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Adoption of electronic health record systems to enhance the quality of healthcare in low-income countries: a systematic review

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ABSTRACT

Background Electronic health record (EHR) systems are mentioned in several studies as tools for improving healthcare quality in developed and developing nations. However, there is a research gap in presenting the status of EHR adoption in low-income countries (LICs). Therefore, this study systematically reviews articles that discuss the adoption of EHR systems status, opportunities and challenges for improving healthcare quality in LICs.

Methods We used Preferred Reporting Items for Systematic Reviews and Meta-Analyses in articles selected from PubMed, Science Direct, IEEE Xplore, citations and manual searches. We focused on peer-reviewed articles published from January 2017 to 30 September 2022, and those focusing on the status, challenges or opportunities of EHR adoption in LICs. However, we excluded articles that did not consider EHR in LICs, reviews or secondary representations of existing knowledge. Joanna Briggs Institute checklists were used to appraise the articles to minimise the risk of bias.

Results We identified 12 studies for the review. The finding indicated EHR systems are not well implemented and are at a pilot stage in various LICs. The barriers to EHR adoption were poor infrastructure, lack of management commitment, standards, interoperability, support, experience and poor EHR systems. However, healthcare providers' perception, their goodwill to use EMR and the immaturity of health information exchange infrastructure are key facilitators for EHR adoption in LICs.

Conclusion Most LICs are adopting EHR systems, although it is at an early stage of implementation. EHR systems adoption is facilitated or influenced by people, environment, tools, tasks and the interaction among these factors.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Research findings show that electronic health record (EHR)/EMR is being implemented in low-income countries (LICs) despite various challenges influencing its success. However, no empirical evidence is built on systematically collected and analysed studies across LICs that could be used to develop a better implementation strategy.

WHAT THIS STUDY ADDS

⇒ The study identified that LICs are struggling to adopt EHR systems, but they are failing at the initial stages due to people-related barriers, environment-related barriers, infrastructure-related barriers and poor integration of the system with people.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study could help LICs to properly adopt and use EHR systems considering the barriers identified.

INTRODUCTION

According to the WHO definition, quality of healthcare is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes.[1] Currently, with advancements in digital technology, most of the work in the healthcare sector is becoming digitised and efficient.[2] This could significantly improve the quality of healthcare[3 4] compared with the traditional approach. The electronic health record (EHR) system is at the forefront of implementation in healthcare institutions to enhance the quality of healthcare.[5]

The EHR system is a digital way of capturing, storing, and using patient information by authorised healthcare providers to deliver healthcare services effectively.[6] EHR systems enable data-driven clinical decision-making to improve healthcare quality. Gatiti *et al*[7] noted that the proper adoption of EHR systems could boost the quality of healthcare by enhancing patient safety and ensuring effective, efficient, timely, equitable and patient-centred care.

Despite the benefits of EHR systems, problems or unintended consequences are hampering the successful adoption and use of EHR systems in healthcare settings. The most common are physician burn-out,[8–10] failure of expectations,[8] EHR market saturation,[8] innovation vacuum,[8] data obfuscation,[8] interoperability,[11] privacy in data sharing,[12]

protracted to complete tasks,[13] interruption of tasks and workarounds at point of care[13] and misalignment of technology and clinical context.[11] In addition to these, DeWane *et al*[14] and Gagnon *et al*[15] noted data duplication errors during decision-making, intermittent system delays and workflow interruptions as unintended consequences of EHR systems. Generally, unintended consequences could have a severe impact on the diagnostic and therapeutic processes undertaken by healthcare professionals at points of care, eventually jeopardising patients' safety and well-being.[13]

EHR system has been used in developed countries since its inception in the USA in the 1960s.[16] Since then, its impact in enhancing the quality of healthcare has been clear both in the developed and developing world. In developed countries, where EHR systems have undergone an established implementation strategy, there is increased success and health worker satisfaction and decreased delays and chances of usability being compromised.[17] However, despite increased use in developed countries, multiple studies conducted in developing countries indicated the adoption of an EHR system is still lagging[18]; hence, multiple factors play a role in technology adoption and use. A study conducted in Kenya, Ghana, Nigeria, South Africa and Saudi Arabia indicated that EHR adoption is challenged by inadequate training,[19–23] poor infrastructure,[19 21–23] lack of technical support,[19 21–23] poor communication between users[21] and absence of regulations and implementation framework.[22] Furthermore, the findings from Jung *et al*[24] showed that EHR implementation is not an easy task even for countries advancing from developing to developed, let alone developing countries.

