Acta Informatica Pragensia
2025, Volume 14, Issue 3, 393–407
https://doi.org/10.18267/j.aip.265

PRAGUE UNIVERSITY OF ECONOMICS AND BUSINESS

Article Open Access

Electronic Health Record Systems in Limited Resource Settings: A Comprehensive Evaluation of the Impilo Platform

Hamufare Dumisani Mugauri [1,2], **Memory Chimsimbe** [1]

[1] Department of Global Public Health and Family Medicine, Faculty of Medicine and Health Sciences, University of Zimbabwe, Harare, Zimbabwe
[2] AIDS and Tuberculosis Programme, Ministry of Health and Child Care, Harare, Zimbabwe

Corresponding author: Hamufare Dumisani Mugauri (hmugauri@medsch.uz.ac.zw)

Editorial Record

First submission received:
January 14, 2025

Revision received:
February 20, 2025

Accepted for publication:
April 8, 2025

Academic Editor:
Jan Bruthans
Czech Technical University in Prague, Czech Republic

This article was accepted for publication by the Academic Editor upon evaluation of the reviewers' comments.

How to cite this article:
Mugauri, H. D., & Chimsimbe, M. (2025). Electronic Health Record Systems in Limited Resource Settings: A Comprehensive Evaluation of the Impilo Platform. *Acta Informatica Pragensia*, 14(3), 393–407. https://doi.org/10.18267/j.aip.265

Abstract

Background: Zimbabwe has implemented the Impilo electronic health record (EHR) system since 2016 to manage the health system electronically, gather strategic information and reduce manual documentation burden.

Objective: We evaluated the capacity of decentralized structures to effectively use the Impilo EHR platform, identify training needs and challenges and provide recommendations for enhancing its effectiveness and support for integrated people-centred services at the primary healthcare level.

Methods: We conducted a cross-sectional, mixed-method design, applying the COM-B (Capability, Opportunity, Motivation and Behaviour) model of behavioural change. Forty-five purposively selected healthcare workers (nurses, data entry clerks, receptionists, pharmacy staff, laboratory technicians and primary counsellors) from ten healthcare facilities in Harare and Bulawayo were included in this study. Interviews were transcribed, translated and manually coded for thematic analysis using the COM-B constructs.

Results: Health workers had satisfactory skills for using the Impilo EHR system but lacked troubleshooting abilities. The capacity building did not equip users with the necessary programme-specific skills. Problems such as internet connectivity, power backup, human resource shortages, interoperability issues and lack of editing rights hindered usage. The EHR system integrated primary health services but struggled with interoperability with other software and lacked data aggregation servers, limiting its effectiveness. Leadership support and user involvement were missed opportunities to enhance performance.

Conclusion: This study provided key insights into the implementation of the Impilo EHR system in Zimbabwe. The system empowers healthcare professionals with timely information, improving decision-making and patient care. However, problems such as module issues, knowledge gaps, internet connectivity, interoperability, human resource shortages and power constraints hinder its full potential. We recommend addressing these handicaps, enhancing leadership support, integrating EHR usage into performance appraisals and improving system integration with other platforms to enhance accuracy and reliability.

Index Terms

Electronic health records; EHR; Capacity building; Integrated people-centred services; Interoperability; Healthcare delivery; Zimbabwe.

1 INTRODUCTION

Zimbabwe has embraced information communication and technology in healthcare as a means of enhancing access and quality of care. The rollout of electronic systems such as District Health Information System 2 (DHIS2), Electronic Patient Monitoring System (EPMS), electronic health records (EHR), Laboratory Information System (LIMS), Electronic Logistics Management Information System (eLMIS), telemedicine and the proliferation of mobile data collecting platforms are examples of how digital health is being used to improve service delivery in the country (Ministry of Health and Child Care, 2021).

Zimbabwe has been implementing the Impilo electronic health record (EHR) system for close to ten years, starting as a pilot in 2016 and has now covered 1050 out of 1869 healthcare facilities, and is striving to cover all public healthcare facilities (Zimbabwe Ministry of Health & Child Care, 2021). The project aims to build the capacity of the Ministry of Health and Child Care (MoHCC) at the national, provincial and district levels to utilize this electronic patient management, monitoring and evaluation system as opposed to the traditional paper-based system (Elikwu et al., 2020). The primary objective of the EHR is to collect key strategic information (SI) required to measure progress in all health programme implementation and achievement of epidemic control for HIV; by generating a strong evidence base, the system informs programme decision-making in Zimbabwe (Naik et al., 2022).

The key system features of the Impilo EHR system include firstly patient registration, where Impilo facilitates the initial entry of recipients of care (RoC), ensuring accurate and comprehensive records (Windle et al., 2021). Secondly, Impilo facilitates patient management and evaluation by tracking RoC health data, including treatment history and outcomes. Thirdly, EHR enables patient tracking by monitoring the RoC health journeys, aiding continuity of care. Fourthly, the system facilitates stock usage and tracking. In this regard, Impilo manages medical supplies and tracks their utilization. Lastly, the EHR facilitates data aggregation, validation and analysis. To this end, it aggregates health data, validates their accuracy and provides insights for informed decision-making (Hossain et al., 2024; Kissi et al., 2023).

A seamless and interoperable architecture is key for integrating digital health services within Zimbabwe's health ecosystem. Interoperability is built into the EHR through an enterprise service bus using global standards such as Health Level 7 Fast Health Interoperability Resources (HL7 FHIR). The adaptation of global standards has provided opportunities for data sharing across different software platforms. To date, Impilo EHR is interoperable with the District Health Information System (DHIS 2) for national data reporting and the Laboratory Information Management System (LIMS) sharing laboratory results with other clinical records, improving data accuracy and completeness (Ministry of Health and Child Care, 2025). The absence of interoperability among digital health systems results in disjointed patient care, preventing healthcare providers from accessing complete patient histories, which leads to repeated tests, overlooked diagnoses and erroneous treatment choices. This situation also creates inefficiencies in care delivery, prolongs treatment times and raises healthcare expenses due to redundant procedures and inadequate coordination. Moreover, it obstructs data analysis, which complicates the ability of managers and policymakers to make evidence-based decisions (Li et al., 2022).

