The Role of SmartCare Electronic Health Records System in the Delivery of Health Services: Case of First Level Hospitals in Lusaka District, Zambia

Misozi Ngoma[1], Abel M'kulama[2], Akakandelwa Akakandelwa[3] and Tuesday Bwalya[4]
misozik@gmail.com[1]; abel.mkulama@unza.zm[2]; akakandelwa@unza.zm[3]; bwalya.tuesday@unza.zm4

ABSTRACT
The digitization of healthcare through electronic health records (EHRs) has transformed medical service delivery globally thus leading to improved efficiency, data accuracy, and patient care. However, developing countries like Zambia face significant implementation challenges, including skills challenges, infrastructure gaps, and policy limitations. This study examines the implementation of Zambia's SmartCare Electronic Health Record (EHR) system in first-level hospitals of the Lusaka District, focusing on registry personnel's experiences, policy frameworks, service delivery impacts, and implementation challenges. The study employed a qualitative research design, exploiting a purposive sampling method to select 30 registry personnel across five hospitals in Lusaka. Data was collected from 25 registry personnel through in-depth interviews and analysed using thematic analysis. The findings reveal that all twenty-five participants emphasized that the SmartCare system was useful, and user-friendly, and its ability to streamline data capture and retrieval made work enjoyable and much easier. However, findings also revealed a concerning gap in policy awareness among registry staff, which potentially compromises data governance and system interoperability. The study further established that while SmartCare has significantly improved efficiency in patient record management, reducing paperwork and enhancing data accessibility, substantial barriers hinder its optimal utilization. Key challenges include system failures (reported by all participants), erratic power supply, inadequate training and therefore limited skills, insufficient computer resources, and inconsistent distribution of SmartCare cards.

Keywords: Electronic Health Records, SmartCare, Zambia, healthcare digitization, Registry Personnel, First-Level Hospitals

1. INTRODUCTION

The digitization of healthcare systems through Electronic Health Records (EHRs) marks a significant milestone in modern medical practice, revolutionizing how health services are delivered, managed, and evaluated. EHR systems offer a range of benefits, including real-time access to patient information, improved accuracy in clinical documentation, enhanced coordination among healthcare providers, and opportunities for data-driven decision-making (Ali et al., 2023; Margam, 2023). Globally, EHRs have been instrumental in reducing medical errors and promoting interoperability, thus elevating the overall quality and efficiency of healthcare delivery (Thit et al., 2020; Stephen & Lawrence, 2024). However, while high-income countries have made remarkable progress in integrating EHRs, many developing nations, particularly in sub-Saharan Africa, still face systemic barriers to effective implementation. These challenges include inadequate infrastructure, limited human resource capacity, and insufficient policy frameworks (Adedeji et al., 2018; Katurura, 2019).

In Zambia, the Ministry of Health (MoH) introduced the SmartCare EHR system in 2005 as part of a nationwide initiative to modernize healthcare delivery (MoH, 2008). Initially launched to support HIV/AIDS care with backing from the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), SmartCare has since evolved into a more comprehensive platform aimed at improving continuity of care and streamlining administrative processes across a variety of health services (Clarke et al., 2019). By digitizing patient records, the system seeks to enhance data accuracy, reduce the administrative burden on healthcare staff, and ultimately improve the efficiency of service delivery (MoH, 2023). Despite its promising potential, the rollout of SmartCare has been uneven, with notable disparities in adoption and effectiveness across different healthcare facilities (Gumede-Moyo et al., 2019). This inconsistency is particularly pronounced in first-level hospitals, which serve as primary points of care for most of the

population and often operate under conditions of limited resources, high patient volumes, and workforce shortages (Kruse et al., 2009).

The role of registry personnel, including clerks and supervisors, is especially crucial in the implementation and day-to-day functioning of information and data management systems such as SmartCare. These individuals are responsible for managing the input, retrieval, and maintenance of patient data, making their experiences and perceptions vital to understanding the system's efficacy and limitations (Tsvuura, 2022). While existing literature has addressed aspects such as the system's role in improving health outcomes (Mutale, 2017), its adoption barriers (Mwanza, 2019), and concerns about data security (Halubanza, Kunda, & Halubanza, 2022) remain unattended, and therefore presents a critical gap in understanding how SmartCare supports records management in Zambia's first-level hospitals. This gap is particularly relevant in Lusaka District, which hosts 13 district hospitals and serves a large urban population (Kruse et al., 2009). Given the integral role of accurate and efficient records management in ensuring quality healthcare service delivery, it is imperative to examine how SmartCare is utilized by registry personnel in these facilities. This study investigated the influence of the SmartCare system on health service delivery in first-level hospitals in the Lusaka District, focusing on user experiences, policy frameworks, system challenges, and perceived impacts on operational efficiency.