EHR implementation or adoption in most low-income countries (LICs) is lagging and affected by multifaceted challenges. Some of these barriers are economy,[25 26] infrastructure[25] and policy.[26] In addition to these, healthcare professionals' readiness,[27] poor collaboration among stakeholders,[28] and relying on software provided by non-governmental organizations (NGOs)[28] are affecting EHR adoption in LICs. However, due to the development of open-source systems, support from international donors and homegrown software development campaign[29]; EHR adoption in LICs is becoming feasible and a future direction.

On top of this, there is a research gap in identifying the existing situation of EHR adoption in LICs despite some efforts made in low-middle-income and middle-income countries. Therefore, this review aimed to examine the status, challenges and opportunities of adopting EHR systems to enhance the quality of healthcare delivery in LICs. It is hoped that the review will provide effective support for the local developers, healthcare providers, different stakeholders and funders in the course of developing or adopting EHR systems. We conducted the review based on the following questions:

RQ1: What is the status of HER systems adoption in LICs?

RQ2: What are the challenges influencing the adoption of EHR systems in LICs?

RQ3: What opportunities are facilitating the adoption of EHR systems in LICs?

METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 checklist was used to conduct this review.[30]

Eligibility criteria

We used the inclusion and exclusion criteria presented in table 1 to identify articles that meet the study objectives.

Information sources and search strategy

PubMed, Science Direct and IEEE Xplore were the electronic databases used for the literature search. We conducted the search using keywords based on four concepts, namely "electronic health record," "adoption," "quality of healthcare," and "developing countries." Medical subject heading (MeSH) terms were also used to supplement the keyword search in the PubMed database, hence it is a controlled vocabulary thesaurus used for indexing articles. We conducted forward and backward citation searches on significant search results and manual searches on health informatics journals found in developing countries. We presented the search strategies in table 2.

Table 1 Inclusion and exclusion criteria

	Criteria
Inclusion	1. Articles that present the status, challenges and opportunities of EHR adoption in LICs
	2. Articles published in English starting from January 2017 to 30 September 2022
	3. Peer-reviewed journal articles
Exclusion	1. Articles do not explicitly discuss EHR adoption, its challenges and opportunities in LICs
	2. Articles on EHR adoption in countries other than LICs
	3. Books, book chapters, conference papers, symposiums, review articles and non-English scripts

EHR, electronic health record; LICs, low-income countries.

Table 2 Information sources and search strategy

Date of the search	Database	Search query	Filters	Search result
28 September 2022	PubMed	(("Electronic Health Records"[MeSH Terms] OR "electronic health record*"[Title/Abstract] OR "electronic medical record*"[Title/Abstract] OR "computerized medical record*"[Title/Abstract] OR "EHR"[Title/Abstract] OR "EMR"[Title/Abstract]) AND ("Adoption"[Title/Abstract] OR "application"[Title/Abstract] OR "utilization"[Title/Abstract] OR "acceptance"[Title/Abstract] OR "implementation"[Title/Abstract]) AND ("Quality of Health Care"[MeSH Terms] OR "Health Care Quality"[Title/Abstract] OR "Quality of Healthcare"[Title/Abstract] OR "Healthcare Quality"[Title/Abstract] OR "Quality of Care"[Title/Abstract] OR "Care Quality"[Title/Abstract] OR "pharmacy audit*"[Title/Abstract] OR "Audit Pharmacy"[Title/Abstract]) AND ("Developing Countries"[MeSH Terms] OR "developing countr*"[Title/Abstract] OR "developing nation*"[Title/Abstract] OR "economically developing nation*"[Title/Abstract] OR "economically developing countr*"[Title/Abstract] OR "emergent nation*"[Title/Abstract] OR "least developed countr*"[Title/Abstract] OR "low income countr*"[Title/Abstract] OR "underdeveloped nation*"[Title/Abstract])) AND (2017:2022[pdat])	Year of publication between 2017 and 2022	39
28 September 2022	Science Direct	Year: 2017–2022 Title, abstract, keywords: ("electronic health records" OR EMR OR EHR) AND (adoption OR implementation) AND "Quality of healthcare" AND ("developing countries" OR "low-income countries" OR "developing nations") Article type: Research articles	Year of publication between 2017 and 2022, Research articles	44
28 September 2022	IEEE Xplore	("All Metadata":"electronic health record*" OR "All Metadata":"electronic medical record*" OR "All Metadata":"computerized medical record*" OR "All Metadata":EHR OR "All Metadata":EMR) AND ("All Metadata":"developing countr*" OR "All Metadata":"low income countr*") You Refined By: Content-Type: Journals, Early Access Articles Year: 2017-2022	Journals, early access articles, Year of publication between 2017 and 2022	12
29 September 2022	Citation search+other journals	"electronic health records" AND "name of LIC" OR "electronic medical records" AND "name of LIC"	Year of publication between 2017 and 2022, empirical research articles	14