As Zimbabwe is scaling up EHR across the country, a robust assessment must be conducted that focuses on both the system and users of EHR to provide comprehensive recommendations for optimal, integrated implementation. This rapid assessment is part of the broader work being done by the Department of Biomedical Informatics and Biomedical Engineering through World Health Organisation (WHO) Health Systems Strengthening funding and other partners such as Zimbabwe Technical Assistance Training and Education Centre for Health (Zim-TTECH) with a particular focus on fostering an integrated approach to EHR implementation, managing the change process as health workers transition from a paper-based platform. It applied the COM-B (Capability, Opportunity, Motivation and Behaviour) constructs, a change management theory, to enable users to embrace the digital health management brought by EHR, with all its benefits (Timlin et al., 2021).

The rollout of the EHR system in Zimbabwe has enhanced healthcare delivery by decreasing patient waiting times, improving continuity of care and optimising record-keeping for healthcare providers. It has facilitated immediate access to patient information, which in turn enhances diagnosis and treatment, while also providing managers and policymakers with reliable health data for informed decision-making (MOHCC, 2018; Reid et al., 2020). Nonetheless, issues such as power outages, system downtimes, low digital literacy, financial limitations and cybersecurity threats have impeded its complete implementation (Silvestre, 2018).

Stakeholders have a positive outlook on the ability of the EHR system to revolutionise healthcare in Zimbabwe by increasing efficiency, enhancing patient outcomes and facilitating evidence-based decision-making. They anticipate ongoing investment in infrastructure, training and cybersecurity to bolster reliability and accessibility, particularly in rural regions. Furthermore, they look forward to improved interoperability among healthcare facilities to guarantee smooth healthcare delivery (Ministry of Health and Child Care, 2025).

The Impilo EHR plays a crucial role in supporting healthcare delivery in Zimbabwe and presents opportunities to enhance integrated, people-centred healthcare services, particularly in addressing gaps arising from weakened healthcare delivery due to vertical healthcare programming (Odekunle et al., 2017).

Justification: As Zimbabwe is scaling up EHR across the country, a robust assessment must be conducted that focuses on both the system and users of EHR to provide comprehensive recommendations for optimal, integrated implementation. This rapid assessment complements the work being done by various partners, using varied dimensions to orchestrate seamless migration of Zimbabwe's health system onto an electronic platform without compromising the basic tenets of an accurate, reliable and easily accessible health system database for decision-making at all levels. The application of the COM-B constructs (a change management theory) in this evaluation approaches this evaluation from a qualitative perspective with a view to enable users to embrace the digital health management brought by EHR, with all its benefits.

1.1 Literature review

The implementation and utilization of EHR systems have been a focal point of healthcare reform globally. These systems are designed to improve the quality of healthcare delivery by providing timely access to patient information, enhancing decision-making processes and reducing errors associated with paper-based systems (Baporikar, 2024; Elikwu et al., 2020; Ruban et al., 2024). Studies from various parts of the world reveal varying degrees of success, influenced by factors such as infrastructure, user training and system interoperability (Polner & Main, 2022).

In the African context, the adoption of EHR systems has faced numerous challenges, including limited technological infrastructure, inadequate training and resistance to change among healthcare workers (Alanazi et al., 2020). Successful EHR implementation in limited resource settings heavily relies on robust training programmes, continuous support and active involvement of healthcare providers in the system development and refinement (Mamuye et al., 2023).

Zimbabwe launched the Impilo EHR system in 2016 as part of an initiative to modernize health information management and improve healthcare service delivery. Previous assessments indicated that while the system offered significant potential for improving healthcare outcomes, its effectiveness was often hindered by issues such as connectivity problems, lack of technical support and insufficient training (Upadhyay & Hu, 2022). These challenges were not unique to Zimbabwe; similar issues had been reported in other low- and middle-income countries (LMICs), highlighting the need for tailored solutions that addressed local contexts (Mamuye et al., 2023).

Moreover, the integration of EHR systems with other health information systems, such as laboratory information management systems (LIMS) and electronic logistics information management systems (e-LIMS), was crucial for creating a comprehensive health information ecosystem. However, interoperability remained a significant barrier, affecting data consistency and the overall utility of EHR systems (de Mello et al., 2022)

This study aims to build on the existing body of knowledge by evaluating the implementation of the Impilo EHR system in Zimbabwe, focusing on the capacity of decentralized structures, user training needs and system challenges. By identifying gaps and providing actionable recommendations, this research contributes to the ongoing efforts to optimize EHR systems in LMICs and enhance integrated, people-centred healthcare services.

2 RESEARCH METHODS

2.1 Study design

This study employed a cross-sectional, mixed-method design to evaluate the capacity of decentralized structures to use the Impilo EHR system effectively, identify training needs and assess system challenges in delivering integrated people-centred services at the primary healthcare level.

Cross-sectional design: This design allowed us to capture a snapshot of the current state of EHR implementation across multiple healthcare facilities at a single point in time. This approach was instrumental in assessing the intellectual and practical skills of health workers, as well as the system attributes, motivation and leadership support for EHR usage.

Mixed-method approach: This approach was adopted to provide a comprehensive understanding of the EHR system implementation. This involved synthesizing both quantitative and qualitative data to measure and explore various aspects of the study. The quantitative component included structured questionnaires administered to healthcare providers, capturing key variables such as intellectual and practical skills, system attributes and leadership support. The qualitative component involved in-depth interviews with healthcare providers, allowing a deeper exploration of their experiences, challenges and perceptions regarding the EHR system.

***Theoretical framework*:** The study was guided by the COM-B model for behavioural change, which regards capability (C), opportunity (O) and motivation (M) as key factors influencing behaviour (B), see Table 1. This theoretical framework provided a structured approach to evaluate health workers' ability to use the EHR system effectively. Additionally, we incorporate an overall adherence element, focusing on leadership support and user involvement, to thoroughly interrogate the system and identify areas for improvement.