1.1 Problem Statement

The adoption of Electronic Health Record (EHR) systems, such as SmartCare represents a pivotal shift in healthcare information management, particularly within low and middle-income countries like Zambia. Despite SmartCare's integration into Zambia's national health infrastructure, its implementation at the operational level, particularly among registry staff in first-level hospitals, remains under-examined. Many studies (Mengesha, 2011; Gumede-Moyo, 2019; Moomba et al., 2020) highlight the system's potential to enhance data accuracy, reduce service delivery times, and improve patient monitoring. However, these benefits are undermined by persistent challenges that include inadequate digital infrastructure, limited computer literacy among healthcare personnel, poor internet connectivity, and inconsistent availability of SmartCare resources such as smart cards. Registry staff, who are integral to data entry, record management, and patient registration, often lack sufficient training and technical support to leverage the full capabilities of the system. Based on this background, this study sought to address this empirical gap by investigating how the SmartCare EHR system influences health service delivery in first-level hospitals in the Lusaka District, with a particular focus on records management practices and the lived experiences of registry personnel. Addressing this gap will contribute valuable insights to the discourse on digital health implementation in developing countries.

1.2 Research Objectives

The purpose of this study was to investigate the role of the SmartCare Electronic Health Records System in delivering health services in first-level hospitals in Lusaka District, Zambia. In this regard, the study sought to:

i) ascertain registry personnel's experiences and perceptions of using the SmartCare system for managing healthcare (medical) records.
ii) assess the availability policy framework for managing records within the SmartCare health system.
iii) ascertain the extent to which SmartCare has enhanced service delivery.
iv) explore the challenges faced by registry personnel in the implementation of the SmartCare health system.

2. LITERATURE REVIEW

2.1 Use of SmartCare in the Management of Health Records

SmartCare is Zambia's national EHR platform, designed to digitize patient health records and optimize healthcare workflows (Gumede-Moyo, 2019). It integrates multiple healthcare service components, including patient registration, outpatient and inpatient management, and specialized modules for

tuberculosis (TB), HIV, maternal health, pharmacy services, and laboratory operations (Mutabazi, 2016; Gumede-Moyo, 2019). Its longitudinal record-keeping capacity is particularly beneficial for chronic disease management, while the use of smart cards enhances data portability and continuity of care. According to Halubanza, Kunda, & Halubanza (2022), SmartCare has demonstrated improved service efficiency in the delivery of care through expedited electronic record retrieval and reduced administrative burdens. This is because as Mengesha (2011) notes, SmartCare employs role-based access control, allowing secure data entry and retrieval by clinicians, data clerks, and managers. Therefore, registry personnel play a critical role in ensuring data quality, confidentiality, and accuracy of patient health information (HPCZ, 2016).

Studies by Moomba et al. (2020) and Pande (2022) highlight SmartCare's advantages over traditional paper-based systems, particularly in rural settings where offline capabilities ensure uninterrupted data capture. The system also enhances data security through encryption and controlled access (Mweebo, 2014). Further, Moomba et al (2020) notes that the SmartCare system's user-friendly interface contributes to reduced processing errors and improved user satisfaction. In Zambia, registry staff play a central role in the provision of healthcare using SmartCare including patient registration, appointment scheduling, and data verification, supporting interdepartmental coordination and reporting while also upholding confidentiality standards (HPCZ, 2016; MOH, 2018).

2.2 Policy Framework, Guidelines, and Standards for EHR Management

Effective EHR management depends on comprehensive policies and standards that govern data accuracy, privacy, and compliance. Keakopa et al. (2009) emphasize the need for structured policies that address record creation, access, retention, and disposal, supported by regular policy reviews and ongoing staff training. Legal frameworks also influence EHR practices by establishing record-keeping obligations and institutional accountability (Okello-Obura, 2011; Khumalo, 2017). In Zambia, it is observed that while facilities are guided by legislation such as data protection and privacy laws, enforcement challenges persist, often due to limited policy dissemination and awareness (HPCZ, 2011; Marutha, 2011).

The International Records Management Trust (IRMT, 2009) defines records management policy as a systematic guideline for controlling records across their lifecycle, ensuring transparency, legal compliance, and operational efficiency. ISO 15489-1 (2001) reinforces this by promoting accountability and stakeholder rights. However, research in Southern Africa indicates that many institutions lack formalized policies tailored to digital records (Mnjama & Wamukoya, 2007; Marutha, 2011). The National Archives of Australia (2014) and Nengomasha (2009) advocate for assigning clear responsibilities and promoting awareness to avoid mismanagement.

Standards are equally vital for ensuring interoperability, data integrity, and system security. Huffman (1980, cited in Adebayo, 2019) conceptualizes standards as benchmarks that facilitate consistency in health information exchange. ISO 13606, for example, supports secure data sharing while protecting patient confidentiality (AC06953431, 2008). The Global Digital Health Partnership (GDHP, 2021) advocates for harmonized digital health standards to address disparities across regions. Nevertheless, Bwalya and Akakandelwa (2023) caution that failure to align with international standards can compromise system security, interoperability, and legal compliance.

Zambia's digital health landscape is guided by several key frameworks, including the National Health Policy (2013), the Electronic Government Act (2021), and the Smart Zambia Master Plan (2018–2030). While these frameworks support record-keeping and confidentiality, gaps remain in data privacy, cybersecurity, and system integration (Ministry of Health, 2023). Addressing these deficiencies is essential for developing a cohesive and secure digital health ecosystem.