Selection process

We imported the search results from all databases and citation searches into EndNote to begin the selection process. First, we removed duplicate records. After doing so, we screened the remaining records to detect subject relevance with the research objectives considering their title and, or abstract. Next, full-text articles were identified for retrieval. Finally, articles that fulfilled the inclusion criteria were selected for qualitative analysis and synthesis. The author (WJ) validated the entire selection process to ensure its accuracy.

Data collection process, data items, analysis and synthesis

The data collection process started by identifying the main concepts in the three research questions that appear as results or findings in each of the reviewed articles. This approach formed a conceptual basis for data extraction under the corresponding heading in a Microsoft Word document. The headings include the authors' name, publication year, research design, data collection methods, data analysis techniques, study population, sample size and sampling techniques. Moreover, the findings from each of the studies included were extracted as EHR functions, challenges, opportunities and healthcare quality indicators addressed. Content analysis was used to organise related concepts under the categories EHR in LICs, challenges of EHR adoption in LICs, opportunities of EHR in LICs and EHR and healthcare quality in LICs. Finally, narrative synthesis and ordering of the evidence were conducted in each of the four categories by comparing and contrasting with previous studies conducted on the topics.

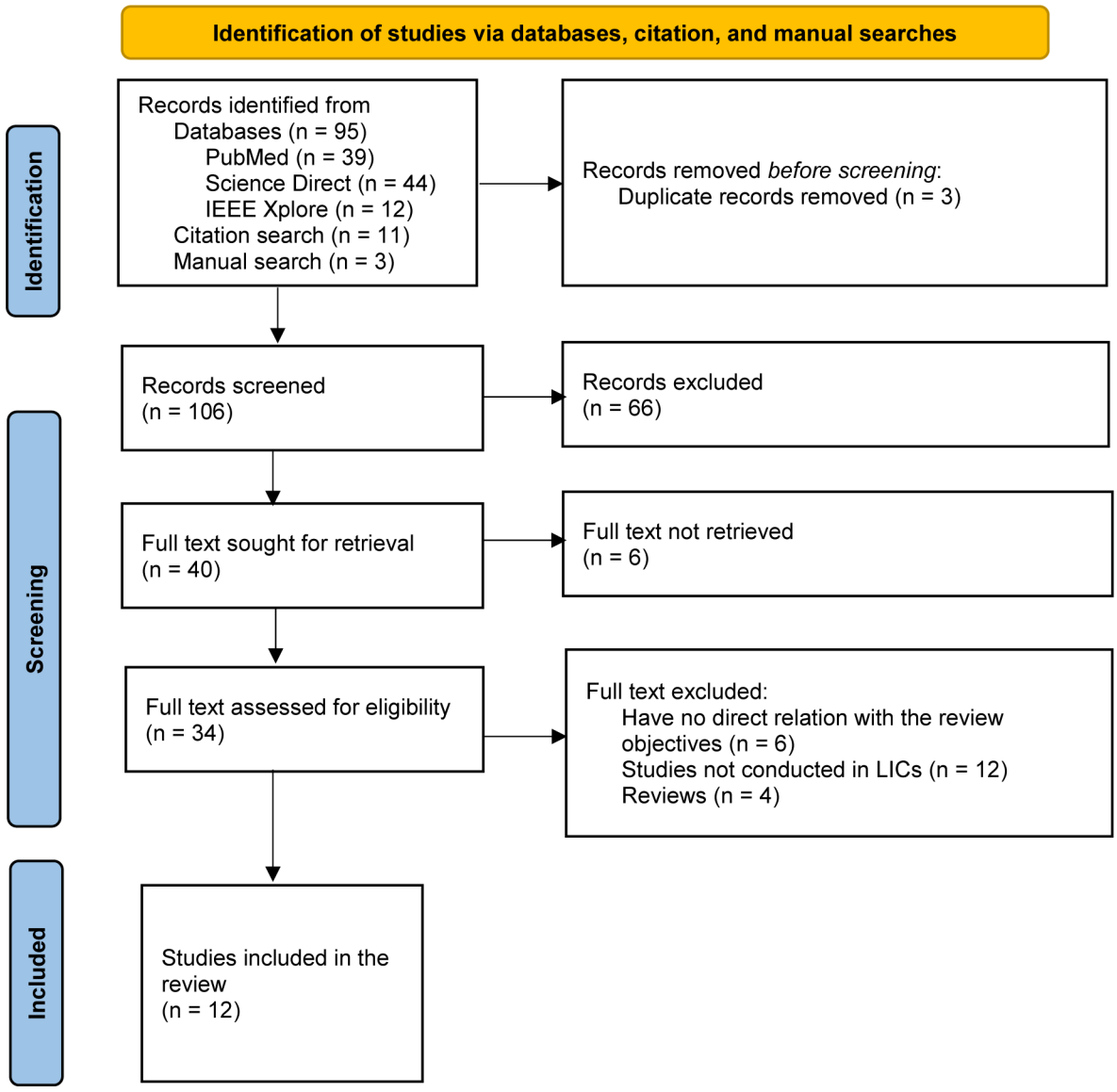

Figure 1 PRISMA 2020 flow diagram illustrating the overall selection process to show studies included and excluded (modified from Page *et al*[30]). LICs, low-income countries; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

Risk of bias

Each study included in the review was subject to an appraisal using the Joanna Briggs Institute checklists.[31 32] Accordingly, we selected and included studies with an optimum score based on the requirements in the checklist. Further, to avoid selection bias, we strictly followed the protocol. In doing so, to some extent, we managed the risk of bias in selection, analysis and reporting.

RESULTS

Study selection

As presented in figure 1, we retrieved 109 records following the search strategy defined. We removed three records that were duplicates. Further, we excluded 66 records after reviewing titles and, or abstracts. Out of 40 studies sought for retrieval, we discarded six as a result of not finding their full text. Out of 34 studies accessed for eligibility, we included 12, which qualified for the inclusion criteria.

Study characteristics

In this review, we used the world bank classification of 2023 to identify LICs.[33] The studies selected systematically from this group were four from Ethiopia, two from Uganda and one from each remaining country: Gabon, Rwanda, Malawi, Sierra Leone, Angola and LICs altogether (Kenya, Rwanda, Uganda and Mozambique). Based on the type of study; five were quantitative, two were qualitative, three were mixed-type, one was agile software development and one was situational analysis. The details of each study are presented in table 3.

