

Exploring the Sustainability of Electronic Medical Record Systems in Decentralised Local Government Settings in Malawi: The Case of Mulanje District

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Abstract

Electronic medical record systems (EMRs) are crucial for improving healthcare in low-resource settings but face sustainability challenges, particularly in decentralised local governments like Mulanje District, Malawi. This study aims to contribute to the existing literature by identifying and analysing specific factors influencing the sustainability of EMR. Using a qualitative case study design and the Program Sustainability Assessment Tool (PSAT), data were collected through semi-structured interviews and analysed with NVivo. Key findings, including the impact of environmental support, funding instability, essential partnerships, organisational capacity, and adaptation strategies, offer novel insights into the barriers and facilitators for sustainable EMR implementation in decentralised governance contexts. Despite the presence of local champions, persistent funding challenges after donor support and gaps in organisational capacity alongside the absence of tailored sustainability plans are identified as critical hindrances. This study offers strategic insights and stresses proactive planning to address EMR sustainability challenges in under-resourced, decentralised healthcare systems.

Keywords: Electronic Medical Records Systems (EMRS); Sustainability; Decentralised; Local Council.

1. Introduction

Electronic medical record systems (EMR) are computer programmes created for gathering, storing, and manipulating data and offering secure access to all patient information. EMRs track patient health data generated during one or more interactions

in healthcare settings. These data include the patients' demographics, notes on their progress, issues, prescriptions, vital signs, previous medical history, vaccines, laboratory results, and radiological reports (Ben-Assuli, 2015; Heart, Ben-Assuli & Shabtai, 2017). Within the health information systems domain, a shift is occurring from Electronic Medical Records Systems (EMRs) to Electronic Health Records Systems (EHRs), as EHRs are a more comprehensive report of a patient's overall health than EMRs which are a narrower view of a patient's medical history (Ministry of Health, 2020).

In 2001, Kamuzu Central Hospital implemented the first EMRs in Malawi, which included patient registration and discharge processes. Implementing EMRs has not only improved data completeness by reminding service providers of the required fields but has also introduced various advantages, such as reducing medical errors caused by typographical mistakes and simplifying the reporting process, enabling the generation of reports with just a click of a button (Chawani, 2014). Currently, in Malawi, the President's Emergency Plan for AIDS Relief (PEPFAR) supports a Point of Care (POC) EMR system in 210 high- and medium-volume health facilities, as well as an electronic HIV treatment system (eMastercard) for retrospective data entry in 511 medium- and low-volume health facilities (PEPFAR, 2021).

The rest of this paper is structured as follows: Section 2 covers Research Design and Methodology, Section 3 presents the Literature Review, Section 4 discusses Results and Discussion, Section 5 offers Conclusion and Recommendations, and Section 6 outlines Areas for Further Study.

2. Research Design and Methodology

The study adopted a qualitative case study approach to examine factors influencing the sustainability of EMRs in Mulanje District, Malawi. This approach was suitable as it provided an in-depth understanding of complex contextual factors impacting EMR systems. Data collection involved semi-structured interviews with key informants, including facility system users, digital health partners, local council members, district health teams, and Ministry of Health staff. Participants were purposefully sampled to ensure diverse insights, resulting in a sample size of 12 individuals (Sukmawati, Salmia & Sudarmin, 2023). The Program Sustainability Assessment Tool (PSAT) was employed to assess sustainability across eight domains, including environmental support, funding stability, partnerships, and strategic planning, among others (Schell *et al.*, 2013; Douglas A. Luke *et al.*, 2014a; King *et al.*, 2018; Chirambo, Muula & Thompson, 2019). The data was transcribed using NVivo 12 software, and it was then analysed thematically by grouping the data according to particular domains. Validity was strengthened through techniques such as prolonged engagement and triangulation (Guba, 1981). This methodology was appropriate because it allowed for rich, detailed data collection and analysis essential

for understanding sustainability challenges and strategies within the unique health context of Malawi. This study was approved by the College of Medicine Research and Ethics Committee (COMREC) number P.07/23-0166. Permission to conduct the study in Mulanje was also sought and granted by the Mulanje District Hospital Research Committee.