Table 1. *Adaptation of COM-B theory. Adapted from Jackson et al. (2014).*

Capability	**Opportunity**	**Motivation**	**Overall adherence element**
User's physical and psychological capacity to use EHR *Psychological* Cognitive capacity for EHR usage - Knowledge of how to navigate the EHR interface, input data accurately and interpret information - Comprehension of the value of EHR in service provision	External factors that make EHR usage feasible *Technical infrastructure* - Availability of reliable hardware - Network connectivity - Proficient software	Conscious and unconscious cognitive processes that direct and inspire EHR use *Intrinsic motivation* EHR user's desire to - Improve patient care - Streamline documentation - Enhance communication	Contextual factors in leadership and user involvement *Leadership support* Motivation of users through leadership endorsement, emphasizing benefits and aligning EHR use with organizational goals
Physical - User access to appropriate hardware (tablets, etc.) - Skills to interact effectively with the EHR system - Capacity to navigate through the system to enter and update records - Basic tablet utilisation skills	*Workflow integration* - Seamless integration of EHR tasks into existing clinical workflows - Interoperability *Time availability* - Sufficient time for users to effectively use EHR during patient encounters	*Extrinsic motivation* External factors such as - Efficient system that lowers workload - Supervisor advocacy - Support and mentorship - Regulatory requirements - Performance appraisal	*User involvement* End-user involvement in - Module development - Module review - System update

2.2 Setting

General setting: Zimbabwe is a landlocked, low-income country in Southern Africa that is located between Botswana, South Africa, Mozambique and Zambia with an estimated population of 16 million and a human development index of 0.516. It ranked number 154 globally out of 189 countries in 2016 (IOM, 2022). The country is divided into two urban provinces, eight rural provinces and 62 districts. The capital city is Harare and other major cities include Bulawayo, Gweru, Kadoma, Kwekwe, Masvingo and Mutare (IOM, 2022). Harare, located in the northern part of the country, is the capital and largest city, serving as Zimbabwe's political and economic hub. Bulawayo, situated in the southwestern part of Zimbabwe, is the second-largest city and an important industrial and cultural centre. Both cities are integral to the country's healthcare infrastructure, hosting some of the leading healthcare facilities in Zimbabwe.

Study setting: Harare and Bulawayo were specifically chosen for this study due to their pioneering roles in the implementation of the EHR system. These cities were among the first to adopt the EHR system during its pilot phase, which began in 2016. The prolonged experience and early adoption of the EHR system in these locations provided a rich context for evaluating its implementation and effectiveness. The healthcare facilities in Harare and Bulawayo (Table 2) have accumulated significant experience and insights since the initial rollout, making them ideal candidates for assessing the capacity of decentralized structures to effectively use the EHR system, identify training needs and explore system challenges. This selection allowed the study to make use of the extensive experience and data available in these regions, providing a comprehensive understanding of the impact the Impilo EHR system on healthcare delivery in Zimbabwe.

Table 2. *Study sites in Harare and Bulawayo.*

Harare	Bulawayo
Kuwadzana Polyclinic	Northern Suburbs
Warren Park Polyclinic	Mzilikazi
Rujeko Polyclinic	Pelandaba
Beatrice Road Infectious Diseases Hospital	Nketa
Wilkins Hospital	Nkulumane

2.3 Participants

Ten healthcare facilities from Harare and Bulawayo were chosen to provide a comprehensive overview of the system usage across different settings and service delivery scenarios. Selection criteria included the length of time the facility had been using the EHR system, the diversity of services provided and their geographical distribution to ensure a representative sample.

Inclusion criteria: All healthcare professionals actively using the Impilo EHR system found onsite during data collection were included in the study. These include nurse managers (responsible for overseeing nursing staff and ensuring the quality of patient care), health information officers (tasked with managing health data, ensuring data accuracy and facilitating EHR system usage), monitoring and evaluation officers (focused on assessing the performance and impact of healthcare services, including the use of the EHR system), matrons (senior nursing officers managing nursing services and staff), nurses (frontline healthcare providers using the EHR system to document patient care), data entry clerks (staff responsible for entering patient data into the EHR system), receptionists (administrative staff managing patient intake and initial data entry), pharmacy staff (healthcare workers managing medication records and dispensing medications through the EHR system), laboratory technicians (professionals responsible for recording and managing laboratory test results within the EHR system) and primary counsellors (staff providing counselling services and documenting interactions in the EHR system). This diverse participant pool ensured a comprehensive evaluation of the EHR system from multiple perspectives within the healthcare setting.

Exclusion criteria: Healthcare professionals who do not use the Impilo EHR system in their daily duties were excluded from participating in this study. This included temporary staff or those not directly involved in patient management.

2.4 Data collection

Two-part questionnaires were utilized to collect data. The first part focused on collecting quantitative data related to participants' intellectual and practical skills, system attributes and leadership support. The questionnaire included multiple-choice and Likert scale questions to capture a range of responses. The second part aimed at gathering qualitative data through open-ended questions, allowing participants to elaborate on their experiences, challenges and perceptions regarding the EHR system.

In-depth interviews (IDIs) were conducted with selected participants to gain a deeper understanding of their experience with the EHR system. Interviews were semi-structured, allowing flexibility in exploring specific topics while ensuring consistency in the questions asked across different participants. Simulated patient entry and treatment participatory exercises were conducted to triangulate the data collection process as follows.

Simulated patient entry and treatment participatory exercises: Before focus group discussions (FGDs) were conducted, one of the evaluation team members performed simulated patient entry and treatment exercises. These participatory exercises enabled the evaluator to assess the technical (intellectual and physical) skills required to navigate the EHR system and observe its performance. Activities included transferring patients from one point to another and generating and printing reports. This exercise aimed to triangulate participants' responses with direct observations, thereby verifying the asserted intellectual and technical skills.

Internal validity: This was ensured by controlling for potential confounders by matching participants on key characteristics such as age, gender and health status. Random sampling was also used to select participants, minimizing selection bias.

External validity: This was achieved by conducting the study across multiple healthcare facilities to ensure generalizability. We also included diverse participant demographics to enhance representativeness.

Reliability: This was ensured by standardized data collection procedures ensuring consistency. Furthermore, inter-rater reliability checks were conducted during the coding process to ensure the accuracy and consistency of qualitative analysis.

Table 3 below summarises the eventual sample for the qualitative data collection. Some participants participated in all three activities of data collection, namely IDIs, FGDs and implementation simulations as displayed, whilst others only participated in one or two of the activities. Ultimately, the approach produced a robust database to analyse and draw critical conclusions on all aspects of the evaluation.