EHR in low-income countries

In this review, 9 of the 12 studies showed some of the major functions of EHR/EMR in LICs. The first one is

Table 3 Study characteristics

Author(s)	Country	Article title	Study design/method of data collection	Data analysis technique
Bagayoko *et al*[42]	Gabon	Implementation of a national electronic health information system in Gabon: a survey of healthcare providers' perceptions	Cross-sectional survey/ questionnaire	Logistic regression
Bisrat *et al*[43]	Ethiopia	Implementation challenges and perception of care providers on Electronic Medical Records at St. Paul's and Ayder Hospitals, Ethiopia	Cross-sectional survey/ questionnaire and Interview	Descriptive analysis and thematic analysis
Fraser *et al*[40]	Rwanda	User Perceptions and Use of an Enhanced Electronic Health Record in Rwanda With and Without Clinical Alerts: Cross-sectional Survey	Cross-sectional survey/ interviews, observation and free text	Thematic analysis and descriptive analysis
Liang *et al*[39]	Uganda	A Locally Developed Electronic Health Platform in Uganda: Development and Implementation of Stre@mline	Cross-sectional survey/ questionnaire	Descriptive analysis
Mkalira Msiska *et al*[44]	Malawi	Factors affecting the utilisation of electronic medical records system in Malawian central hospitals	Cross-sectional survey/ questionnaire and Interview	Descriptive analysis and χ^2 test
Oumer *et al*[38]	Ethiopia	Utilisation, Determinants and Prospects of Electronic Medical Records in Ethiopia	Cross-sectional survey/ questionnaire	Descriptive analysis, bivariate and multivariate logistic regression
Oza *et al*[34]	Sierra Leone	Development and Deployment of the OpenMRS-Ebola Electronic Health Record System for an Ebola Treatment Centre in Sierra Leone	Agile software development/ questionnaire	Not mentioned
Robbiati *et al*[35]	Angola	Improving TB Surveillance and Patients' Quality of Care Through Improved Data Collection in Angola: Development of an Electronic Medical Record System in Two Health Facilities of Luanda	Not mentioned/meetings, interviews, site visits and observation	Situational analysis
Were *et al*[41]	Kenya, Rwanda, Uganda and Mozambique	mUzima Mobile Electronic Health Record (EHR) System: Development and Implementation at Scale	Not mentioned/mHealth evidence reporting assessment checklist	Not mentioned
Ahmed *et al*[37]	Ethiopia	Intention to use electronic medical record and its predictors among healthcare providers at referral hospitals, north-West Ethiopia, 2019: using unified theory of acceptance and use technology 2 (UTAUT2) model	Cross-sectional explanatory/ questionnaire and in-depth interview	Structural Equation Model, χ^2 test and thematic analysis
Kabukye *et al*[54]	Uganda	User Requirements for an Electronic Medical Records System for Oncology in Developing Countries: A Case Study of Uganda	Qualitative study/FGD and interview	Content and thematic analysis
Ngusie *et al*[36]	Ethiopia	Healthcare providers' readiness for electronic health record adoption: a cross-sectional study during pre-implementation phase	Cross-sectional/questionnaire	Multivariate logistic regression