3. State of literature on EMRS

3.1 Electronic Medical Records Systems

EMRs are computer systems designed to collect, store, and manage patient health data, providing secure access to this information. EMRs encompass various patient details, including demographics, medical history, prescriptions, lab results, and radiological reports (Ben-Assuli, 2015; Heart, Ben-Assuli & Shabtai, 2017). While EMRs are often conflated with Electronic Health Records (EHRs), they serve distinct yet interconnected roles aimed at improving patient safety, care quality, and reducing healthcare costs (Garets & Davis, 2006). Current literature has been limited in examining the long-term sustainability and contextual challenges of EMR systems in low-resource environments. There is also a limited critique regarding the scalability of these systems within decentralised healthcare settings, such as those found in low-income countries, indicating a gap in assessing the adaptability of EMR frameworks beyond high-resource contexts. The transition from paper-based records to EMRs began in the late 1970s with the advent of microprocessors, evolving from simple, physician-centric notes to comprehensive systems offering real-time data access and integration across healthcare providers (Shortliffe, 1998). However, this literature often overlooks the significant barriers that come with these advances, such as high maintenance costs, dependency on stable infrastructure, and the substantial training burden they place on local healthcare providers—factors particularly pertinent to low-resource environments like Malawi.

In Malawi, the journey of EMR implementation began in 2001 with the introduction of Anti-Retroviral Therapy and Patient Registration Systems at Kamuzu Central Hospital, later expanding to other sites (Matthew Thokozani Kumbuyo, 2018). The EMR systems in Malawi have grown to include functionalities for HIV treatment data management and are managed by organisations such as the Elizabeth Glaser Pediatric AIDS Foundation (EGPAF) and Luke International. These systems have significantly enhanced the ability to manage patient data efficiently and provide comprehensive healthcare services through real-time data access and clinical decision support (PEPFAR, 2015). While these implementations have undoubtedly enhanced the efficiency of data management and healthcare delivery, the literature often underplays the operational and financial sustainability of such initiatives post-donor support. The effectiveness of these systems may not translate seamlessly to settings where local governments lack sufficient resources or technical capacity to manage complex EMR

infrastructures, a challenge that the literature has yet to address thoroughly. The limited exploration of these post-donor sustainability issues indicates a significant gap, particularly in how these systems are to be sustained independently by local councils or national governments in low-income countries.

3.2 Functionalities and Benefits of EMRs

The implementation of EMRs in Malawi's healthcare system was driven by a taskforce from the Ministry of Health and Population in 2005 (Fraser *et al.*, 2004). They evaluated models for data entry, ultimately selecting a touchscreen Point-of-Care (POC) system piloted at Queen Elizabeth Central Hospital (QECH) in 2006. This system supported clinical workflows and included functionalities for patient registration, vital signs tracking, medical history documentation, and clinical decision support. Features like alerts and reminders assist healthcare providers in making informed decisions, enhancing patient care through timely and accurate data access (Douglas *et al.*, 2010; Park *et al.*, 2019).

EMRs also facilitate medication prescribing and dispensing, clinical calculations, and order management, thereby improving accuracy and efficiency in healthcare delivery. They enhance interoperability, allowing seamless information sharing across different healthcare systems, which is crucial for coordinated care. For example, the integration of the Surveillance Programme of IN-patients and Epidemiology (SPINE) at QECH enhances patient tracking and data management. Additionally, EMRs incorporate laboratory information management systems to streamline test ordering and results tracking, thus boosting workflow efficiency and patient safety. Despite these advantages, challenges such as power outages, system failures, and the need for ongoing user training and sensitisation remain (SanJoaquin *et al.*, 2013; Msiska, Kunitawa & Kumwenda, 2017a; Matthew Thokozani Kumbuyo, 2018). While these functionalities improve the accuracy and speed of care, the literature has been largely optimistic about their potential without critically examining the risks and adaptability of these systems in settings that may experience frequent power outages, internet instability, or low IT literacy among users. For instance, while clinical decision support and real-time data access have demonstrated effectiveness, they are highly dependent on reliable infrastructure, a condition not consistently available in Malawi. This lack of critical assessment raises important questions regarding the system's resilience and the contingency plans needed to address infrastructural weaknesses.

3.3 Adoption Rates and Global Usage Patterns

The Electronic Medical Record Adoption Model (EMRAM) is commonly used to assess EMR adoption levels, ranging from basic to comprehensive capabilities. Leading countries in EMR adoption include the United States, China, Brazil, France, and Russia (Sharma & Aggarwal, 2016). For example, Turkey shows significant public hospital adoption of EMR systems, while regions like Hebron and Palestine

exhibit lower adoption rates (Najjar, Amro & Macedo, 2021). In Kenya, various EMR systems, such as Funsoft and AMPATH, support HIV care, and in Zambia, the Electronic Perinatal Record System (ZEPRS) helps manage prenatal and infant care (Wamae, 2015). While Malawi's EMR systems, implemented since 2001, demonstrate a commendable spread across high and low-volume sites, particularly for HIV management (Msiska, Kunitawa & Kumwenda, 2017b), the literature seldom critiques the success metrics in these implementations. The EMRAM model may not capture the full complexity of EMR adoption in low-resource, decentralised healthcare systems, potentially overstating progress in cases where infrastructure and local expertise lag.