Table 3. *Profile of respondents' sample.*

Respondent or participant	Methods used and numbers engaged									Overall total
	Focus group discussions			Implementation simulations			In-depth interviews			
	M	*F*	*Total*	*M*	*F*	*Total*	*M*	*F*	*Total*	
Health directorate	0	0	0	0	0	0	1	1	0	1
Health information	0	0	0	0	0	0	1	1	2	2
M & E	0	0	0	0	0	0	1	0	1	1
Pharmacy	0	0	0	0	0	0	1	0	1	1
Laboratory	0	0	0	0	0	0	0	1	0	1
Clerical	0	6	6	2	4	6	4	6	0	12
Sisters in charge	0	4	4	0	0	0	2	6	8	12
Nurses	6	5	11	3	6	9	4	9	13	42
Data entry clerks	0	3	3	5	3	8	4	2	6	17
Primary counsellors	2	6	8	4	3	7	4	5	9	24
Total	**8**	**24**	**32**	**14**	**16**	**30**	**22**	**30**	**40**	**216**

Interviews, lasting between 25 and 35 minutes, were conducted using a structured guide containing open-ended questions, see Table 4. The guide encompassed topics related to participants' knowledge and skills in utilizing the EHR system, as well as their perceptions of its usefulness. Additionally, we practically assessed their ability to use the EHR system for data entry, patient monitoring, communication and report generation. Interviews were conducted in quiet locations, predominantly in open spaces or offices, ensuring minimal distractions. While the primary language of the discussions was English, participants were encouraged to express themselves in vernacular languages (Shona or Ndebele) to better articulate their experiences with the EHR system.

To ensure the comprehensive coverage of themes, saturation was achieved through regular debriefing sessions among the investigators, focusing on refining probing techniques. Interviews were concluded once it was determined that no new issues or themes were emerging.

Table 4. *Key evaluation questions.*

Evaluation criterion	Key questions
Technical skills	• Are you able to navigate through the EHR without assistance? • Are you able to enter and retrieve patient data? • Are you able to generate reports on the work done? • Are you able to perform basic troubleshooting on EHR?
Capacity utilization	• Are you able to communicate with other departments through EHR? • Does EHR assist you in making clinical decisions? • Are you able to integrate EHR into routine patient care workflow? • Have you used established channels for support/troubleshooting?
System attributes	• Is there a consistent power supply for EHR functionality? • Are there reliable power backup alternatives for EHR? • Is there reliable internet connectivity? • What is the average system downtime? • Are there adequate, functional data entry gadgets on site? • Is there consistency in data entered and output through reports? • Is there a reliable help desk in the case of system problems? • What is the response rate/turnaround time?
Integration and interoperability	• Are you able to utilize EHR outside the facility, i.e., outreach? • Are multiple users able to simultaneously access the same patient data? • Does EHR give you access to previous treatment history for the client? • Are you able to use EHR to coordinate patient care plans? • Are you able to share patient data with other healthcare centres?
Leadership support	• Is there leadership support for consistent EHR usage?

2.5 Data analysis

All the interviews were transcribed verbatim. Audio recordings, inclusive of local languages, were transcribed and translated into English by investigators proficient in the respective languages, ensuring accuracy by cross-checking against the original digital recordings. Both investigators conducted multiple readings of the transcripts, followed by systematic manual coding and categorization into predetermined themes. Additionally, emergent themes were identified from recurring related responses. The transcripts underwent a detailed manual analysis for interpretation and were subsequently organized into key dimensions to identify patterns across different participant groups. Soft-copy transcripts were securely stored on password-protected computers and audio recordings were deleted after transcription. Participants did not review the transcripts for comments.

The study team independently reviewed and coded the transcripts, guided by the constructs of the COM-B theory to explore participants' perceptions of the utility of screening tools in public health settings. A combination of open and axial coding techniques was employed to facilitate a comprehensive interpretation of the data. The qualitative data were analysed using a hybrid approach, integrating both inductive and deductive coding methods. The codes were organized into three primary domains—capability, opportunity and motivation—encompassing aspects such as knowledge, skills, cues to action, ergonomics and motivational factors.

The investigators collaboratively reviewed and refined the emerging key dimensions and themes. This iterative process of refinement and review continued until thematic saturation was achieved, indicating that no additional themes or categories could be identified. The analysis process highlighted significant differences in healthcare workers' perceptions of the EHR system and its utility in public health settings. Participant demographic characteristics were derived from the qualitative interviews, see Online appendix A.

3 SOLUTIONS AND RESULTS

3.1 Participants' characteristics and themes related to COM-B model

The participants (n = 45) were mostly female (30; 66.6%) and nurses (20; 44.4%). The majority had experience using EHR for more than one year (26; 57.7%). Only 17 (37.7%) received formal training on EHR while the rest received on-the-job training, see Table 5.

Table 5. *Demographic characteristics of participants.*

Variable	Bulawayo	Harare	Total	Proportion (%)
Total	24	21	45	100
Profile				
• City health director	1	0	1	2.2
• Provincial health information officer	1	1	2	4.3
• Provincial M & E officer	1	1	2	4.3
• Nurse managers	5	3	8	17.4
• Nurses	11	9	20	43.5
• Data entry clerks	4	4	8	17.4
• Reception clerks	1	2	3	6.5
• Laboratory technician	0	1	1	2.2
• Pharmacy technician	0	1	1	2.2
Gender				
• Male	8	7	15	32.6
• Female	16	14	30	65.2
Duration of EHR usage				
• < 6 months	5	7	12	26.1
• 6-12 months	4	3	7	15.2
• >1 year	15	11	26	56.5
Training on EHR				
• Formal	9	8	17	36.9
• On the job	15	13	28	61.1

We present the four constructs of the COM-B model and the themes that emerged under each construct supported with verbatim, minimally edited quotes, see also Table 6 and Online appendix B.

Table 6. *Themes and key dimensions from in-depth interviews and their relevant COM-B theory constructs and domains.*

Themes and key dimensions	Relevant COM-B construct and *operational definition*	Relevant COM-B domain
Theme 1: Technical skills *Key dimensions* • Navigate EHR un-assisted • Enter and retrieve data • Generate reports • Perform basic troubleshooting • Theoretical knowledge of EHR value	**Psychological and physical** *"EHR users having both the intellectual appreciation and technical skills for utilization"*	**Capability**
Theme 2: Capacity utilisation *Key dimensions* • Ability to communicate via EHR, internal and external • EHR role in the clinical decision-making process • EHR integrated with ideal patient care workflow • Utilisation of existing support systems	**Technical infrastructure,** **workflow integration** **time availability** *"Interactions between EHR software, hardware and how the system fits into existing patient workflow"*	**Opportunity**
Theme 3: Integration and interoperability *Key dimensions* • System access within and without • Simultaneous access to records • Previous treatment database • Sharing patient records across healthcare facilities	**Intrinsic and extrinsic motivation** *"Motivation to use EHR as a consequence of appreciating its value as good ergonomics"*	**Motivation**

Themes and key dimensions	Relevant COM-B construct and *operational definition*	Relevant COM-B domain
Theme 4: System attributes *Key dimensions* • Appreciate system value • Consistent power supply and reliable backup • Consistent connectivity and internet backup • Functional gadgets • Reliable help desk • Ability to produce accurate and reliable records		
Theme 5: Leadership support and user involvement *Key dimensions* • Supervisor advocacy • Leadership endorsement • Performance appraisal • Involvement of users in module development and review	**Overall adherence element** *"Clear leadership buy-in, constant motivation for utilisation"* **System ownership** *"Nothing for us without us"*	**Leadership support – motivation**

3.2 Capability domain

User's physical and psychological capacity to use EHR.

