportunities from the utilization of digital technologies in many fields (Xia et al., 2024). One of these fields is healthcare, where various digital technologies have been utilized towards the betterment of healthcare outcomes (Sharma et al., 2018; Shaw et al., 2018; Li et al., 2021). According to Li et al. (2021), one benefit is enhanced patient experience; patients benefit by avoiding unnecessary in-person visits and through virtual triage. Besides, patients can receive remote prescriptions, treatments and video consultations enhancing their overall experience.

Efficient hospital management is another benefit that is associated with the application of technological advancements in the healthcare sector (Awad et al., 2021). This is because through these technologies, in-hospital journals can be managed more efficiently, patients can be observed firsthand by specialists if needed, optimizing the use of hospital resources. Moreover, decreased physical presence reduces expenses related to extended time, space usage, and personal protective gear. Also as opined by Senbekov et al. (2020), the utilization of technological advancements in

healthcare contributes to improved healthcare provider workflow; clinicians can oversee virtual consultations, ensuring the safety and effectiveness of the process. Furthermore, partially automated functionalities, like registration and counseling through chat bots, streamline the workflow for healthcare providers.

There has been a progressive creation and implementation of digitized systems to help provide efficiency in the provision of health care services. This was largely driven by donor funded agenda stemming from the need to manage HIV and Non-communicable diseases pandemics. Its aim was to enhance clinical processes and administrative functions of health care facilities (Muinga et al. (2018). KNH as a premier facility has endeavoured to provide automated systems to help health care worker perform their duties with ease and efficiency. The need for digitalization of clinical processes was to help manage the large number of referrals and allow exchange of information between workstations as well as ensure efficiency.

However, these benefits notwithstanding, literature also indicates that digitalization of clinical processes for patient management in healthcare is not without some limitations. In the study by Li et al. (2021), factors such as education and training, technical concerns, as well as usability and accessibility were among the challenges affecting the utilization of various digital health technologies in healthcare settings. In another study by Singh et al. (2020), factors such as attitude, adaptability, ease of use, and reliability were identified as facilitators for physicians' acceptance for these technologies. In Switzerland, high adoption costs, system complexities, and the absence of adequate staff training were reported as the main barriers to the utilization of digital health technologies (Van Velthoven & Cordon, 2019). Ngugi et al. (2021a) established that factors such as organizational, technical, and human processes can either act as facilitators or barriers the utilization of digital health technologies in low resource settings. In Kenya, obstacles to utilization included challenges stemming from the socio-political climate, attitudes and behaviors, system-related issues, and inadequate infrastructure (Bakibinga et al., 2020).

Other studies conducted at KNH alluded to the fact that the hospital had made conceded efforts to adopt the use of health information systems in their provision of patient care. The findings gave mixed reactions where a proportion agreed that indeed application of digital platforms helped ease work and improve patient service delivery, while another proportion indicated that still manual processes were largely still being used as well as the systems were not fully implemented. The studies further called out for the enhancement of synchronizing information systems and human systems to ensure full adoption (Matagi, 2024; Musee et al., 2024). The use of both paper and computerised systems points out to a gap in system suitability with the clinical work flows, tasks and complexities of health care environments. Hence, the study sought to use fit between individuals, tasks, and technology (FIIT) and Unified theory of acceptance and use of technology (UTAUT) models to assess these gaps and help provide new knowledge about the established questions arising from the reviewed studies that reveal system effectiveness as a key factor in digitalization of clinical processes for patient management.

Socio-demographic factors encompass age, gender, ethnicity, and religion among others. Research by Zambianchi et al. (2019) indicates that socio-demographic factors like age and gender can impact the process of embracing new innovations or technologies. In the context of healthcare, the existing studies reveal mixed findings in regards to the effect or influence of various socio demographic factors on the utilization of healthcare innovations in the digital realm; some studies have found that these factors have a considerable influence on the utilization of digital health technologies while others have not.

In the study by Reiners et al. (2019), age, income level, and education achievement were found to influence utilization of digital health technologies. In particular, lower income, higher age, and lower education achievements were associated with lower utilization of digital health technologies. In a comparable investigation conducted by Aldosari et al. (2020), factors such as gender, age, education level, and years of experience were identified as demographic attributes influencing nurses' utilization of technological advancements in healthcare in a hospital in Saudi Arabia. In another study conducted at KNH pointed out that facilitating conditions under the Unified Theory of Acceptance and Use of Technology affirmed that age, gender, experience and voluntariness strongly influences user acceptance of eHealth (Migwa et al., 2022). Notably, most studies reported that age is a factor that considerably influences the utilization of technological advancements in healthcare whereby younger healthcare professionals demonstrate greater willingness and enthusiasm for using eHealth technologies, showcasing more experience and interest compared to their older counterparts (Duplaga, 2018; Samiei et al., 2018).