3.4 Decentralisation in Healthcare Governance

Decentralisation in healthcare involves transferring decision-making authority from national to sub-national levels, encompassing political, administrative, and fiscal aspects (Kwamie *et al.*, 2016). In Malawi, the Ministry of Health oversees strategic planning and policymaking, while District Councils manage local health services and budgets (Kwamie *et al.*, 2016). However, despite these intentions, the literature suggests that decentralisation in Malawi's healthcare system may lack the necessary structural support to be fully effective. Challenges such as the reluctance of central governments to fully relinquish control, coupled with institutional capacity limitations, suggest that decentralisation may be more symbolic than operationally impactful (Jagero, Kwandayi & Longwe, 2014). While decentralisation can theoretically support sustainable EMR implementation by making systems responsive to local needs, current literature inadequately addresses how limited local taxation power, weak institutional frameworks, and external pressures shape these implementations in practice. Sustainable EMR implementation in decentralised settings requires environmental support, stable funding, partnerships, organisational capacity, robust technological infrastructure, and effective governance and leadership (Devas, 2005; Weingast, 2009; Jiménez-Rubio, 2023).

3.5 Sustainability of electronic medical record systems

Most countries in low-resource settings struggle to provide high-quality healthcare services to their citizens partly because of their high disease burden. In their 2006 Policy Brief, the World Health Organization stated that a nation had a 'serious shortage' of health professionals if there were fewer than 2.28 physicians, nurses, and midwives per 1,000 people. Thirty-six nations in sub-Saharan Africa with low and moderate incomes met the criteria for a critical shortage of health staff. Under the recommended WHO ratio, as of 2020, Malawi, a Low and Middle Income Country (LMIC) in sub-Saharan Africa (SSA), had a health professional density of 0.019 (Bickton & Lillie, 2019). EMRs have been provided to health workers to document medical data and assist in clinical decision-making to close this gap. Fraser *et al.*

(2005) explained that using information technology in health has advantages, such as better clinical management, tracking patient outcomes, and report generation. Most EMRs are donor-funded and come with a challenge that one day, the researchers or donors that fund them will leave, and local organisations or governments will have to take over the running of EMRs (Fritz, Tilahun & Dugas, 2015a). With recent evidence suggesting that donor funding is stagnating, the sustainability of EMR, defined as the capacity to maintain the programme after managerial, technical, and financial support, has become increasingly critical (Joint United Nations Programme on HIV, 2013; Moucheraud *et al.*, 2017). As Fritz *et al.* (2015b) have shown, this is a problem because EMRs are often challenging to maintain after the donor's original financing period ends.

Rajalam *et al.* (2020) found that hospital staff members using the system had significant gaps because training programmes for EMR use primarily focused on utilising EMR and documenting client encounters. However, secondary aggregation, extraction, and data evaluation have received little attention. Therefore, it was challenging for the user to become proficient in the activities and sustain correct EMR use (Rajaram *et al.*, 2020). Health professionals' lack of computer literacy poses significant challenges to the sustainability of EMR systems.

The implementation of EMR systems introduces a new type of medical error: typographical errors, particularly among users with lower levels of computer literacy. This issue affects the widespread adoption of EMRs and their long-term viability (Yehualashet *et al.*, 2021). Mahalli (2015) stated that most physicians believe that EMRs will demand the use of a variety of alternatives, as well as opening and moving through computer menus, affecting health professionals' perceptions of the adoption and long-term use of EMRs. Meinert (2005) also discovered that healthcare professionals' resistance significantly impacted how their subordinates perceived EMR sustainability. Three-country research by Moucheraud *et al.* (2017) emphasised the significance of project champions at all levels of the health system, integration into routine operations, perceived system efficacy, and clearly defined goals among all stakeholders as critical determinants of EMR sustainability.

Although a vast amount of literature is available on the sustainability of Electronic Medical Record Systems (EMR), there is still a need to understand the impact of decentralisation on Malawi's current hybrid HIS. This study explores how the decentralisation of local government could affect Malawi's HIS, which is characterised by a mix of centralised and decentralised management structures for its various components.

4. Results and Discussion

To visualize the recurring themes, the word cloud in figure 1 below displays the most frequently mentioned words from the transcripts. Larger words represent higher

officer for the District Health Office. And then, at the Council, we have monitoring and evaluation officer (R5).

