E-Health Systems and Service Delivery Efficiency in Ghana: Assessing the Role of Electronic Health Records (EHR) In Improving Service Delivery Outcomes - A Systematic Literature Review

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ABSTRACT

This systematic literature review assesses the role of Electronic Health Records (EHRs) in improving healthcare service delivery efficiency in Ghana. Following PRISMA guidelines, a comprehensive search of Google Scholar, PubMed, Scopus, IEEE Xplore, and Web of Science was conducted, yielding 24 empirical studies published between 2008 and 2026. Thematic analysis identified eleven interrelated themes, including perceived benefits, implementation barriers, user acceptance, training, infrastructure constraints, data security, policy support, interoperability, change management, financial sustainability, and patient engagement. Findings indicate that EHR systems positively impact healthcare efficiency by reducing patient waiting times, improving workflow processes, enhancing data accuracy, and supporting timely clinical decisions. However, these benefits are unevenly realised due to persistent challenges such as unreliable electricity, poor internet connectivity, inadequate technical support, limited staff digital literacy, and weak interoperability. Organisational factors, including leadership commitment, continuous training, and sustainable funding, critically determine adoption and long-term system performance. The study concludes that while EHRs are essential tools for modernising healthcare delivery, their effectiveness in Ghana depends on coordinated investments in infrastructure, capacity building, governance, and context-sensitive implementation strategies. Recommendations include a national digital health policy, enforced interoperability standards, sustained facility-level funding, and embedded digital health training for all healthcare workers. This review provides evidence-based insights to guide policy decisions and improve EHR implementation outcomes in low-resource settings.

Keywords: Electronic Health Records (EHRs), healthcare service, delivery efficiency, digital health, implementation, low-resource settings

INTRODUCTION

Timely access to accurate patient information is central to effective healthcare delivery (Hornberger, 2009; Shapiro et al., 2011; Johnson et al., 2011; Mandell, 2024). In recent years, Electronic Health Records (EHRs) have emerged as a key tool for achieving this goal. EHRs are digital systems that store, manage, and provide access to patient health information across healthcare facilities (Blumenthal & Tavenner, 2010; World Health Organization, 2019). They replace paper-based records and allow healthcare providers to retrieve and share patient data in real time, thereby improving coordination and decision-making in clinical practice. Globally, EHR systems have become widely integrated into national health systems as part of broader digitalisation efforts (World Health Organization, 2016). Adoption rates are high in many high-income countries; for example, by 2015, 80.5% of hospitals in the United States had adopted a basic EHR system (Adler-Milstein & Jha, 2017). Evidence from these settings shows that EHRs improve the quality and efficiency of healthcare delivery. A meta-analysis by Campanella et al. (2016) found that EHRs reduce documentation time by 22.4% (which in turn helps reduce medical errors, enhance patient safety, and support faster, more accurate clinical decisions. The availability of real-time patient data also improves communication among providers, reduces duplication of services, and promotes more patient-centered care (Campanella et al. 2016; Kruse et al, 2018). However, regarding cost-effectiveness, early projections of annual savings based on 1.5% to 4% productivity improvements have not yet been achieved; the actual gains from health information technology have been only

marginally better (Kellermann & Jones, 2013). Nevertheless, global experience confirms that the success of EHR systems depends heavily on local context including infrastructure, technical capacity, user skills, and organisational support (Boonstra & Broekhuis, 2010). Where these conditions are weak, the benefits of EHR systems are often reduced.

This reality is evident across many African countries, where health systems continue to face structural and resource constraints. In response, there has been increasing interest in the use of EHRs as part of wider e-health strategies aimed at improving service delivery (World Health Organization, 2016; Danso et al., 2024). These efforts seek to address persistent challenges such as poor data management, fragmented healthcare services, and limited access to timely patient information. While several countries such as Rwanda, Nigeria, South Africa, Ethiopia and other developing nations have introduced EHR systems, implementation remains uneven across the continent (Rwanda Ministry of Health, 2025, Shaibu, 2025; Chuma, 2026). Many health facilities operate under conditions of unstable electricity, limited internet connectivity, and inadequate technical infrastructure. In addition, there is often a shortage of trained personnel to manage and use these systems effectively. As a result, the gains observed in high-income countries are not consistently realised in African settings (Danso et al., 2024).