2.3 SmartCare and Service Delivery

The implementation of SmartCare has significantly improved healthcare service delivery in Zambia, particularly by enhancing interoperability, decision-making, and information management. As the nation's primary EHR system, it enables data sharing across healthcare levels and supports national health monitoring and reporting (Ministry of Health Zambia, 2023).

2.3.1 Easy Access and Information Storage

SmartCare enables timely access to patient records, offering improved documentation and comprehensive patient histories compared to traditional methods (Mwinga, 2019; Nawa, 2018). Studies indicate that healthcare providers favor SmartCare due to its ability to consolidate and organize medical data efficiently (Shah, Murtaza & Opara, 2014; Mutale, 2017). Improved documentation enhances care accuracy and expedites clinical decision-making (Mweebo, 2014; Latha, Murthy & Sunitha, 2012).

2.3.2 Service Delivery Efficiency

The system has contributed to significant reductions in patient waiting times by streamlining processes such as identification and record retrieval (SmartCare Zambia, 2024; Chaudhry et al., 2006). Moomba (2017) reported increased efficiency at Maramba and Mahatma Gandhi Clinics, where health workers noted improvements in patient flow and service delivery.

2.3.3 Patient Monitoring

SmartCare facilitates real-time patient monitoring via automated alerts and integrated data tracking tools. It is particularly effective for managing chronic conditions such as HIV/AIDS by monitoring treatment adherence and immunological indicators (Mutale, 2017; Mwanza, 2019). It also supports PMTCT initiatives, although implementation gaps remain (Gumede-Moyo et al., 2019).

2.3.4 Referral Coordination

SmartCare's electronic referral functionality enhances continuity of care through automated communication between facilities (Liddy et al., 2015). Research shows improved outcomes in HIV and maternal health services due to timely and efficient referrals (Bashar et al., 2019; Azamar-Alonso et al., 2019; Clarke et al., 2019).

While SmartCare demonstrates considerable benefits, its sustainability depends on continued investment in digital infrastructure, human resource development, and policy alignment. Further empirical evaluation is needed to assess long-term impacts on patient health outcomes and healthcare system efficiency.

2.4 Challenges in Using the SmartCare Electronic Health Record System

Despite its benefits, the SmartCare EHR system faces several implementation challenges that limit its efficacy. Some of the major challenges identified in the literature include unreliable power supply which hinders SmartCare's reliability, especially in rural facilities. Power outages compromise system availability and force a fallback on paper records, delaying data entry and impairing continuity of care (Achampong, 2012; Chibawe et al., 2019; Mweebo, 2014; WHO, 2006). The other challenge is System Failures. SanJoaquin et al (2013) and Mutale (2017) note that system crashes and software issues erode user trust and disrupt clinical workflows. Furthermore, performance lags and user interface issues contribute to system abandonment and user dissatisfaction (Granlien, Hertzum & Gudmundsen, 2008; Mahalli, 2015).

Inadequate Staff Skills are yet another challenge effective implementation of SmartCare in Zambia. Many (Silvestre, 2018; Alwan et al., 2015; Waithera et al., 2017) have commented that low computer literacy among health professionals undermines the system's full utilization. In Zambia, empirical studies (Mutale, 2017; Ng'andu & Haabazoka, 2024; M'kulama and Bwalya, 2024) show that inadequate digital skills and insufficient training continue to impede the adoption of digital records management systems. Added to inadequate staff and skills is the challenge of computers or workstations and internet connectivity which has resulted in health facilities operating dual systems, backlog, increasing workloads, and errors (Clarke

et al., 2019; Ravindra et al., 2015). Poor internet access affects SmartCare's real-time synchronization capabilities, often leading to data gaps and a return to manual methods (Bedeley & Palvia, 2014; Gumede-Moyo et al., 2019; Mwanza, 2019).

Lastly, the unavailability of SmartCare Cards, which facilitate secure and portable data access, restricts patient engagement and undermines care continuity (Van Reisen, 2017; Mweebo, 2014). To fully realize SmartCare's potential, comprehensive interventions are required, focusing on infrastructure enhancement, capacity building, and sustained technical support. Addressing these barriers is critical to achieving a robust and resilient digital health ecosystem in Zambia.

3. METHODOLOGY

This study adopted a qualitative research design and approach to explore the use of the SmartCare EHR system in first-level hospitals in the Lusaka District of Zambia. As Creswell (2014) notes, the qualitative approach was selected to gain in-depth insight into participants' experiences, perceptions, and contextual factors that influence the implementation and use of SmartCare. The study was conducted across five purposively selected first-level hospitals in the Lusaka District. Purposive sampling was used to identify participants with direct responsibility for health record management. From each facility, one registry supervisor and five registry clerks were selected, yielding a total of 30 participants. This sampling strategy ensured the inclusion of individuals with relevant knowledge and experience in managing health records using SmartCare. Data was collected through in-depth interviews with 25 participants who consented to take part in the interview phase. The interviews were conducted using an interview guide, which allowed flexibility for probing and follow-up questions based on participants' responses. Each interview was audio-recorded, and detailed notes were taken to complement the recordings. Data analysis was conducted using thematic analysis. Emerging patterns and concepts were identified and organized into main themes and sub-themes aligned with the study objectives. The thematic coding process involved both manual annotation and the use of analytical memos to track the development of themes. Data was presented in narrative form, with selected direct quotations used to illustrate key findings and enhance the authenticity of the participants' voices. Ethical clearance was obtained from the Humanities and Social Sciences Research Ethics Committee (HSSREC) at the UNZA. Further permissions were secured from the Provincial Health District Office (PHDO) and the National Health Research Authority (NHRA). Before participation, all individuals provided informed consent, and confidentiality was assured throughout the study. One of the primary limitations of the study was its restricted geographical scope and limited sample size, which may affect the generalizability of the findings to other contexts. However, the depth and richness of qualitative data provide valuable insights that can inform broader discussions on the implementation of EHR systems in similar settings.