While participants highlighted the importance of these internal roles, they expressed doubts about these champions' ability to secure the necessary resources effectively. As one participant noted:

In terms of resources, there has always been a challenge, so as far as resources are concerned, these champions may need support from the Council as well as from other partners that can help to support this programme (R8).

This result highlights the critical role that environmental support plays in sustaining EMR systems within decentralised structures. The literature underscores the necessity of local champions in decentralised settings, as effective leadership within existing council structures can significantly influence the implementation and sustainability of EMRs (Calhoun et al., 2014). In contexts like Malawi, where decentralisation is still developing, the role of local champions becomes even more crucial for the adaptation and resilience of systems in low-resource settings (Kwamie et al., 2016). However, the findings align with research that warns about the challenges in resource mobilisation faced by local champions, as limited financial autonomy and weak institutional frameworks may hinder their ability to support the EMR programme fully (Msiska, Kunitawa, & Kumwenda, 2017). As highlighted in the literature, while councils may generally support EMRs, sustainability may require substantial and consistent resource allocation, not just local enthusiasm. This supports the argument that successful EMR implementation in decentralised systems cannot rely solely on internal champions but must involve comprehensive external support mechanisms (Anyango, 2016).

Moreover, the study's findings emphasise that although council-level champions play a central role in establishing EMRs, their success heavily depends on the availability of external support, often from partners and higher-level government funding. This finding aligns with studies showing that a lack of robust managerial and financial support can divert council resources away from EMRs, undermining the system's long-term success (Anyango, 2016). Specifically, donor funding, while essential in the early phases of EMR implementation, is often not sustainable, and systems can fail when local governments cannot maintain infrastructure and operational costs (Fritz, Tilahun & Dugas, 2015a). Consequently, sustaining EMRs post-donor funding will likely necessitate reliable external support mechanisms in addition to local council initiatives, ensuring a well-rounded support framework that addresses both internal and external resource requirements.

These findings highlight the delicate balance between internal championing and the need for ongoing external support in fostering an environment that can sustain EMRs. However, they must first address the financial limitations restricting effective

resource allocation. This gap is particularly relevant in low-resource environments like Malawi, where institutional capacity to manage EMRs sustainably without external funding remains a major obstacle (Moucheraud et al., 2017). Thus, the sustainability of EMRs in decentralised healthcare settings hinges on the successful integration of local efforts with external financial and technical support, a factor that the literature has emphasised but not fully explored in terms of long-term sustainability.

4.2 Funding stability

The study found that sustaining Electronic Medical Records (EMR) funding presents ongoing challenges due to the local council's dependence on government transfers as its primary funding source. Respondents noted that while some revenue is generated locally, these funds are insufficient and predominantly allocated to salaries, limiting their availability for broader expenditures such as EMR maintenance. Participants noted the challenges in government funding as follows: "There is a challenge because we just rely on funding from the ministry, from government, which usually takes time to come. Sometimes, we stay two months or four months without the funding" (R2). Another respondent noted that "after the council has these funds, [the personnel] also decides in terms of planning that how to allocate between the sectors based on the need. Since at the moment we are still collecting, I can say it is very low and it's mostly used for the direct employees for the district" (R8).

These findings underscore the urgent need for long-term strategic planning to ensure funding stability, particularly considering the fluctuations in political and economic conditions. Relying solely on government funding makes the EMR programmes vulnerable to potential delays and budget cuts, which can disrupt EMR operations. This vulnerability is further exacerbated by the limitations of central government transfers, which often fail to account for the ongoing operational and maintenance costs of EMR systems. As emphasized in the literature, programmes that rely on a single source of funding are inherently at risk of instability, especially in low-resource settings where political and economic uncertainties can result in sporadic funding cycles (Fritz et al., 2015a; Moucheraud et al., 2017). Moreover, the increasing stagnation of donor funding, as discussed by Fritz et al. (2015b), highlights the urgent need for local governments to develop sustainable financial models for EMR systems. Without this, the sustainability of EMRs could be jeopardized once donor funding phases out, leaving healthcare systems vulnerable to technological decay and operational breakdowns.

To mitigate these risks, it is essential for local councils to explore alternative funding sources that provide more consistency and resilience to sustain EMRs, especially as donor assistance phases out. Literature suggests that diversifying funding streams is critical in ensuring the longevity of health IT systems (Luke et al., 2014b).

Establishing multiple funding avenues, such as partnerships with NGOs, forming public-private partnerships, or exploring international grants, could provide a more stable financial base. This approach would not only help in stabilising EMR support but also in distributing the financial responsibility across various stakeholders, reducing the risk associated with dependence on a single funding source. Additionally, local councils should consider incorporating sustainability strategies into the design of the EMR systems from the outset, such as embedding a culture of cost-sharing with local communities and integrating the costs into broader national health budget frameworks.