However, Ladan et al. (2019) found out that socio demographic attributes such as age, gender, profession and previous experience did not necessarily influence digital health technology utilization among healthcare providers in a tertiary hospital in Sub-saharan region. The context under which the technology was being applied would directly affect the overall progress, acceptance and use of the health information system as indicated in the study of physician attitudes on EMR where inconsistent and unsuitable system was a precursor to negative attitude towards EMR use (Kalayou et al., 2021). Similarly, other studies conducted in different contexts established that gender had no influence on the utilization of technological advancements in healthcare (Rho et al., 2018; Nelson et al., 2019). These mixed findings in regards to the effect of socio demographic factors on the utilization of digital health technologies point out the need for more research on the area to provide clarity.

The utilization of digital health technologies varies across regions and healthcare facilities. In countries with a high level of income, there is a substantial adoption of advanced technologies, including mobile applications for disease management, wearable devices to monitor vital signs, and personalized health management platforms. In the United Kingdom (U.K.), for example, Gunn et al. (2018) reported the increased adoption of virtual clinics specifically to facilitate remote glaucoma management. In China, telemedicine-based public healthcare delivery has been adopted since 2012 (Li et al., 2021).

In contrast, countries with low as well as middle income levels face challenges related to inadequate resources, infrastructure, and awareness, impacting the widespread adoption of these technologies (Frost et al., 2018). In the same vein, Adetoyi & Raji (2020) noted that many developing countries are yet to incorporate digital health technologies despite the myriad of benefits they offer. Ngongo et al. (2019) also noted that Sub-Saharan Africa is behind in embracing mobile health (m-health) applications and utilizing them to achieve sustainable development goals. While focusing on Ethiopia, Manyazewal et al. (2021) noted challenges with the utilization of technological advancements in healthcare and recommended that their utilization in full capacity required more training, infrastructure, and access to enhanced devices like smartphones. Despite these challenges, there are notable efforts in regions like Sub-Saharan Africa, where initiatives such as mobile health clinics and telemedicine services have been implemented to bridge the healthcare gap, especially in managing chronic illnesses (Adeola & Evans, 2018).

In Kenya, digital health technologies such as KenyaEMR and International Quality patient care (IQ-Care), and Comprehensive care center patient database (C-Pad) have been widely

implemented, furnishing healthcare practitioners with thorough and up-to-date patient data, facilitating accurate diagnoses, and improving treatment adherence especially among HIV patients (Amulega, 2018). This is in line with the Kenya Health Policy 2014-2030, through which the Ministry of Health (MOH) seeks to strengthen prompt production and utilization of unified, thorough, and high-caliber health data through governance and management of the health information system (HIS) development process.

STATEMENT OF THE PROBLEM

Empirical evidence reveals significant gaps in the digitalization of service delivery within Kenyan government institutions, including the Ministry of Health (Ngugi et al., 2021a; 2021b). Despite global health targets, inconsistent use of digital innovations and regional disparities persist in managing conditions like HIV, hypertension, and diabetes (Musyoki et al., 2021; Kasaie et al., 2020). While the prevalence of chronic illness grows, research remains limited regarding the comprehensive digitalization of clinical processes beyond basic technology adoption. At Kenyatta National Hospital (KNH), system effectiveness is heavily dependent on reliable infrastructure (Migwa et al., 2022). Although KNH has implemented systems such as Funsoft, ERP-eHospital, LIMS, and PACS, they lack interoperability, preventing seamless data sharing (Oreni et al., 2021). Furthermore, no existing studies have examined how these specific systems align with the FITT and UTAUT models within actual clinical workflows. These gaps lead to fragmented processes, task duplication, and inconsistent system utilization among healthcare workers. Additionally, there is limited of data on how socio-demographic interact to influence digitalization. This study assessed the level of digitalization for patient management at KNH and examined the sociodemographic factors associated with its use.