4. FINDINGS

4.1 Response Rate of Participants

A total of 25 participants took part in in-depth interviews, comprising 22 registry clerks and 3 registry supervisors across five first-level hospitals in the Lusaka District. Table 1 presents the distribution of participants by facility and role.

Table 1: Participants from Respective Hospitals

Hospital	**Registry Clerks**	**Registry Supervisors**
Chawama Level 1 hospital	5	0
Chipata level 1 hospital	5	0
Chilenje level 1 hospital	4	1
Kanyama level 1 hospital	3	1
Matero level 1 hospital	5	1
Total	**22**	**3**

4.2 Socio-Demographic Characteristics of Participants

Socio-demographic data were collected to contextualize participants' perspectives. Of the 25 respondents, 20 were male and 5 were female. Most participants were aged between 31–40 years, with a mean age of 33.7 years. The majority had less than five years of service. Regarding educational background, 15 participants held diplomas, while others had Grade 12 certificates (3), college certificates (4), or bachelor's degrees (3). Table 2 provides a summary of these characteristics.

Table 2: Socio-demographic Characteristics of Participants

Variable	Values	Frequency (n=25)
Gender	Male	20
	Female	5
Age	18 – 20 years	1
	21 – 30 years	5
	31 – 40 years	13
	Above 40	6
Number of years in Service	0 – 5 years	15
	6 – 10 years	3
	Above 11 years	7
Education	Grade 12 Certificate	3
	College Certificate	4
	Diploma	15
	Degree	3

4.3 Experiences and Perceptions of Using SmartCare for Managing Health Records

Registry personnel were asked to explain their experiences and perceptions on the utilization of the SmartCare system for managing healthcare records. The findings revealed that all 25 participants acknowledged that SmartCare had improved the management of patient records. They cite enhanced data capture, easier retrieval of records, reduced paperwork, and greater efficiency. As one participant noted:

> *"It helps us to easily capture patients' information as compared to the old manual system."* (RC01)

Another stated:

> *"SmartCare has made things easier in that we don't have to file the books, and we do not have problems with running out of filing space."* (KI001)

These perspectives suggest that SmartCare contributes to improved workflows, minimized physical storage challenges, and a transition towards more efficient health information management.

4.4 Policy Framework and Standards for Managing Electronic Health Records

To establish the availability of the policy framework for managing records in various first-level hospitals, twenty-five participants were asked whether they had a written records management policy for managing medical records in the various health facilities and who was responsible for preparing it. This was important because a records management policy is core to any records management function. It was established that nineteen out of twenty-five participants indicated that there was no written policy for records management at their facilities. Most stated they received guidance from the District or Provincial Health Office:

> *"As a hospital, we do not have a copy of the policy. If there is anything, we only receive instructions from the District Office or National Provincial Office."* (KI003)

Only one participant vaguely acknowledged the existence of a policy:

> *"Hmmm, yes, we have. I have not read through it. The document is too big."* (RC19)

When further asked if they were aware of the local health records guidelines compiled by the Health Professions Council of Zambia (HPCZ). None of the participants were aware of local records management guidelines developed by the Health Professions Council of Zambia (HPCZ).

Participants were asked whether they were aware of the internationally recognized records management standards, such as ISO 15489 and ISO 27001, that govern records management. The study findings revealed that twenty-20 participants reported being aware of them and stated that these were applied in their work:

> *"Yes, I am aware, and we ensure that they are applied in our daily work."* (KI003)
>
> *"We need to uphold the privacy of our patients... one of the standards is to uphold their privacy and give them the best service."* (RC02)

Others highlighted principles of good records management:

> *"We are required to follow the three Cs: correct information, consistency, and completeness."* (RC06)

4.5 Impact of SmartCare on Service Delivery

Participants were asked to explain how SmartCare had improved operations in healthcare delivery. The study showed that twenty-one participants largely agreed that SmartCare improved delivery service, particularly in terms of timely patient care, better storage, and faster retrieval of records:

Participant (RC 04) stated that:

> *"It is less time-consuming to register patients as compared to the previous paper-based system."*

Another participant

> *"Everything is done electronically; hence, all the information is readily available and can be accessed easily."* (RC19)

However, one participant expressed concerns about system inconsistency:

> *"Some components are not complete... there is no continuity in SmartCare because you find that SmartCare is off today, and tomorrow you use paper."* (RC17)

4.6 Challenges in Using the SmartCare EHR System

The study identified several challenges in using SmartCare, as illustrated in Figure 4 below. The most prominent issue reported by all twenty-five participants was system failure. For example, the participants had the following to say regarding system failure:

> *"If the system goes down, we resort to writing their [patient] details in a book... those details are not entered into the system."* (RC03)

The second most common challenge, noted by participants, was the erratic power supply which affects consistent work:

> *"When the electricity goes out, we also lose access to electronic records, making it more challenging to keep track of a patient's medical history."* (RC12).