3.2.1 Physical

This theme was assessed through implementation simulations whereby the users entered pseudo-patients into the system and evaluators observed how users handled the system. The users were also required to download a specified report to evaluate this skill. Furthermore, the availability of adequate gadgets, mainly tablets, was made in the context of the facility's needs as informed by the entry points for service provision. The results of this exercise are quantified in Table 7 below.

Table 7. *Technical skill evaluation for EHR users.*

Variable	Bulawayo	Harare	Total	Proportion
Total	**13***	**10***	**23**	**100**
Initial patient registration	13	10	23	100
Record retrieval	10	8	18	78.3
Workflow consistency	13	10	23	100
Patient transferred to the next department	9	10	19	82.6
Report generation	7	6	13	56.5
Downloading and printing reports	3	4	7	30.4
Adequate gadgets	13	10	23	100
Basic troubleshooting skills	7	4	11	47.8

Note: * *The number only includes users evaluated on this criterion and not the entire sample size.*

Practical assimilation revealed that 100% of the users were able to enter, retrieve and be consistent in using EHR in line with the standard workflow of attending to the clients. Notably, 56.5% of the users were able to generate and print reports in terms of both skills and system problems. The gaps identified include proficiency in data management and analysis, effective use of clinical decision support (CDS) tools, basic troubleshooting for EHR system issues, facilitating data exchange between systems and engaging patients using EHR tools. These gaps lead to data inconsistencies, missed opportunities for evidence-based decisions, increased system downtime, fragmented patient records and reduced patient engagement.

The broader impact on the healthcare system includes compromised data quality affecting clinical decisions, reduced workflow efficiency due to lack of CDS utilization and IT skills, hindered care continuity from interoperability problems, lower patient satisfaction and outcomes due to inadequate engagement, and resource diversion towards IT support.

To address these issues, we recommend targeted training programmes focusing on specific skills, continuous professional development, adequate technical support and initiatives to enhance patient engagement using EHR tools. Addressing these skills and their broader impact will result in more actionable recommendations for improving capacity building and healthcare service delivery. EHR users encounter system problems such as failing to download a report or basic troubleshooting, see Table 7.

3.2.2 Psychological

This theme was observed across the ten facilities visited. Participants had clear intellectual knowledge of the value of the EHR system for the health system. EHR users acknowledged the importance of EHR such as reduction in the use of multiple registers and the prevention of double patient entry into EHR and paper-based registers. Participants highlighted that double entry was a significant burden to them. Additionally, participants highlighted issues such as inadequate human resources and lack of training as barriers to effective EHR utilisation; therefore, these challenges need to be addressed. Staff attrition further compounded these issues as city councils often hired stand-in nurses who were not trained in EHR, negatively affecting EHR implementation in the facilities. Problems with software proficiency were revealed, associated with reports that are inaccurate and the system failing to provide consistency with previously documented information on the same patient. We went further to verify this information by downloading a report on HIV-tested individuals. The register contained eight entries for the day and the system produced a report with five entries. We went further to search for the missing entries and indeed, they had been entered into the EHR but did not appear on the report. This was documented as a situation requiring troubleshooting, see Table 7.

3.3 Opportunity domain

External factors that make EHR usage feasible.

3.3.1 Capacity utilisation construct

This construct was interrogated under the following sub-themes.

3.3.1.1 Technical infrastructure

Availability of reliable hardware: All ten sites had entry-specific tablets and site-specific servers. However, server breakdowns were reported.

Participants noted a possible link between server malfunction and the installation of an updated version of the EHR system. System incompatibility issues between the EHR system and the EHR servers were also reported and this negatively affected EHR implementation in the facilities. Additionally, parallel systems were also reported with no interoperability between EHR and the laboratory management information system, which was used for ordering commodities, see Table 7.

Electricity blackouts affected consistent system functioning, particularly in four of the ten facilities visited. In some instances, there was no backup power to ensure consistent system use, causing delayed data entry. EHR use was restricted to times when electricity was available due to the facilities' non-functioning solar systems. The facilities lacked a backup power supply during outages as the solar batteries had not been charged for more than a year and had not been replaced. EHR deployment in the facilities was further hampered by the absence of generators for power backup, see Table 7.

Network connectivity was reported to have sporadic hiccups, which resulted in the system failing to process and progress. This was particularly a challenge when attending to clients. Participants reported numerous concerns with the tablet freezing, preventing them from progressing with patient entry. They proposed an EHR system that would allow patient information to be entered offline and synchronized once the network was restored. One participant expressed irritation with system failures, saying, *"Getting stuck with a patient in front of me is bad."*

3.3.1.2 Workflow integration

Users acknowledged that the EHR flow was consistent with standard workflows for attending to patients. Participants reported that the EHR system facilitates internal (intra-facility) interoperability, allowing patient information to be transferred between devices and departments such as the laboratory, pharmacy, opportunistic

infection clinic, visual inspection with acetic acid and camera and HIV testing services. It also allows simultaneous access to patient records and monitors patient queues via the EHR for simplified help. The EHR, however, does not provide inter-facility interoperability or give provincial staff access to facility data because the servers are located locally. As a result, despite the usage of Impilo EHR, clients can visit several clinics and undergo recurrent HIV testing, even if they have already been diagnosed as positive at one facility. The lack of system-wide tracking distorts statistics since the EHR does not detect when a client seeks the same service at another clinic, see Table 7.

3.3.1.3 Time availability

This theme was observed across the ten sampled facilities. Clinic setups are associated with high patient flows in the morning, which demand swift and efficient systems to attend to patients within a reasonable timeframe. Sufficient time for users to effectively use EHR during patient encounters was affected when the system was running slow. Due to the high patient load in clinics, clinic staff were unable to complete back-capturing of patient data, as they completed work at 4 p.m. and began each new day with long queues. Participants advocated providing incentives for overtime work and allowing them to enter data into the Impilo EHR after hours, which would increase EHR utilisation, see Table 7.