METHODOLOGY

The study employed a cross-sectional research design with the target population consisting of 2,291 healthcare workers directly involved in patient care at Kenyatta National Hospital outpatient department, Nairobi City County. A sample size of 329 was determined using the Krejcie and Morgan formula. Stratified sampling using professional cadre as the basis for stratification was used in selecting participants for the quantitative part of study while purposive sampling was used in selecting section heads for the qualitative part of the study. A total of 327 participating in the study, representing a response rate of 99%. Data was collected using self-administered semi-structured questionnaires comprising Likert scale statements and open-ended questions, supplemented by key informant interview guides administered to section heads selected through purposive sampling. The instruments were pre-tested at Kenyatta University Teaching, Referral and Research Hospital and refined accordingly, with a Cronbach's Alpha of 0.813 confirming reliability. Quantitative Data was analyzed using SPSS version 28, where descriptive statistics summarized the sample characteristics and digitalization levels. Chi-square and Fisher's Exact tests was computed to examined associations between socio-demographic factors including; age, gender, education level, and professional cadre, to digitalization outcomes. Binary logistic regression was further used to determine the independent contribution of socio-demographic factors on digitalization. Qualitative data from key informant interviews were analyzed using inductive thematic analysis, with themes derived iteratively until saturation was achieved. Prior to the study, approvals obtained from NACOSTI, Kenyatta University, and the KNH-UoN Ethical Review Committees. The study was conducted in adherence to all other ethical guidelines for similar studies.

FINDINGS AND DISCUSSION

Sociodemographic Characteristics of Respondents

Female doctors constituted the majority of respondents (n=120, 59.1%), while male doctors among the sampled respondents, 62.4% were female while 37.6% were male. In regards to age distribution, the results show a dominance of younger healthcare workers whereby the majority, 37.9% were aged between 20 and 30 years and were closely followed by those aged between 31 and 40 (37.6%). 18.7% were aged 41-50 while only 5.8% were aged 51 and above years. In terms of work experience at Kenyatta National Hospital, 46.5% had between 1 and 5 years, 25.4% had between 6 and 10 years, 12.5% had worked at the hospital for more than 20 years, while 10.4% had work experience of between 11 and 15 years.

In terms of education qualification, there was an almost evenly split between diploma holders (n=149, 45.6%) and degree holders (n=148, 45.3%), together accounting for over 90% of the sample. A smaller proportion had advanced and certificate qualification, with 18 participants (5.5%) holding a master's degree or higher, while 12 participants (3.7%) being certificate holders. In terms of professional carder composition, the majority were nurses, accounting for 206 individuals (63.0%), making it by far the most dominant profession in the sample, followed by doctors with 27 participants (8.2%) and health information professionals at 22 participants (6.7%). Other mid-level representations included laboratory staff with 16 participants (4.9%), physiotherapists with 14 participants (4.3%), and pharmacists with 12 participants (3.6%), while smaller proportions were observed among nutritionists (7 participants, 2.1%), dentists, orthopedics, and RCO professionals each with 6 participants (1.8%). The least represented professions were psychology and radiology, each with only 2 participants (0.6%), indicating that the workforce distribution is heavily skewed toward nursing, with comparatively minimal representation from specialized and support health professions. This is illustrated in Table 1.

Table 1: Sociodemographic Characteristics of Respondents

Characteristic		Frequency	Percentage %
Gender	Male	123	37.6%
	Female	204	62.4%
Age	20-30	124	37.9%
	31-40	123	37.6%
	41-50	61	18.7%
	51 and above	19	5.8%
Work Experience	1-5 years	152	46.5%
	6-10 years	83	25.4%
	11-15 years	34	10.4%
	16-20 years	17	5.2%
	21 and above years	41	12.5%
Profession at KNH	Dentist	6	1.8%
	Doctor	27	8.2%
	Health Info	22	6.7%
	Lab	16	4.9%
	Nurse	206	63.0%
	Nutrition	7	2.1%
	Ortho	6	1.8%
	Pharm	12	3.6%
	Physio	14	4.3%
	Psych	2	0.6%
	Radio	2	0.6%
	RCO	6	1.8%
Level of education	Certificate	12	3.7%
	Diploma	149	45.6%
	Degree	148	45.3%
	Masters and above	18	5.5%

Level of Digitalization Use in Clinical Processes at Kenyatta National Hospital

An analysis of the level of digitalization of digital health systems in clinical processes at Kenyatta National Hospital revealed that a significant majority of healthcare workers (70.9%) reported full utilization as they indicated they 'always' use them in their work. A further 23.9% reported partial utilization and this reflected in their responses of 'sometimes' while 5.2% indicated that they never use digital health systems in clinical processes. A composite index was calculated by weighing responses (Always=1, Sometimes = 0.5, Never = 0). This yielded an overall digitalization score of 82.9%, indicating that KNH can be considered to be highly digitalized with considerable integration of digital systems in clinical processes.