4.3 Partnerships

The sustainability of EMRs is heavily reliant on strong partnerships, with the study revealing that collaborations with entities such as the Ministry of Health (MOH), EGPAF, and Partners in Health (PIH) currently support EMR implementation and maintenance. Participants emphasised the value of these relationships, as partners contribute not only technical expertise but also provide essential leadership and advocacy for the programme's sustainability. There was consensus among participants that lobbying for continued support from existing partners, and perhaps new ones, is vital to sustain EMRs long-term. One participant highlighted this need as follows:

I believe we will continue to require a close partnership because managing a system like this is too important to underestimate. It's a significant deal, therefore we need a strong relationship. And, certainly, as a Council, we still need partners to assist in the sustainability of this system. Internally, in the district, we have partners who assist our various systems. So, for this one, I believe we will need to lobby for more support; they are partners that are already supporting the other systems, and I believe we will write them so that they can also support this one (R1).

These findings emphasise that maintaining long-term partnerships is not just about continuing technical support but also ensuring a continuous flow of financial and human resources. The literature supports this viewpoint, showing that effective partnerships between government agencies and external stakeholders can strengthen programme resilience and continuity (Calhoun et al., 2014). However, this dynamic can be complex in decentralised healthcare systems, where local governments may struggle to maintain partnerships without sufficient infrastructure, funding, or leadership capacity (Devas, 2005; Weingast, 2009). For instance, decentralisation, while theoretically beneficial, may complicate the establishment and continuity of these partnerships due to variations in local governance, resource allocation, and political will.

Partnerships have proven beneficial in similar EMR initiatives, such as those by AMPATH in Kenya, where academic and healthcare collaborations enabled ongoing technical support and resource allocation for EMR sustainability (Einterz et al., 2007; Inui et al., 2007). Such collaborations, however, were most effective when coupled with strong local leadership and integration into routine healthcare operations, ensuring that external support aligned with local needs and priorities. This suggests that by engaging diverse stakeholders in collaborative efforts, councils can better ensure the long-term viability of EMRs in decentralised settings. Yet, this process requires careful consideration of how decentralised structures, coupled with varying capacities across local councils, can affect the stability and effectiveness of partnerships. Sustaining partnerships in this context demands not only technical solutions but also a clear framework for governance and accountability, ensuring that all parties are committed to long-term success.

4.4 Organisational capacity

The organisational capacity of local councils to manage EMRs presents several challenges, particularly concerning integration, staffing, and system fragmentation. Participants highlighted that multiple, disjointed systems complicate data management and integration. One participant remarked as follows: “At the moment, No! I think because of the fragmentation of systems, it might be a bit difficult. You find that DHIS 2 is a different one HMIS will use to collect data manually on paper, then enter it into DHIS 2” (R11). This fragmentation can lead to inefficiencies in data collection and management, ultimately undermining the effectiveness of EMR systems. Additionally, staffing challenges were frequently noted. A participant expressed concerns regarding the limitations faced by assistant ICT officers, stating:

I believe that staffing for EMR will be a challenge for all assistant ICT officers across the country. The majority of us are under E-government, which means we are in common service. This means that we can be transferred to any department of the government. So, I believe it will be a challenge if we are taught to assist with EMRs and are later transferred to another department (R6).

This situation highlights an important concern in the literature regarding the sustainability of health information systems in low-resource settings. Staffing instability is a critical barrier to the effective maintenance and continuity of EMR systems, especially when personnel are subject to reassignment or turnover. In the context of decentralised healthcare systems like Malawi’s, this issue is compounded by the reliance on centrally managed ICT officers, who are not necessarily dedicated to specific councils. This lack of continuity can disrupt ongoing support for EMR systems, leading to gaps in system maintenance and further fragmentation of healthcare data (Fraser et al., 2005).

The findings underscore the critical role of organisational capacity—including adequate staffing and strong leadership support—in integrating EMRs into local council activities. As noted in the literature, organisational capacity is essential for the successful implementation of health information systems, particularly in settings where resources are limited (Calhoun et al., 2014). The study revealed significant issues related to system fragmentation, which creates redundancies in data collection and hampers seamless integration across various platforms (Moucheraud et al., 2017). Such fragmentation leads to increased workloads for staff and a greater likelihood of data entry errors, ultimately compromising the integrity of the information systems. This situation aligns with broader concerns identified in the literature about the operational challenges faced by healthcare systems in low-resource environments, where infrastructure and personnel capacity are often insufficient to meet the demands of complex health information systems (Moucheraud et al., 2017).