FGD, focus group discussion.

the OpenMRS-Ebola, which was implemented in Sierra Leone. The system can track patients' vital signs, medication, intravenous fluid ordering and monitoring, laboratory results, and clinician notes, and export data for clinical decision-making.[34] EMR systems are being used to enhance tuberculosis surveillance and control in Angola.[35]

In Ethiopia, studies were conducted to assess the healthcare providers' technological and organisational readiness and the level of EHR adoption. The findings indicated that the overall readiness of healthcare providers was inadequate.[36] Ahmed *et al*[37] noted that 39.8% of healthcare providers surveyed showed a score above the mean intention to use EMR in northwest Ethiopia. Whereas, a study by Oumer *et al*[38] in eastern Ethiopia showed optimal EMR usage level. These findings portray that EHR systems are not adopted as expected to address quality healthcare in the country.

In Uganda, a locally developed EHR platform (Stre@mline) is highly accepted and used despite implementation challenges.[39] The system can monitor patients, control stock levels, provide early warning and capture prescription errors. Similarly, Fraser *et al*[40] noted that OpenMRS in Rwanda supports healthcare delivery by

Table 4 Barriers and facilitators to EHR adoption in LICs

	EHR system adoption in LICs to enhance the quality of healthcare	
Work system factors	Barriers	Facilitators
People	Awareness, experience, resistance, lack of training	Providing alerts Perception to use EHR
Environmental	Interoperability with other systems, finance, absence of explicit policy, lack of standards, lack of management commitment, quality of a system	Immaturity of health information exchange infrastructure in LICs
Tools	Poor infrastructure	
Tasks		The partnership among stakeholders to design and adopt EHR systems.
Interaction between people, environments, tools and tasks	Poor integration of the EHR system with people, infrastructure, functions and other existing systems.	

EHR, electronic health record; LICs, low-income countries.

managing patient records, making informed decisions, and providing useful alerts and reminders. Finally, mUzima is a mobile-based EMR system that is providing quality healthcare in countries like Kenya, Rwanda, Uganda and Mozambique.[41]

Barriers and facilitators to EHR adoption in LICs

Five studies identified barriers to EHR adoption in LICs, as presented in table 4. Dominantly, lack of training,[40 42–44] poor infrastructure,[40 43 44] lack of management commitment,[40 43] lack of standards[40 43 44] and absence of interoperability[43] are the barriers observed. Bagayoko *et al*[42] identified the quality of a system, support, information, actual use, satisfaction and impact as potential barriers. Oza *et al*[34] showed that inconsistency in EHR systems creates an enormous challenge. In addition to this argument, experience is another barrier to adopting EHR as a health professional over 5 years of experience had two times higher odds of using EMR than early career workers.[38] Overall, in most LICs, EHR adoption exists in the preimplementation phase.[36]