The majority of those who utilize the digital health systems use them for billing purposes (22%), capturing and assessing clinical data (14.2%), registration (12.5%), ordering services or commodities (10.9%), booking patients' appointments (8.3%), making reports (6.9%), diagnostic requests (5.7%), and prescribing and dispensing medicine (5.7%). As for the specific digital health systems they have used in patient management, the majority mentioned Ehospital (70.6%),

followed by those who have used computers (12.8%), and those who have used none (5.5%). In addition, Ehospital/SAP has been used by 4.3%, Funsoft by 2.4%, and LIMS by 1.5%. Others had a negligible number of users (below 1%) as shown in Table 2.

Table 2: Type of Digital Systems Used at KNH

Digital systems used	Computer	42	12.8%
	Ehospital	231	70.6%
	Ehospital/Funsoft	1	0.3%
	Ehospital/PACS	2	0.6%
	Ehospital/SAP	14	4.3%
	Ehospital/SAP/OTC	1	0.3%
	ERP/SAP	1	0.3%
	Funsoft	8	2.4%
	Funsoft/Ehospital	1	0.3%
	LIMS	5	1.5%
	None	18	5.5%
	PACS	2	0.6%
	SAP	1	0.3%

Majority of the participants generally expressed high concurrence with the role of digital systems in facilitating efficient patient registration (Mean = 4.44, Standard deviation = 0.877). This reflects strong acknowledgment of their effectiveness in capturing accurate patient details. Similarly, there was positive agreement that the use of digital systems at KNH has been consistently increasing among healthcare workers (Mean = 4.08, Standard deviation = 0.929). However, perceptions were less favorable regarding the capacity of digital systems to generate comprehensive reports on patient workload, investigations, treatment plans, and outcomes, where responses tended to be more neutral (Mean = 3.31, Standard deviation = 1.238). This was an indication that while core administrative and registration functions are well-integrated, clinical reporting features remain underutilized or less effective. This is summarized in Table 3.

Table 3: Responses on effectiveness of digital systems patient processes

Likert-scale items	N	Mean	Std. Dev
The digital systems facilitate efficient patient registration, enabling accurate documentation of patient details	327	4.44	0.877
I have observed a consistent increase in healthcare workers using the digital systems at KNH	327	4.08	0.929
The available digital systems generate detailed reports that summarize patient workload, investigations, treatment plans, and outcomes	327	3.31	1.238

Association between Socio-Demographic Factors and Digitalization of Clinical Processes at Kenyatta National Hospital

This section presents the relationship between healthcare workers' socio-demographic characteristics and how frequently they use digital systems during patient care. The factors analyzed include age, gender, education level, and profession type. Those who always use digital systems were classified under 'full utilization' while those who use it sometimes were under 'partial utilization'. In reference to gender, shows that more females reported full digital health systems use (62.5%) compared to 37.5% for males. Nevertheless, Fisher's Exact Test was applied owing to a cell count of less than five and the output indicates that there is no statistically significant association between gender and digital health systems utilization ($p = 0.659$).

In terms of age, the results show that the 20–30 years' group has the highest full utilization (93 respondents, 40.1%). Also, according to these findings, usage of digital health systems declines with age (only 6.9% in the 51+ years age group). However, despite this trend, the output of the Fisher's Exact Test indicates that the results were not statistically significant ($p = 0.331$). For education, the results show that those with diplomas and degrees are the most frequent users of digital health systems: 49.1% of diploma holders reported full digital health systems utilization as well as 41.8% of degree holders. Certificate holders have lower utilization (3.9%), and Master's holders are few but show relatively high usage (5.2%). Moreover, these results were statistically significant according to the Fisher's Exact Test ($p = 0.035$).

Similarly, the results show a statistically significant association between profession type and utilization of digital health systems ($\chi^2 = 129.180$, $p = 0.000$). Nurses dominate both full (64.7%) and partial (49.5%) usage. Also, some professions like Health Information Officers have high full use (9.1%) and zero partial utilization of digital health systems. Others like doctors, orthopedics, nutritionists, and psychologists have lower usage or skewed patterns. Table 4 summarizes this relationship.