Moreover, leadership support is vital for aligning priorities and resource allocation within local councils. Without committed leadership, it becomes challenging to address the existing capacity gaps and create a coherent strategy for EMR implementation (Msiska, Kunitawa & Kumwenda, 2017a). Effective leadership is essential for securing the necessary resources, ensuring that systems are integrated across different platforms, and maintaining a strategic focus on EMR sustainability in the long run. The lack of sufficient personnel with the necessary technical skills further exacerbates these challenges, as councils often struggle to find and retain qualified staff capable of managing complex EMR systems. This situation underscores the findings of earlier studies, which highlighted that EMRs in low-resource settings often fail to achieve their potential because of a lack of institutional knowledge, skilled personnel, and sustainable leadership (Fritz, Tilahun & Dugas, 2015a). This points to a pressing need for targeted training and development initiatives to enhance existing personnel's skills and foster a culture of support and commitment toward EMR sustainability.

Ultimately, strengthening the organisational capacity of local councils is essential for the long-term sustainability of EMRs. This can be achieved through strategic planning, ongoing professional development, and fostering an environment where leadership actively champions the integration and utilisation of EMRs. Addressing these organisational capacity challenges is crucial for ensuring that EMRs can effectively serve their intended purpose within decentralised health systems, and for ensuring that these systems are resilient to the unique challenges faced by low-resource settings. By tackling these organisational and staffing issues, Malawi's healthcare system can improve its ability to manage patient data effectively, enhancing the quality of care provided across the country.

4.5 Programme evaluation

Local councils have demonstrated a capacity to evaluate EMRs and report on outcomes, which is essential for informing future planning and implementation. Participants noted that the Monitoring and Evaluation (M&E) department plays a vital role in this evaluative process. As one participant stated, “We have the M&E department or section, and I believe it can help evaluate the system’s performance or how it is operating in the district” (R1).

This capacity enables councils to regularly assess the effectiveness of their EMR systems and identify areas for improvement. Participants provided concrete examples of how existing systems, such as the Local Authority HIV and AIDS Reporting Systems (LAHARS), facilitate outcome reporting as one respondent stated.

On the outcomes reporting, yes, I’ll give examples; we have some systems at the district for example, the LAHARS; Local Authority HIV and AIDS Reporting Systems. So, all information related to HIV and AIDS is being recorded in this system. So, after every quarter or every month we are able to go through the system and come up with the reports and see how we are performing as a district and see where we are having challenges and how we can improve on that (R8).

Such evaluations are crucial for understanding the operational challenges and successes of EMR systems in real time. Additionally, councils consistently engage in planning and implementation processes. These planning and evaluation mechanisms establish an interactive process that ensures alignment between implementation and desired outcomes. Regular programme evaluation is not only crucial for accountability but also foundational to the sustainability of EMRs in decentralised settings. The findings illustrate that councils are actively utilising systems like LAHARS to monitor and evaluate their decentralised responses, demonstrating how local governments are translating their administrative roles into actionable frameworks for EMR sustainability. This capacity aligns with existing literature emphasising the role of decentralised governance in tailoring health information systems to specific local needs (Devas, 2005; Weingast, 2009). By aligning evaluation findings with annual planning processes, councils create a feedback loop that informs strategic adjustments, enhancing adaptability and resilience within decentralised governance frameworks.

The ability to assess the performance of EMR systems through targeted M&E provides councils with vital, actionable feedback. This is not only instrumental for identifying performance gaps but also for developing scalable, context-specific strategies that reinforce the long-term viability of EMRs. For example, the ongoing evaluation processes highlighted in the findings help local councils address performance challenges, directly supporting operational and strategic planning

efforts. This aligns with the broader literature, which emphasises that regular evaluations maintain programme fidelity, ensuring systems are both functional and responsive over time (Calhoun et al., 2014).

Furthermore, by embedding these evaluation processes into their routine operations, councils foster a culture of evidence-based decision-making that extends beyond EMR implementation to other areas of public health. This systemic integration of M&E processes into strategic planning cycles not only supports programme effectiveness but also strengthens the foundational governance structures needed for sustained EMR utilisation.

Ultimately, the commitment to evaluation underpins the broader goal of ensuring sustainability. While the findings highlight existing evaluation capacities, they also point to the need for enhanced investment in M&E systems to address challenges such as limited technical expertise and resource constraints. Without such investments, the long-term viability of EMRs in decentralised local government contexts may be compromised.