3.4 Motivation domain

Conscious and unconscious cognitive processes that direct and inspire EHR use.

3.4.1 Intrinsic motivation

This theme was observed across all the healthcare facilities in Harare and Bulawayo. It was established that motivation plays a crucial role in shaping how users interact with EHR. It was explored under the following tenets.

Autonomy and sense of control: The users had divergent views concerning whether EHR allowed customization and flexible workflows to motivate usage. EHR users expressed concern that the Impilo EHR system diagnoses were not specific to Zimbabwe, were unnecessarily numerous and contributed to time inefficiencies. Clinic staff preferred a concise list of diagnoses that corresponded to those on the Tally 5 form, which they use for monthly data reports. We interrogated this assertion and established that the diagnosis package in EHR is according to the International Classification of Diseases (ICD) version 10, which is a standardized disease and injury classification. The users resorted to using EHR notes where their preferred diagnosis was not among the options.

Sense-making and meaningful work: Users concurred that EHR usage was inevitable given technological advancements that promote the use of electronic databases as opposed to manual entry of data. The ability to retrieve past information on a patient and continue the management in the context of patient history was motivating.

Creativity and exploration: Inquisitive users were able to handle the system and explore its full potential such as reaching out to the help desk in the case of challenges, which motivated them.

Mastery and skill development: The EHR uses an entry-first approach and some users perceived this approach to be inappropriate for certain situations such as when a woman presents in labour fully dilated.

"Honestly, when a woman is fully dilated, I cannot waste that critical moment by entering into a tablet. I deal with the woman first until I am sure the mother and baby are safe. When I go back to the tablet, I cannot enter correct details on the time of delivery, etc., that is a problem because the records will not be a true reflection of the work I would have done…." (Impilo EHR user, urban clinic).

EHR use provided an opportunity for developing skills in gadget usage by some users unlike the old schools as it only needed one to be motivated to learn, see Table 7.

3.4.2 Extrinsic motivation

This theme was observed across the ten facilities visited in Harare and Bulawayo with consistencies of responses that centred on the system failures and deficiencies negatively affecting the users' propensity to routinely use it. EHR users were demotivated to utilize the system due to a variety of issues, including poor network access, power outages, difficulty retrieving critical data and the continued use of paper-based registers, see Table 7.

3.5 Overall adherence element domain

This additional domain was added deductively to address emanating themes that were outliers and yet prominent. These are contextual factors in leadership support and user involvement.

3.5.1 Leadership support

This theme was observed across various facilities visited in Harare and Bulawayo. There were varied perspectives regarding supervisor support, leadership endorsement of the system and aligning EHR usage to organizational goals. However, challenges such as lack of leadership support and workload affected EHR utilisation, see Table 7.

"The report is needed weekly whether Impilo EHR is working or not, and when the report raises eyebrows because of its inaccuracies, then I am in trouble, look here, I didn't accord a diagnosis of influenzas, the system did by classifying the symptoms I entered and I had to explain how I arrived at these confirmed diagnoses without laboratory tests. At times our managers don't seem to understand the problems we have with Impilo EHR…." (EHR user, urban clinic).

"One day I was determined to use Impilo EHR consistently throughout the day, the queue grew long outside because the system was slow, the sister in charge came and gave me a thorough shout, some patients had already gone to report to her that the queue was not moving" (Impilo EHR user, urban clinic).

3.5.2 User involvement

This theme emerged prominently across participants from Harare and Bulawayo. Users concurred that EHR performance would be enhanced if module development, review and capacity building all involved users at the lowest level, see Table 7.

"The system was a top-down approach, consulting us from the outset would have helped, we would have suggested what is critical for the system to work without interrupting workflow, for example, we would have said no to a system that only works when connected to the internet when we have such serious internet problems, I mean, is it not possible to have a system where I can enter data even when off-line and it synchronizes later?" (Impilo EHR supervisor, urban area)

4 DISCUSSION

Our key findings indicate sub-optimal capacity utilization of the electronic health record (EHR) system. Although health service providers are intrinsically motivated to routinely use the EHR, various systemic factors—including infrastructural and technical issues, shortage of human resources for health, interoperability challenges and data quality concerns—hinder a seamless full transition to the EHR.

Our findings underscore the importance of using the COM-B framework to understand the enablers and barriers to the full utilization of the EHR capacity by service providers in urban clinics in Zimbabwe. The findings from this rapid assessment are discussed under the COM-B domains as follows.

Capability: The technical proficiency observed among health workers in navigating the EHR system may largely be attributed to routine usage rather than structured capacity-building initiatives. This hypothesis is supported by the notable concern regarding the exclusion of service providers from capacity-building sessions and module review processes. Consequently, some modules—such as the diagnosis package, ANC and maternity modules—do not fully align with practical service delivery workflows. This finding is corroborated by existing literature (Ruban et al., 2024; Upadhyay & Hu, 2022). Furthermore, the intellectual understanding of the value of EHR in health service provision, as demonstrated by the service providers, correlates with their utilization capability. The healthcare workers' recognition of the necessity for an electronic health management system underscores the importance of complementing their intrinsic knowledge with comprehensive capacity-building sessions. These sessions should encompass all aspects of implementation dynamics from a health professional's perspective and be combined with training in system navigation skills to cultivate both practically and intellectually proficient users (Ali et al., 2023). Additionally, integrating the EHR system with other electronic platforms utilized by the Ministry of Health and Child Care for laboratory and pharmacy services could mitigate the verticalization concerns raised by participants.

***EHR customization and flexibility*:** The principle of "one size does not fit all" is particularly pertinent in the context of patient care and electronic health record (EHR) system integrations (Bogiatzis et al., 2025). The operational scale, scope of services provided and existing processes significantly influence the optimal configuration of the EHR

system (Aguirre et al., 2019). Insights from in-depth interviews (IDIs) and focus group discussions (FGDs) reveal that the current EHR system fails to adequately address unique clinical scenarios, such as those encountered in maternity wards during deliveries, where immediate patient care takes precedence over documentation. An ideal solution would enable post-attendance data entry. Additionally, facilitating information entry into the EHR with subsequent synchronization upon restoration of connectivity would be advantageous.