Regarding inadequate staff training on the SmartCare EHR system. Participants felt that inadequate training made it difficult even impossible for them to perform duties on the SmartCare system effectively. Participant RC12 had the following to say regarding this:

> *"Some of us did not go through formal training for SmartCare... the absence of training might hinder our ability to perform these duties effectively".*

Additional challenges included the unavailability of smart cards and poor network connectivity, which further hindered the effectiveness of the SmartCare system in the provision of care:

> *"There is an inconsistency in the supply of SmartCare cards... they must start a new record because they do not have a card".*

Participant RC20 stated. While others complained of the erratic Internet connectivity:

> *"At times, the network is very slow... we often resort to using paper"* (RC09).

Moreover, most health facilities had only a limited number of computers available for data entry and management of patient records against the demand for care:

> *"We attend to many people, but we do not have enough computers... only one computer is functioning."* (RC10)

5. DISCUSSION OF FINDINGS

The findings of this study underscore the transformative potential of the SmartCare EHR system in enhancing healthcare delivery across first-level hospitals in the Lusaka District. Participants consistently reported that SmartCare significantly improved medical records management by facilitating efficient data capture, retrieval, and storage. The unanimous consensus among all participants regarding the system's utility reflects its perceived user-friendliness and operational efficiency. These benefits are most evident in the streamlined capture of patient demographic information, such as names, addresses, and contact details, offering critical support for patient identification and continuity of care. This observation echoes findings by Halubanza, Kunda, and Halubanza (2022), who similarly documented the system's utility in improving health information access.

Despite these advantages, the study also identified a major gap in policy awareness and application among registry personnel. Although Zambia has developed legal and regulatory frameworks, such as the Electronic Government Act (2021), the General Public Service Records Management Policy of 2012, and the National Archives Act Cap 175 are inadequately disseminated at the facility level. Most participants were unaware of these instruments, and very few were familiar with internationally recognized standards such as ISO 15489 and ISO 27001. This aligns with research by Marutha (2011) and Bwalya and Akakandelwa (2023), who found similar gaps in legal awareness among public health personnel in South Africa, and with Bwalya and Akakandelwa (2023), who noted widespread ignorance of e-records legislation in Zambia, respectively. The absence of standardized practices not only limits interoperability but also risks compromising the integrity, confidentiality, and retrievability of health data.

The study further revealed that SmartCare has substantially improved healthcare service delivery by reducing administrative burdens, facilitating timely access to patient records, and enhancing overall efficiency. Most participants observed quicker patient registration, easier information retrieval, and better coordination across healthcare units. These benefits have positively impacted patient throughput and quality of care. The findings align with previous studies such as those of Chaudhry et al. (2006), Nawa (2018), and Moomba (2017) that affirm EHR systems' contributions to improved healthcare outcomes and organizational efficiency.

Nonetheless, persistent challenges limit the system's overall effectiveness. The most mentioned among these are recurrent system failures manifested by server downtimes and software malfunctions that interrupt clinical workflows and delay care delivery. These technical issues reflect earlier findings by Mweebo (2014) and Mutale (2017), emphasizing the importance of ongoing system maintenance and reliable technical support.

Another critical challenge is the limited ICT proficiency among registry personnel. Many respondents reported having received minimal or no formal training in SmartCare, relying instead on informal learning. This lack of capacity not only undermines effective system use but also reinforces reliance on paper-based systems, thus negating the very benefits SmartCare seeks to deliver. This challenge is consistent with previous research (Ng'andu & Haabazoka, 2024; M'kulama et al.,2023; Mutale, 2017) and underscores the need for structured, continuous professional development.

Infrastructure constraints further impede system implementation. These include an inadequate number of computers, intermittent supply of SmartCare cards, erratic power supply, and poor internet connectivity. Such barriers were reported to cause significant disruptions in service delivery and, in some cases, force staff to revert to manual record-keeping. These observations are in line with Gumede-Moyo et al (2019), who identified infrastructural weaknesses as impediments to EHR adoption in low-resource settings.

In sum, while SmartCare offers a viable pathway to improved healthcare delivery and data management in Zambia, its success is contingent upon addressing a range of systemic, infrastructural, and capacity-related

challenges. Strengthening institutional support, investing in robust infrastructure, and enhancing user training are critical to maximizing the system's potential and aligning it with international best practices in digital health.

6. CONCLUSION AND RECOMMENDATIONS

The finding indicates that SmartCare is widely regarded by registry personnel in first-level hospitals in the Lusaka District as an efficient and user-friendly system for managing patient records. It has demonstrably improved data accessibility, minimized reliance on paper-based processes, and streamlined healthcare workflows. These perceived benefits position SmartCare as a critical tool in advancing the digital transformation of Zambia's healthcare system. However, the sustainability and long-term effectiveness of SmartCare depend significantly on the provision of consistent technical support, institutional commitment, and strategic investment in health information systems.