4.6 Programme adaptation

The study revealed that engaging in national review meetings and fostering partnerships are crucial for exchanging ideas and technical support. Participants emphasised the value of collaborative learning among districts through these meetings. One participant noted that “engaging in at least National Review meetings whereby you now have several districts coming together and then you are learning from each other...would help one get more ideas and engage with partners” (R10). This highlights the potential of shared knowledge in enhancing the functionality and sustainability of EMR systems. Moreover, the ability to incorporate new technologies was recognised as essential for effective programme adaptation. One respondent acknowledged the availability of IT experts at the district level and some councils have the MISO (R5). This indicates a foundational capacity within local councils to seek technical expertise for implementing necessary updates and improvements.

Adapting programmes to changing conditions is vital for sustainability, as noted by Su et al. (2008). This study underscores the need for local councils to remain responsive to evolving technological and environmental needs, an increasingly relevant principle in digital health systems. The ability to adapt EMRs is not merely a technical requirement but a strategic imperative that can influence overall programme effectiveness.

The findings reflect the importance of national review meetings as a platform for collaboration and learning. Such forums facilitate the sharing of experiences and best practices, enabling local councils to learn from one another and implement successful strategies observed in other districts. This collaborative approach mirrors successful

adaptations seen in other countries, such as the adaptation of the OpenMRS system in Peru to meet specific local requirements (Fraser *et al.*, 2012). These examples illustrate that flexibility and ongoing improvement in EMR systems are critical for maintaining their relevance and efficacy in health service delivery. As the literature suggests, the sustainability of health information systems is enhanced when local stakeholders actively engage in adapting and refining these systems to fit local contexts and needs (Calhoun *et al.*, 2014).

The findings on program adaptation suggest potential strategies for enhancing the sustainability of EMRs in decentralized settings. By prioritizing collaborative learning, leveraging existing technical expertise, and committing to continuous adaptation, local councils can work toward strengthening the resilience and effectiveness of their EMR initiatives, ensuring they are better positioned to meet the needs of their communities over time.

4.7 Communication

Effective communication strategies are crucial for informing the public and stakeholders about Electronic Medical Records (EMRs). The study found that, while there are existing communication strategies that can be leveraged, there is a significant need for improvement in external communication, particularly with partners. One participant remarked: “We’ll have to indeed sit down and make such straight strategies of communication. The goodness is there are already existing communication strategies” (R3). This indicates an acknowledgement of the existing frameworks while also emphasising the need for more structured and targeted approaches. Additionally, another participant highlighted the ongoing development of a district website: “The district is in the process of developing its website. This website will be a tool for publicising achievements...[including] issues of to do with electronic medical records. All these can also be publicised [on the website].” (R8). This highlights the potential for enhancing communication through digital platforms to better inform stakeholders and the public about EMR initiatives and successes.

Effective communication of a programme’s purpose and successes is essential for fostering transparency and accountability, as emphasised by Luke *et al.* (2014b). The current study indicates that EMRs lack comprehensive communication strategies, highlighting the need for the development of new strategies that engage partners, staff, and the public effectively. The importance of external communication cannot be understated, as it plays a vital role in building support and understanding of the council’s initiatives and services. Strengthening these communication efforts is essential for ensuring the sustainability and acceptance of EMRs within the community. Overall, integrating enhanced communication strategies with existing initiatives, such as the development of a dedicated website, can significantly improve

stakeholder engagement and promote greater awareness of the benefits and successes of EMR systems, which are crucial for their long-term viability.

4.8 Strategic planning

The study found that strategic planning for EMRs involves assessing current resources, identifying future needs, integrating EMRs into budgeting, and defining roles and responsibilities. Participants indicated that local councils have already established strategies to assess their current resources and plan for future needs. There is a clear understanding of the roles and responsibilities associated with EMRs among council members. However, participants highlighted a need to explicitly incorporate EMR considerations into strategic budgeting and planning processes to ensure that adequate resources are allocated to these initiatives. One participant noted:

So, when it comes to strategic planning for the local councils in terms of EMR, I think from what I know, they already have strategies in place whereby they do focus on the current resources that they have and what they need in the next two years or in the next three years. [What remains is the need to add] EMR to strategic budgeting and planning (R2).

Despite a clear understanding of roles, it was noted, however, that there is no sustainability plan (R5). This gap emphasises the need for local councils to recognise that while operational roles are clear, the absence of a dedicated sustainability plan for EMRs could jeopardise the long-term success of these systems. The lack of a sustainability plan underscores a critical disconnect between current operational clarity and strategic foresight. The findings align with broader literature indicating that effective EMR implementation requires not only clear operational guidelines but also robust strategic frameworks that anticipate financial, technical, and infrastructural challenges (Douglas et al., 2010; Fraser et al., 2004).