Four studies identified facilitators to HER adoption in LICs, as presented in table 4. Bisrat *et al*[43] found 70%–95% of healthcare providers have a favourable perception of using EMR systems. Similarly, Oumer *et al*[38] identified that about 85% of healthcare professionals demonstrated goodwill in using EMR systems. Fraser *et al*[40] noted the role of EHR systems in supporting patient care by providing alerts ahead of complications. The immaturity of health information exchange infrastructure in many LICs provides an opportunity to enhance EHR systems by incorporating mobile-based systems.[41]

Table 4 illustrates people and environment-related factors are both facilitating and impeding EHR adoption in LICs. While tool-related factors influence, task-related factors are facilitating EHR adoption. Overall, poor integration of EHR among the work systems factors affects EHR adoption. The absence of facilitators under tools and interaction among the four work systems indicated an insufficiency of technology and lack of management support to facilitate EHR adoption, respectively.

EHR and healthcare quality in LICs

EHR systems are improving healthcare delivery in both developing and developed countries. An empirical work reported from Rwanda,[40] Uganda[39] and Malawi[44] showed that EHR systems improve healthcare by managing patient information, supporting informed decisions and providing useful alerts. In developed nations, EHR-based clinical trials are providing evidence about treatment strategies, patient safety, care and health policy decisions.[45] Based on the WHO definition, this review considered seven quality indicators of healthcare: Safety, effectiveness, people-centredness, timeliness, efficiency, equity and integrated service.[1]

Safety

In terms of safety, the finding presented by Fraser *et al*[40] signified the role of openMRS system in supporting patient care by providing alerts. Additionally, Liang *et al*[39] mentioned the significance of EHR systems in maintaining patient safety features, which in turn has improved care for more than 60 000 patients in Uganda. This indicates implementation of an EHR system is highly important to ensure patient safety.

Effectiveness

In this review, Mkalira Msiska *et al*[44] noted EMR systems help generate more accurate information that can reduce medical errors. This could improve the decision-making capability of healthcare workers for effective patient management. Liang *et al*[39] mentioned that the locally developed EHR platform is capable of managing patient information and related healthcare services. Further, Fraser *et al*[40] indicated the effectiveness of openMRS despite the infrastructure limitation in Rwanda. These all assertions prove the significance of adopting EHR systems in delivering effective healthcare services.

People-centredness

In this review, the findings of Liang *et al*[39] reported that the partnership between healthcare providers and developers is significant to the design and adoption of user-centred technologies. The mUzima (mobile health) application is an example of how technologies can be used to promote healthcare for people at large.[41] The finding also indicated the adoption of mUzima across multiple LICs and for numerous core healthcare domains. These findings depict, EHR systems that are well communicated with the users during the design and adoption phases would yield a better outcome.

Timeliness

The review identified the benefits of EHR systems in facilitating contacting patients to ensure good ongoing care in place.[39] Mkalira Msiska *et al*[44] finding affirmed the introduction of EMR systems in Malawi healthcare helped to assess patients within a short period. Similarly, a survey by Oumer *et al*[38] found that 75% of health professionals agreed EMRs can improve timely patient care. These findings affirm the significance of EHR systems in providing timely care for patients in LICs.

Efficiency

The findings from Liang *et al*[39] indicated that EHR platforms play a crucial role in improving clinical efficiency. This could help healthcare professionals to carry out their duty on time and help patients not to wait too long to get treatments. Further, Mkalira Msiska *et al*[44] noted that the EMR system is more efficient in assessing more patients in a short period than traditional systems. Thus, adopting EHR systems can help improve healthcare quality by providing efficient services.

Equity

In this review, Were *et al*[41] stressed the use of the EHR system in delivering healthcare services by avoiding geographical barriers. The study identified that such systems could extend the reach of EHR systems within resource-limited settings as opposed to siloed mhealth applications. Further, Mkalira Msiska *et al*[44] underlined the significance of EHR systems in reaching every patient awaiting healthcare services with no bias. EHR systems provide healthcare services without geographical, economical and social limitations.

Integrated

In this review, the findings of Oza *et al*[34] showed that OpenMRS is the most comprehensive, adaptable clinical EHR built for a low-resource setting. The system is interoperable with other EHR systems to provide integrated healthcare services. Liang *et al*[39] noted that EHR platforms are being used to support patient care, live control of stock medicines, forward warnings to pharmacists and recognise prescription errors before causing harm. These findings elucidate the role of EHR systems in providing integrated quality healthcare services for patients.