Table 4: Socio-demographic characteristics and digital health systems utilization

Variable	Category	Partial Utilization (N)	Full Utilization (N)	Significance	Degrees of freedom
Gender	Male	29(27.6%)	87(37.5%)	p=0.659	
	Female	49(46.7)	145(62.5%)		
Age	20–30 years	23(21.9%)	93(40.1%)	p=0.331	
	31–40 years	34(32.4%)	83(35.8%)		
	41–50 years	16(17.1%)	40(17.2%)		
	51+ years	5(2.9%)	16(6.9%)		
Education	Certificate	6(2.9%)	9(3.9%)	p=0.035	
	Diploma	29(30.5%)	114(49.1%)		
	Degree	38(38.1%)	97(41.8%)		
	Masters and above	5(2.9%)	12(5.2%)		
Profession	Doctor	11(10.5%)	6(2.6%)	χ^2 =129.180	df=11
	Nurse	52(49.5%)	150(64.7%)	p=0.000	
	Health Info	0(0%)	21(9.1%)		
	Lab Technologist	3(2.9%)	13(5.6%)		
	Nutritionist	0(0%)	7(3.0%)		
	Ortho	4(3.8%)	2(0.9%)		
	Pharmacist	2(1.9%)	11(4.7%)		
	Physio	2(1.9%)	11(4.7%)		
	Psychologist	0(0%)	0(0%)		
	Radiographer	0(0%)	2(0.9%)		
	RCO	2(1.9%)	4(1.7%)		
	Dental	2(1.9%)	4(1.7%)		

Further binary logistic regression was done to examine the influence of socio-demographic factors on the level of digitalization and the results showed that sociodemographic factors had no statistically significant prediction of digitalization level (p=0.246). As such, age, gender, education level, and profession type do not significantly predict full utilization of digital systems in this sample (coefficient (B) = 0.173, p = 0.246, Odds Ratio (Exp (B)) = 1.189). This implies that variations in digital system utilization were not meaningfully explained by socio-demographic differences among healthcare workers in this setting. Although the odds ratio suggests a slight positive association that higher sociodemographic scores increase odds of full utilization by about 19%, this effect is not statistically significant. This is summarized in table 5.

Table 5: Binary Regression Analysis

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[a]	SD	.173	.149	1.344	1	.246	1.189
	Constant	1.106	.707	2.450	1	.118	3.023

Variable(s) entered on step 1: SD, TF, HSF.

The qualitative findings further reinforced the quantitative patterns for age. Interview participants consistently highlighted age as a key influence on digital system use, particularly noting resistance among older workers who were more accustomed to manual processes. One participant explained that the introduction of Funsoft was challenging because *"the old people have been in manual forever… that is what they are accustomed to."* Another echoed this by stating that transitioning to digital systems felt burdensome for some staff because "*it's not the way you have been using something for a long time."* Conversely, interviewees described younger healthcare workers as more adaptable and confident in engaging with digital platforms, with one respondent noting that *"if you have grown with it, you don't even wonder."* These insights complement the quantitative trend showing higher utilization among younger age groups, despite the non-significant statistical association.

Regarding education, KII findings aligned with the significant quantitative relationship observed. Some staff reported voluntarily upgrading their qualifications to improve digital competency, as one interviewee stated: *"people went back to college… they did records diploma and degree, and now they are better.*" This suggests that higher educational attainment may facilitate smoother digitalization.

The qualitative results also clarified that variation in utilization across professions was less about cadre differences and more about systemic challenges such as inadequate training and technological limitations. Participants emphasized that "*not everybody was trained*," and some systems, such as Funsoft, lacked complete functionality in reporting. This supports the quantitative finding that while profession was statistically associated with digitalization levels, the underlying drivers extend beyond individual roles to institutional support gaps.