Importantly, the paper revealed a substantial gap in knowledge and application of existing policies and regulatory frameworks governing electronic health records. Despite the availability of instruments such as the Electronic Government Act (2021), the General Public Service Records Management Policy (2012), and the National Archives Act Cap 175, most registry personnel lacked awareness of these policies and legislation. This gap in policy dissemination and implementation undermines compliance and weakens the governance structures necessary for the effective management of digital health records.

While SmartCare has made notable contributions to operational efficiency and improved access to patient information, several implementation challenges persist. These include frequent system downtimes, inadequate training of personnel, insufficient computer equipment, irregular supply of SmartCare cards, unreliable electricity, and limited internet connectivity. Collectively, these challenges constrain system performance, hinder user adoption, and limit the system's ability to support evidence-based decision-making and high-quality healthcare delivery.

Considering the findings, the following recommendations are proposed:

i) Ensure the procurement and equitable distribution of adequate computer equipment across all health facility registries to support uninterrupted use of SmartCare.
ii) Conduct regular sensitization campaigns and training workshops to improve registry personnel's understanding of existing electronic records management policies and legal frameworks.
iii) Facilitate training programmes to familiarize registry staff with the Health Professions Council of Zambia (HPCZ) guidelines and internationally recognized standards such as ISO 15489 and ISO 27001.
iv) Implement continuous professional development initiatives to equip registry personnel with the necessary ICT competencies for effective use of the SmartCare system.
v) Establish a reliable and consistent supply chain for SmartCare cards to ensure seamless patient registration and service continuity.
vi) Invest in robust technical infrastructure, including power backup solutions and stable internet connectivity, to reduce disruptions and support real-time data management.

REFERENCES

Achampong, E. K. (2012). The state of information and communication technology and health informatics in Ghana. *Online Journal of Public Health Informatics*, 4(2), ojphi. v4i2.4191. https://doi.org/10.5210/ojphi.v4i2.4191. (Accessed on 13/1/2021).

AC06953431, A. (Ed.). (2008). Health informatics-Electronic health record communication-Part 1: Reference model. ISO

Adebayo, T.T. (2019). The Role of Health Information Officers in the Prevention and Management of HIV/AIDS in the Three Tertiary Institutions in Southwestern Nigeria. Library Philosphy and Practice (e-journal), 3625.

Adedeji, P., Irinoye, O., Ikono, R., et al. (2018). Factors influencing the use of electronic health

records among nurses in a teaching hospital in Nigeria. *Journal of Health Informatics in Developing Countries*, 12.

Ali, S. K., Khan, H., Shah, J., & Nadeem Ahmed, K. (2023). An electronic health record system implementation in a resource-limited country—lessons learned. *Digital Health*, 9, 20552076231203660. https://doi.org/10.1177/20552076231203660..

Alwan, K., Ayele, T. A., & Tilahun, B. (2015). Knowledge and utilization of computers among health professionals in a developing country: a cross-sectional study. JMIR human factors, 2(1), e4

Azamar-Alonso, A., Costa, A. P., Huebner, L. A., & Tarride, J. E. (2019). Electronic referral systems in health care: a scoping review. Clinico Economics and outcomes research: CEOR, 11, 325.

Bedeley, R. T. & Palvia P. (2014). Study of the Issues of E-Health Care in Developing Countries: The Case of Ghana. Twentieth Americas Conference on Information Systems, Savannah

Bwalya, T., & Akakandelwa, A. (2023). An assessment of government efforts towards the implementation of an integrated electronic records management system in the Zambian public service. *Zambia Journal of Library & Information Science*, 7(2), 1-15.

Chaudhry, B., Wang, J., Wu, S., Maglione, M., Mojica, W., Roth, E. et al. (2006). Systematic Review: Impact of Health Information Technology on Quality, Efficiency, and Costs of Medical Care. Annals of Internal Medicine, 144, 742-752. https://doi.org/10.7326/0003-4819-144-10-200605160-00125

Chibawe, C. P., Essiet-Gibson, I., Mwansa, F. D., Jacenko, S., Rhee, C., & MacNeil, A. (2019). Strengths, pitfalls, and lessons learned in implementing electronic collection of childhood vaccination data in Zambia: The SmartCare experience. *International Journal of Medical Informatics*, 129, 146-153. doi: 10.1016/j.ijmedinf.2019.06.006.

Clarke, K. E., Chibawe, C. P., Essiet-Gibson, I., Mwansa, F. D., Jacenko, S., Rhee, C., & MacNeil, A. (2019). Strengths, pitfalls, and lessons learned in implementing electronic collection of childhood vaccination data in Zambia: The SmartCare experience. *International Journal of Medical Informatics*, 129, 146-153.

Global Digital Health Partnership. (2021). Advancing interoperability together globally. Available at: https://www.healthit.gov/sites/default/files/page/2021-01/GDHP-Advancing%20Interoperability%20Together%20Globally.pdf. (Accessed on 10th February 2024).

Government of the Republic of Zambia. (2021). The Electronic Government Act, 2021. Lusaka, Zambia: Government Printers.