Strategic planning is essential for sustaining EMRs (Douglas A. Luke et al., 2014b). The absence of a comprehensive sustainability plan for EMRs is particularly problematic in decentralised healthcare contexts like Malawi, where resource allocation and decision-making often depend on local governance capabilities (Kwamie et al., 2016). These gaps suggest that without proactive measures, EMRs risk becoming unsustainable due to fluctuating donor support and limited local resources (Fritz et al., 2015b).

Creating a customised sustainability plan for EMRs is not merely an operational necessity but a governance imperative. Such a plan would provide a roadmap for addressing resource limitations, clarifying long-term roles, and mitigating risks associated with fluctuating external funding. By embedding EMR sustainability within broader governance structures, local councils can address systemic challenges

like low IT literacy, unreliable infrastructure, and limited technical expertise among healthcare providers (Yehualashet et al., 2021; Matthew Thokozani Kumbuyo, 2018).

Integrating EMR considerations into existing strategic planning frameworks will allow councils to proactively address potential challenges, align resources with programme needs, and ensure continuous improvement in the management and operation of EMR systems. This integration is critical for overcoming barriers such as power outages, inconsistent internet access, and limited training for end-users, which are pervasive in low-resource environments (Msiska, Kunitawa & Kumwenda, 2017a).

What this means is that the necessity of detailed and well-defined sustainability strategies is evident. These strategies must be adaptable, stakeholder-driven, and context-specific to guarantee the longevity of EMR initiatives in decentralised and resource-constrained settings like Malawi. Addressing this gap would ensure EMRs not only survive post-donor support but also thrive as integral components of local healthcare systems.

5. Conclusion and Recommendations

This study has examined the sustainability of electronic medical record (EMR) systems within decentralised local government settings, revealing the complex array of factors necessary for long-term success. Findings underscore the significance of environmental support, funding stability, partnerships, organisational capacity, and programme adaptability. Specifically, environmental support plays a key role in addressing resource limitations and fostering stakeholder engagement. Similarly, diversifying funding sources helps reduce dependence on government transfers, making financial management more resilient and sustainable.

Collaborative partnerships, as exemplified by models like AMPATH and Partners in Health, provide essential resources and expertise, underscoring their value for sustainable EMR integration (Einterz *et al.*, 2007; Inui *et al.*, 2007). The study further emphasises the significance of organisational capacity, particularly in leadership and staffing, while highlighting the role of continuous evaluation and effective communication in ensuring that EMRs adapt to and meet the evolving needs of healthcare.

To address these challenges and build on the study's conclusions, the following recommendations are proposed. First, local councils should establish clear policies and guidelines for EMR implementation with support from organisations like the Elizabeth Glaser Pediatric AIDS Foundation (EGPAF) and the Ministry of Health Digital Health Division. Such policies would standardise resource allocation and create a consistent framework across health programmes. Local councils are also encouraged to diversify their funding sources beyond government transfers by

fostering partnerships with organisations experienced in similar initiatives, such as AMPATH. Advocating for dedicated budget allocations within council financial plans is essential to underscore the significance of EMRs in improving health outcomes and operational efficiencies.

Additionally, councils should focus on forming collaborative partnerships with academic institutions, international organisations, and relevant stakeholders. These alliances can harness expertise and resources while promoting access to cutting-edge research and best practices. To ensure accountability and long-term support, establishing formal agreements that outline roles, responsibilities, and expectations within partnerships is recommended. Investment in capacity building for EMR-related staff is critical, with local councils encouraged to collaborate with universities to develop digital health courses that equip personnel with the necessary technical and management skills.

The study also advocates for the decentralisation of human resource functions, enabling local councils to make responsive staffing and training decisions aligned with their unique requirements. Addressing system fragmentation by implementing a uniform reporting system across health sectors and disease priorities would standardise data management, enhancing the efficiency and impact of EMR systems. Robust monitoring and evaluation mechanisms should be integrated to assess EMR performance continually and inform strategic planning for system optimisation.

Formal processes for periodic programme reviews and adaptations are also vital to align EMRs with evolving technological and organisational demands. Investing in research and development initiatives could yield innovative solutions to enhance EMR sustainability and effectiveness. Local councils should develop comprehensive communication strategies to engage stakeholders and increase awareness of EMR benefits, using various platforms, including district websites, social media, and community outreach, to ensure information reaches diverse audiences.

To address the need for tailored sustainability, local councils should design specific sustainability plans for EMR systems. These plans should clearly outline long-term objectives, resource needs, and implementation strategies, along with delineating roles and responsibilities to enhance coordination and foster stakeholder collaboration.

6. References

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