***Opportunity*:** The flow of the EHR system was found to be well-aligned with the standard workflow for service provision at primary healthcare sites. This alignment facilitated smooth and seamless patient entry and transfer within the facility. However, frequent power outages, inadequate backup systems and internet connectivity issues adversely affected the utilization of the EHR system. High patient inflows necessitated an efficient system that would not cause delays in patient care. Ideally, the system should process commands swiftly, enabling healthcare providers to attend to patients promptly while simultaneously entering data (Aguirre et al., 2019). Unfortunately, system or internet disruptions hampered this process, thereby increasing the time required to attend to patients.

***Customization and flexibility*:** Customization and flexibility are paramount considerations that extend beyond front-end features. The ability to integrate with existing systems is essential (Lazar, 2021). An EHR system, regardless of its extensive feature set, is rendered ineffective if it cannot seamlessly integrate with hospital and large healthcare organization systems. This challenge is a major limitation of the current EHR system, which relies on facility-based servers and lacks the capability for interoperability with other healthcare facilities and digital health interventions, such as the laboratory information management system and electronic logistics information management system. The assessment underscores the critical and urgent need for inter-facility communication via the EHR to enhance its relevance and utility to the healthcare system. Achieving a functional electronic system that operates cohesively across the entire healthcare delivery system of a country represents the gold standard (Torab-Miandoab et al., 2023).

***Motivation*:** The intrinsic motivation of health workers is evident, as reflected in expressions such as “a good system…” and “not the future, but the present…”. This observation aligns with previous studies on health worker perceptions of digital health (Veenstra et al., 2022). In scenarios where health workers are required to complete numerous, program-specific registers with significant duplication beyond demographic data, the EHR system emerges as a solution to the myriad challenges faced by healthcare workers. It offers an opportunity for an electronic system that makes patients' current and previous records readily accessible.

However, this intrinsic motivation is undermined by the current limitations of the EHR system. While the EHR system significantly alleviates the documentation burden, its reliability issues, power shortages, staff shortages and lack of internet backup and outreach entry support diminish the positive impact. Addressing these challenges will enhance motivation and lead to the optimal and consistent use of the system, as demonstrated in previous studies (Veenstra et al., 2022).

***Overall adherence element*:** The evaluation revealed that leadership support for sustained utilization of the EHR system was sub-optimal and inconsistent in some instances. Additionally, the EHR system is currently not integrated into performance appraisals but is viewed primarily as a tool for service delivery. Several studies advocate for a balanced approach that incorporates both EHR utilization and service delivery as essential elements for optimizing healthcare systems and ensuring high-quality patient care (Holmgren et al., 2021). Furthermore, involving service providers in module reviews, where real work scenarios are discussed and feedback on optimal workflow is solicited, is crucial for fostering full acceptance and effective implementation of EHR at all levels. This approach aligns with previous studies that emphasize the importance of the "nothing for us without us" principle (Windle et al., 2021).

4.1 Limitations

The study has several limitations that should be considered when interpreting its findings. Firstly, the geographical scope is confined to specific pioneering sites, which may not comprehensively represent the diverse geographical and service delivery contexts across Zimbabwe. Additionally, the urban-based focus of our assessment could introduce bias, potentially limiting the applicability of the findings to rural areas. Furthermore, the reliance on self-reported data from healthcare providers might introduce biases to the study that could affect the accuracy of the findings.

5 CONCLUSION

This comprehensive evaluation offers a critical overview of the electronic health record system in Zimbabwe, elucidating key insights into the implementation status at pioneering sites. It is important to improve the current EHR system modules to overcome limitations and better cater to a variety of healthcare requirements, enhance network infrastructure to minimize connectivity problems and guarantee dependable access to the system across different areas, and address interoperability challenges among various health systems to enable smooth data sharing. There is a need to establish reliable backup power systems to avoid interruptions caused by inconsistent power sources. Ongoing training should be offered to healthcare professionals to ensure effective and consistent use of the EHR system. Additionally, policymakers should focus on investing in technology and infrastructure to make full use of the EHR system capabilities for advancing healthcare delivery.

ADDITIONAL INFORMATION AND DECLARATIONS

Acknowledgments: We extend our sincere appreciation to the study participants for their valuable contributions, which were integral to the success of this research. We also acknowledge the *Ministry of Health and Childcare* for granting the necessary approvals and facilitating the execution of this study. Furthermore, we recognize the *University of Zimbabwe* for its institutional support and oversight, under whose auspices this research was conducted.

Conflict of Interests: The authors declare no conflict of interest

Author Contributions: H.D.M.: Conceptualization, Methodology, Software, Writing – Original Draft, Writing – Reviewing and Editing. M.C.: Conceptualization, Methodology, Data curation, Visualization, Writing – Original Draft, Writing – Reviewing and Editing.

Institutional Review Board Statement: This study was reviewed and approved by the *Institutional Review Board of the Ministry of Health and Childcare*. Given that the research was conducted within the framework of routine program implementation and exclusively involved healthcare staff rather than clients, it was deemed exempt from additional ethical clearance requirements.

Informed Consent Statement: Participation in this study was voluntary, and all involved healthcare staff were informed of the study's purpose, scope, and intended use of data. Given that the research was conducted as part of routine program implementation, formal written consent was not required. However, verbal consent was obtained, ensuring that participants understood their role and the nature of their contributions. Confidentiality and anonymity were upheld throughout the study, and no personal identifiers were collected. Approval for the study was granted by the *Institutional Review Board of the Ministry of Health and Childcare*, which determined that the research was exempt from additional ethical clearance.

Statement on the Use of Artificial Intelligence Tools: The authors declare that they didn't use artificial intelligence tools for text or other media generation in this article.

Data Availability: The data supporting this study's findings are available as online appendices that are also available on the webpage of this article.