DISCUSSION

Status of EHR adoption, challenges and opportunities in LICs

This review aims to examine the status, challenges and opportunities of adopting EHR systems to enhance the quality of healthcare delivery in LICs. In most LICs, donors provide support to establish EHR systems, which usually fail for many reasons. For example, in Ethiopia, the Smart Care system, which is supported by donors, is not functioning at full scale as expected due to low economic readiness.[46] It is failing at a pilot stage in many of the hospitals where the system is implemented.[43] Further, Ngusie *et al*[36] noted that, in most LICs, EHR implementation exists at the preimplementation stage. This affirms that countries should first identify organisational, technological, social and economic readiness before adopting EHR systems.[46]

However, in countries such as Uganda, locally developed EHR platforms are being used to enhance patient care.[39] The openMRS system in Rwanda is also making a notable influence in supporting healthcare delivery by providing informed decisions, alerts and reminders.[40] Further, studies conducted in Sierra Leone and Angola indicated that open-source EMR systems are enhancing clinical care and clinical decision-making.[34 35] These findings show that EHR systems are currently being practised in LICs despite the challenges reported. It is also in line with the findings reported in low-income and-middle-income countries.[47] Therefore, LICs should work hard towards adopting open-source EMR systems which fit the shortcomings of the economy and user-friendliness.

Most of the challenges for the failure of EHR adoption in LICs were lack of training, infrastructure, management commitment, standards, consistency, interoperability, quality of systems, support, use, information, satisfaction and impact of the system.[34 40 42–44] Further, Oumer *et al*[38] added the impact of healthcare providers' experience on affecting EHR adoption as experienced have twice higher odds of using EMR than early career workers. Most of these challenges are similar to those reported in studies conducted in middle-income countries.[19–23] Furthermore, a scoping review of studies published between 2005 and 2020 on PubMed, Web of Science, IEEE Xplore and ACM Digital Library reported similar challenges as the current study.[48] Therefore, every LICs needs to develop strategies, legislations, regulations and a framework of implementation that can address the mentioned challenges before adopting or implementing EHR systems.

Moreover, EHR adoption might pose unanticipated challenges to existing healthcare systems if not managed appropriately. Windle *et al*[49] in their findings indicated the perception of clinicians on the impact of EHR in impeding the workflow and communication, and prolonging their workday. EHR implementation causes physician burn-out due to contributing factors like increased documentation, which are significantly underestimated.[50] These challenges need critical attention and should be addressed during the preimplementation phase.

Despite the various factors influencing the success of EHR adoption, there are opportunities that can

maximise its potential. The most important scenario is a good perception of healthcare providers in using EMR systems.[43] Also, most healthcare professionals are open-minded about using such systems whenever deployed or adopted.[38] Moreover, the health information exchange infrastructure in LICs is immature or absent. These findings are in line with those mentioned in the studies conducted by Amend *et al*[51] which considers stakeholder readiness, change management, accessibility and ownership, EHR structure and external factors as key facilitators for EHR adoption.

Multiple studies indicated the impact of EHR systems in capitalising on quality in healthcare delivery.[34 38–41 44] Studies conducted in countries other than LICs indicated the significance of EHR systems in enhancing the quality of healthcare in terms of safety, effectiveness, people-centredness, timeliness, efficiency, equity and provision of integrated services.[52 53] This study portrayed a clear image of EHR systems adoption status, challenges and opportunities in LICs to enhance the quality of healthcare delivery.

Conclusion

EHR adoption is at early stage in most LICs, with different types of EHRs being used. It is facilitated or influenced by people, environment, tools, tasks and the interaction among these four factors. Unanticipated challenges such as physician burn-out are creating a challenge in slowing down EHR adoption.

Strengths

The review followed a protocol to select and synthesise relevant studies on the topic. Further, it identified research gaps to be addressed by future researchers. Overall, because of absence of previous systematic reviews in LICs, the findings could help develop implementation strategies and policies.

Limitations

The search result was vulnerable to various problems, such as reporting bias or lack of enough research outputs from LICs, as only studies from eight countries out of 28 were included. Additionally, a literature search was conducted only on PubMed, Science Direct, IEEE Xplore and journals of health informatics in developing countries. However, the quality of the studies was not compromised by following the review protocol.

Implications for practice, policy and future research

The review findings suggest all actors involved in EHR systems should collaborate effectively to yield a better outcome in healthcare delivery. This can be supported through EHR adoption policies, which are currently missing in many countries. Future research should focus on comparative studies on the practice of EHR systems in developing and developed countries.

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