Granlien, M. F., Hertzum, M., & Gudmundsen, J. (2008). The gap between actual and mandated use of electronic medication records three years after deployment. Studies in health technology and informatics, 136, 419. Available at https://person.hst.aau.dk/ska/MIE2008/ParalleSessions/PapersForDownloads/06.HIS&EHR/SHTI136-0419.pdf. (Accessed on 10th August 2022)

Gumede-Moyo, S., Todd, J., Bond, V., Mee, P., & Filteau, S. (2019). A qualitative inquiry into implementing an electronic health record system (SmartCare) for prevention of mother-to-child transmission data in Zambia: A retrospective study. BMJ Open, 9(9), e030428.

Halubanza, S. K., Kunda, D., & Halubanza, B. (2022). A framework for an e-health system for Zambian health centres that incorporate data mining reporting. In *Proceedings of International Conference for ICT (ICICT)-Zambia* (Vol. 4, No. 1, pp. 6-17).

Health Professions Council of Zambia (HPCZ). (2011). National health care standard for Zambia: Class 'A' facilities (hospitals).

Health Professions Council of Zambia (HPCZ). (2016). Guidelines for good practice in the health care profession: Generation and management of patient records. Available at: http://www.hpcz.org.zm/wp-content/uploads/2018/07/Generation-and-Management-of-Patients-Records.pdf. (Accessed on 12th March 2021).

International Standards Organisation (ISO). (2001). 15489-1: Information and documentation—Records management part 1: General. Available at: http://www.iso.org. (Accessed on 17th February 2022).

International Records Management Trust (IRMT). (2009). Planning and managing an electronic records management programme. London. Website: http://www.irmt.org. (Accessed on 12 March 2022).

Katurura, M. C., & Cilliers, L. (2018). Electronic health record system in the public health care sector of South Africa: A systematic literature review. *African Journal of Primary Health Care and Family Medicine*, 10(1), e1–e8. doi:10.4102/phcfm. v10i1.1746.

Keakopa, S., Millar, L., O'Shea, G., Nordland, L. P., Suderman, J., Ardern, C., & Yusef, Z. M. (2009). Understanding the context of electronic records management. Training in Electronic Records Management. International Records Management Trust.

Khumalo, N. (2017) The Need for the Establishment of E-records and eHealth Legislation and Policy Framework in the Health Sector in Zimbabwe. Library Philosophy and Practice (e-journal). 1662. https://digitalcommons.unl.edu/libphilprac/1662. Accessed on 02.02.2021

Kruse, G. R., Chapula, B. T., Ikeda, S., Nkhoma, M., Quiterio, N., Pankratz, D., & Reid, S. E. (2009). Burnout and use of HIV services among health care workers in Lusaka District, Zambia: A cross-sectional study. Human Resources for Health, 7, 1-10. Available at: http://www.human-resources-health.com/content/7/1/55. (Accessed on 17th February 2025).

Latha, N. A., Murthy, B. R., & Sunitha, U. (2012). Electronic health record. International Journal of Engineering, 1(10), 25-27. International Journal of Engineering Research & Technology (IJERT) Vol. 1 Issue 10, December 2012

Liddy, C., Hogel, M., Blazkho, V., & Keely, E. (2015). The current state of electronic consultation and electronic referral systems in Canada: an environmental scan. Global Telehealth 2015: Integrating Technology and Information for Better Healthcare, 75-83.

M'kulama, A., & Bwalya, T. (2024). Digital curation of records at the National Archives of Zambia. ESARBICA Journal: Journal of the Eastern and Southern Africa Regional Branch of the International Council on Archives, 43, 176-192.

Mahalli, A. E. (2015). Adoption and barriers to adoption of electronic health records by nurses in three governmental hospitals in Eastern Province, Saudi Arabia. Perspectives in health information management, 12(Fall).

Margam, R. (2023, July 30). The Importance of EHR in Revolutionizing Healthcare Delivery and Financial Success. *International Journal of Computer Trends and Technology*, 71(7), 52–55. https://doi.org/10.14445/22312803/ijctt-v71i7p108.

Marutha, S.N (2011). Records Management in support of service delivery in the Public Health Sector of the Limpopo Province in South Africa. Dissertation (MLIS). University of South Africa. (Accessed on 4th February 2022).

Mengesha, T. (2011). Electronic solutions for Ethiopian health sector: Electronic medical record (EMR) system.

Ministry of Health [MOH]. (2008). SmartCare Software User's Manual. Lusaka: Ministry of Health

Ministry of Health (2023). Zambia Health Facility Registry Standard Operating Procedures. Lusaka: Ministry of Health. Available at: http://www.moh.gov.zm. (Accessed on 15th Nov. 2024).

Ministry of Health (2023). SmartCare Plus: Paper to Paperless in health facilities. Ndeke House, Lusaka. Available at: http://www.moh.gov.zm. ((Accessed on 15th Nov. 2024).

Ministry of Health, Zambia (2017). Zambia National Health Strategic Plan 2017-2021. Lusaka, Zambia: Government of the Republic of Zambia.