> **Online appendix A: Original dataset** – available at https://aip.vse.cz/attachments/000047.xlsx
>
> **Online appendix B: Qualitative findings from in-depth interviews and their relevant COM-B theory constructs and domains** – available at https://aip.vse.cz/attachments/000048.docx

REFERENCES

Aguirre, R. R., Suarez, O., Fuentes, M., & Sanchez-Gonzalez, M. A. (2019). Electronic Health Record Implementation: A Review of Resources and Tools. *Cureus*, 11(9), e5649. https://doi.org/10.7759/cureus.5649

Alanazi, B., Butler-Henderson, K., & Alanazi, M. R. (2020). Factors Influencing Healthcare Professionals' Perception towards EHR/EMR Systems in Gulf Cooperation Council Countries: A Systematic Review. *Oman Medical Journal*, 35(6), e192. https://doi.org/10.5001/omj.2020.85

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

Baporikar, N. (2024). Role of Information Technology in Enhancing Healthcare Services. In *Digital Technologies for a Resource Efficient Economy* (pp. 63–87). IGI Global Scientific Publishing. https://doi.org/10.4018/979-8-3693-2750-0.ch004

Bogiatzis, M., Smyth, W., Irving, L., & Morton, J. (2025). EMR "one size does not fit all": Nurses' and midwives' opinions about using electronic medical records. *Australian Journal of Advanced Nursing*, 41(4), 4–13. https://doi.org/10.37464/2024.414.1205

De Mello, B. H., Rigo, S. J., Da Costa, C. A., Da Rosa Righi, R., Donida, B., Bez, M. R., & Schunke, L. C. (2022). Semantic interoperability in health records standards: A systematic literature review. *Health and Technology*, 12(2), 255–272. https://doi.org/10.1007/s12553-022-00639-w

Elikwu, I. M., Igbokwe, A. C., & Emokhare, G. (2020). Effect of Electronic Health Information System on Medical Records Management in Public Healthcare Institutions. *Unizik Journal of Business*, 3(1), 43–56. https://doi.org/10.36108/unizikjb/0202.30.0140

Holmgren, A. J., Downing, N. L., Bates, D. W., Shanafelt, T. D., Milstein, A., Sharp, C. D., Cutler, D. M., Huckman, R. S., & Schulman, K. A. (2021). Assessment of electronic health record use between US and Non-US health systems. *JAMA Internal Medicine*, 181(2), 251. https://doi.org/10.1001/jamainternmed.2020.7071

Hossain, M. R., Mahabub, S., Masum, A. A., & Jahan, I. (2024). Natural Language Processing (NLP) in Analyzing Electronic Health Records for Better Decision Making. *Journal of Computer Science and Technology Studies*, 6(5), Article no. 5. https://doi.org/10.32996/jcsts.2024.6.5.18

Kissi, J., Annobil, C., Tijani, A., & Kissi, A. A. (2023). Electronic health record impact on data quality: An integrated review. *Integrated Health Research Journal*, 1(2), Article no. 2. https://doi.org/10.47963/ihrj.v1i2.1376

Lazar, B. (2021). 6 Key Features for an Effective EHR System. *LinkedIn*. https://www.linkedin.com/pulse/6-key-features-effective-ehr-system-benjamin-lazar-mba-/

Mamuye, A., Nigatu, A. M., Chanyalew, M. A., Amor, L. B., Loukil, S., Moyo, C., Quarshie, S., Antypas, K., & Tilahun, B. (2023). Facilitators and Barriers to the Sustainability of eHealth Solutions in Low- and Middle-Income Countries: Descriptive Exploratory Study. *JMIR Formative Research*, 7(1), e41487. https://doi.org/10.2196/41487

Naik, N., Hameed, B. M. Z., Sooriyaperakasam, N., Vinayahalingam, S., Patil, V., Smriti, K., Saxena, J., Shah, M., Ibrahim, S., Singh, A., Karimi, H., Naganathan, K., Shetty, D. K., Rai, B. P., Chlosta, P., & Somani, B. K. (2022). Transforming healthcare through a digital revolution: A review of digital healthcare technologies and solutions. *Frontiers in Digital Health*, 4, 919985. https://doi.org/10.3389/fdgth.2022.919985

Odekunle, F. F., Odekunle, R. O., & Shankar, S. (2017). Why sub-Saharan Africa lags in electronic health record adoption and possible strategies to increase its adoption in this region. *International Journal of Health Sciences*, 11(4), 59–64. https://doi.org/10.12856/JHIA-2018-v5-i1-147

Polner, M., & Main, K. (2022). What Is An EHR? Everything You Need To Know. *Forbes Advisor*. https://www.forbes.com/advisor/business/software/electronic-health-record-ehr/

Ruban, S., Prabagar, S., Moorthy, C., Manimozhi, J. P., Joel, M. R., & Manikandan, G. (2024). Making clinical decisions to treat patients by using health information technology. In *Responsible AI for Digital Health and Medical Analytics* (pp. 87–112). IGI Global. https://doi.org/10.4018/979-8-3693-6294-5.ch004

Timlin, D., McCormack, J. M., & Simpson, E. E. (2021). Using the COM-B model to identify barriers and facilitators towards adoption of a diet associated with cognitive function (MIND diet). *Public Health Nutrition*, 24(7), 1657–1670. https://doi.org/10.1017/S1368980020001445

Torab-Miandoab, A., Samad-Soltani, T., Jodati, A., & Rezaei-Hachesu, P. (2023). Interoperability of heterogeneous health information systems: A systematic literature review. *BMC Medical Informatics and Decision Making*, 23, Article no. 18. https://doi.org/10.1186/s12911-023-02115-5

Upadhyay, S., & Hu, H. (2022). A Qualitative Analysis of the Impact of Electronic Health Records (EHR) on Healthcare Quality and Safety: Clinicians' Lived Experiences. *Health Services Insights*, 15, 11786329211070722. https://doi.org/10.1177/11786329211070722

Veenstra, G. L., Dabekaussen, K. F. A. A., Molleman, E., Heineman, E., & Welker, G. A. (2022). Health care professionals' motivation, their behaviors, and the quality of hospital care: A mixed-methods systematic review. *Health Care Management Review*, 47(2), 155–167. https://doi.org/10.1097/HMR.0000000000000284

Windle, J. R., Windle, T. A., Shamavu, K. Y., Nelson, Q. M., Clarke, M. A., Fruhling, A. L., & Tcheng, J. E. (2021). Roadmap to a more useful and usable electronic health record. *Cardiovascular Digital Health Journal*, 2(6), 301–311. https://doi.org/10.1016/j.cvdhj.2021.09.007

World Health Organisation. (2021). *Nothing for Us, Without Us. Opportunities for Meaningful Engagement of People Living with NCDs: Meeting Report* (1st ed). World Health Organization. https://www.who.int/publications/i/item/nothing-for-us-without-us-opportunities-for-meaningful-engagement-of-people-living-with-ncds

Zimbabwe Ministry of Health & Child Care. (2021). National Health Strategy for Zimbabwe (2021—2025)—Free Download PDF. https://kupdf.net/download/national-health-strategy-for-zimbabwe-2021-2025_6381a462e2b6f535479685a1_pdf

Acta Informatica Pragensia is published by the Prague University of Economics and Business, Czech Republic | eISSN: 1805-4951