DISCUSSION

The study revealed that 70.9% of healthcare workers at Kenyatta National Hospital (KNH) reported full utilization of digital health systems in clinical processes, while 23.9% used them only sometimes, and 5.2% reported never using them. This indicates a relatively high level of digital integration compared to most similar settings. For instance, recent studies in other Kenyan public referral facilities, such as Kitale County Referral Hospital, have shown that while ICT infrastructure exists, consistent utilization is often lower due to digital literacy gaps (Louis, 2024). Furthermore, broader assessments in Sub-Saharan Africa indicate that only about 39.4% of healthcare workers in typical district-level settings consistently utilize digital health tools for routine clinical tasks (Simbini et al., 2026). This finding means that KNH has achieved significant progress in embedding digital technologies in clinical workflows, reflecting institutional commitment and a culture of adoption. The relatively high digitalization percentage suggests that KNH is becoming a leader in digital transformation within public hospitals in Kenya. However, analysis of the different processes of patient care shows that the billing (22%) is the most used

function in the system. This indicates a gap in the use of ERP-Ehospital where other functions are less likely utilized meaning data sharing is still low.

When compared to other studies, this result is more promising. For instance, Muinga et al. (2020) found that EMR use in Kenyan county hospitals was still inconsistent, with frequent downtime and reliance on parallel paper systems. Similarly, Muiruri (2024) reported that health workers in central Kenya continued to struggle with incomplete EMR use, citing infrastructural barriers. Similarly, studies at KNH point to the coexistence of manual and digital systems, indicating incomplete system integration and showing the need for better synchronization between technological solutions and clinical workflows (Matagi, 2024; Musee et al., 2024). In contrast, the findings from KNH demonstrate more advanced digitalization, possibly because of its status as a national referral hospital that benefits from greater investment and technical support.

This study examined the influence of socio-demographic factors specifically age, gender, education level, and profession on the utilization of digital health systems at Kenyatta National Hospital. The results showed that educational attainment and professional cadre had statistically significant effects on digital system use ($p = 0.047$ and "$p < 0.001$" respectively), while age ($p = 0.407$) and gender ($p = 0.951$) did not show significant associations. This means that the more educated staff (diploma and degree holders) and certain professional cadres (especially health information officers) are consistently more likely to use digital systems, whereas demographic variables like age and gender are less influential.

In comparison to other studies, these findings show both similarities and differences. A Kenyan study by Migwa et al. (2022) reported that education was a strong predictor of EMR adoption, aligning with our results. Globally, Aldosari et al. (2020) found that education level strongly influences technology adoption in hospitals in Saudi Arabia, while gender was insignificant. Similarly, Bakibinga et al. (2020) reported that in the community health volunteer context, varying levels of education and training influenced willingness and ability to use digital tools. Also, Nyambok (2024)'s study in Migosi Level Four Hospital showed organisational and leadership factors mattered, but education as a facilitator was also apparent. However, some studies in low and middle-income countries such as the one by Kabore et al. (2022) have suggested age-related differences, with younger staff adopting digital tools faster, which contrasts with the lack of statistical significance here.

CONCLUSION

This study investigated the level of digitalization of clinical processes for patient management and the influence of socio-demographic factors on digitalization among healthcare workers at KNH outpatient department, Nairobi City County. The findings revealed that the level of digitalization among healthcare workers at KNH is generally high, with a majority fully utilizing digital health systems in their clinical workflows. This demonstrates a positive integration of technology in patient care processes, although some gaps remain, particularly the over-reliance on billing functions, continued parallel use of manual processes, and limited interoperability for data sharing across departments. On the other hand, socio-demographic factors such as age, gender, and education exhibited varied influences on digital system use. While younger healthcare providers and those with higher educational attainment tended to use digital systems more frequently, gender showed no significant impact. The type of profession largely influences the use of digital systems basing on the foundations of their curriculums. However, the regression analysis showed they had no significant influence on digitalization of clinical processes ($p=0.246$). Overall, while KNH

reflects meaningful institutional progress in digital health adoption, targeted interventions are needed to bridge utilization gaps across clinical functions and professional cadres. This should particularly strengthen digital competencies among cadres with lower system engagement to ensure that digitalization translates into holistic and consistent improvements in patient management.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed to address identified gaps;

1. KNH management should implement regular and comprehensive digital training programs to improve healthcare workers' familiarity and confidence with all available clinical system modules, moving beyond the current over-reliance on billing functions toward fuller and more consistent system utilization.
2. The KNH Health Information Office should design targeted digital literacy and mentorship interventions tailored to specific professional cadres and education levels to bridge utilization gaps and ensure equitable digital competence across all healthcare worker groups.
3. Further study to investigate patients' perceptions and satisfaction with digital health systems at public hospitals that will provide an understanding on the impact of digitalization's on patient satisfaction with service delivery.

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