Mnjama, N. and Wamukoya, J. (2007), "E-government and Records Management: An Assessment Tool for E-records JOURNAL OF THE SOUTH AFRICAN SOCIETY OF ARCHIVISTS, VOL. 49, 2016 | SASA © 100. Readiness in Government", The Electronic Library, Vol. 25 No. 3, pp. 274-284. Available on https://doi.org/10.1108/02640470710754797. Accessed on 21st February 2022

Mutabazi, B. (2016). A case study to investigate the challenges of EMR implementation in four district Hospitals in Rwanda (Doctoral dissertation, University of Rwanda).

Mutale, M. (2017). Health workers' experiences with the use of SmartCare for decision making

in selected health facilities in Mongu and Limulunga districts of Western Province, Zambia (Doctoral dissertation, The University of Zambia).

Mwanza, L. (2019). An assessment of the appropriateness of SmartCare electronic medical record system in the delivery of HIV/AIDS services: A case study of six (6) health facilities in Lusaka district of Zambia (Doctoral dissertation, The University of Zambia).

Mweebo, K. (2014). Security of electronic health records in a resource-limited setting: The case of SmartCare electronic health record in Zambia. Australian eHealth Informatics and Security Conference Conferences, Symposia and Campus Events. Cowan University, Perth: Western Australia. https://doi.org/10.4225/75/5798297631b47.

Mwiinga S. (2019) The E-health Systems in Zambia. Daily Nation Newspaper. Issued on 13th Sept 2019. Available in https://www.pressreader.com/zambia/daily-nation-newspaper/20190913/281668256675814. (Accessed on 14th March 2020)

National Archives of Australia (2014). Information and Records Management Policy. Available from: http://www.naa.gov.au/records-management/strategic-information/information-governance/key-documents/policy.aspx (Accessed on 4th February 2022).

Nawa, Doreen (2018) UTH medical records earmarked to enter digital era. Daily Mail issued on 7th January. Available at http://www.daily-mail.co.zm/tag/digital-era/. Accessed on 4th March 2020

Nengomasha, C. T. (2009). A study of electronic records management in the Namibian public service in the context of e-government (Doctoral dissertation, University of Namibia).

Ng'andu, D. and Haabazoka, L. (2024) A Study of the Effect of Health Records Digitalization on Healthcare Facility Operational Efficiency. Open Journal of Business and Management, 12, 1135-1157. doi: 10.4236/ojbm.2024.122060.

Okello-Obura, C. (2011). Records and archives legal and policy frameworks in Uganda. *Library Philosophy and Practice (journal)*. Available at: https://digitalcommons.unl.edu/libphilprac/608. (Accessed on 2nd Feb 2021).

Pande, K. F. (2022). Investigating the implementation of SmartCare electronic health record system project in Zambia using tenets of project management (Doctoral dissertation, The University of Zambia).

Ravindra, S. S., Chandra, R., & Dhenesh, V. S. (2015). A study of the management of electronic medical records in Fijian Hospitals. arXiv preprint arXiv:1507.03659. Available on https://doi.org/10.48550/arXiv.1507.03659. (Accessed on 10th August 2022).

SanJoaquin, M. A., Allain, T. J., Molyneux, M. E., Benjamin, L., Everett, D. B., Gadabu, O. & Heyderman, R. S. (2013). Surveillance Programme of IN-patients and Epidemiology (SPINE): implementation of an electronic data collection tool within a large hospital in Malawi. PLoS medicine, 10(3), e1001400

Shah, J. R., Murtaza, M. B., & Opara, E. (2014). Electronic health records: Challenges and opportunities. Journal of International Technology and Information Management: Vol. 23: Iss. 3, Article 10. DOI: https://doi.org/10.58729/1941-6679.1082
Available at: https://scholarworks.lib.csusb.edu/jitim/vol23/iss3/10 . Accessed on 11th Nov 2023

Silvestre, E. (2018) How Electronic Health Records Strengthen the Health Systems of Low- and Middle-Income Countries: Learning from Eswatini and Mexico. Chapel Hill, NC: MEASURE Evaluation, University of North Carolina

SmartCare Zambia. (2024). About SmartCare. Retrieved from https://smartcarezambia.io (Accessed on 16th February 2025)

Stephen, M and Frank, L. (2024). The Role of Electronic Health Records in Transforming Healthcare Delivery and Financial Gains. Available at: https://www.researchgate.net/publication/377407661. (Accessed 16th Dec 2024)

Tsvuura, G. (2022). "Knowledge and skills for managing digital records at selected state Universities in Zimbabwe", *Journal of the South African Society of Archivists, Vol. 55 No. 1, pp. 110-123.*

Thit, W. M., Thu, S. W. Y. M., Kaewkungwal, J., Soonthornworasiri, N., Theera-Ampornpunt,

N., Kijsanayotin, B., & Pan-Ngum, W. (2020). User acceptance of electronic medical record system: implementation at Marie Stopes International, Myanmar. Healthcare Informatics Research, 26(3), 185-192

Van Reisen, M. (2017). International cooperation in the digital era. Universiteit Leiden.

Waithera L, Muhia J, Songole R (2017) Impact of Electronic Medical Records on Healthcare Delivery in Kisii Teaching and Referral Hospital. Med Clin Rev. Vol. 3 No. 4: 21.

World Health Organization (WHO) (2006). Medical records manual: a guide for developing Countries. Manila: WHO Regional Office for the Western Pacific.