Ghana reflects both the progress and the challenges associated with EHR adoption in Africa. The nation has made clear policy commitments to digital health, with the Ghana Health Service promoting the use of information and communication technologies to improve access, quality, and efficiency of care (Ghana Health Service, 2020). EHR systems have been introduced in several public and private health facilities. However, their implementation varies widely across regions, levels of care, and types of institutions (Osei & Kuupiel, 2022). While some facilities operate relatively advanced systems, others continue to rely on paper-based records or use limited digital tools. Empirical evidence suggests that EHR systems have the potential to improve service delivery in Ghana. For instance, Mensah et al. (2024) report a 56.4% improvement in workflow processes, while reductions in patient waiting time of up to 50% have been observed under optimal conditions (News Ghana, 2025; Ofori, 2025). Improvements in access to patient information have also been reported at 26.6% (Boateng et al., 2020; Odei-Lartey et al., 2020). These outcomes indicate that EHRs can enhance efficiency within healthcare facilities. Despite these benefits, many facilities continue to face significant operational challenges, including unreliable power supply, unstable internet connectivity, inadequate hardware, and limited staff training. Weak technical support after implementation further affects system sustainability (Boateng et al., 2020; Jha et al., 2009). In addition, concerns about system interoperability, data security, and user acceptance continue to limit the effectiveness of EHR systems. A further concern lies in existing research on EHRs in Ghana. Current studies are fragmented and vary in design, scope, and measurement of outcomes. Many rely on self-reported data and cross-sectional approaches (Abdulai & Adam , 2020); Addo & Agyepong, 2024; Anane et al., 2025; Odei-Lartey et al., 2020), which limit the ability to establish causal relationships or assess long-term impacts. While some studies report positive outcomes, others highlight significant system limitations (Ngusie et al., 2022; Boateng et al., 2020). As a result, the evidence base remains inconsistent, making it difficult to draw firm conclusions about the overall impact of EHR systems on healthcare service delivery. This inconsistency points to a clear gap in the literature. There is limited synthesis of existing studies that brings together evidence on both the benefits and the challenges of EHR implementation in Ghana. In particular, there is insufficient understanding of how contextual factors such as infrastructure, training, and system design influence service delivery outcomes.

This study makes a distinct contribution by moving beyond isolated findings to provide an integrated and systematic synthesis of the evidence. Unlike previous studies that focus on single facilities or specific outcomes, this review brings together diverse empirical findings and examines EHR effectiveness across multiple dimensions, including workflow efficiency, access to information, and system sustainability. It further links these outcomes to underlying implementation conditions, thereby offering a more comprehensive explanation of why EHR systems succeed or fail in different contexts. This study, therefore, aims to assess E-Health systems and service delivery efficiency in Ghana, with a focus on the role of Electronic Health Records (EHR) in improving service delivery outcomes. Specifically, it seeks to examine: (1) the impact and implementation of Electronic Health Records (EHR) systems in healthcare facilities in Ghana and (2) the perceived and actual benefits and challenges of EHR systems on healthcare service delivery efficiency, particularly in relation to workflow processes, information availability, and clinical satisfaction. By doing so, the study provides clearer,

evidence-based insights to support policy decisions and improve the implementation of digital health systems in Ghana.

SYSTEMATIC LITERATURE REVIEW METHODOLOGY

To systematically find, screen, and synthesize the studies examined in this systematic review, the PRISMA methodology was used. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol was designed "to promote comprehensive and open reporting of systematic reviews of health care interventions". (Moher et al., 2009)

Data Search Process

As shown in Table 1 search string, a comprehensive literature review was conducted to identify empirical studies on Electronic Health Records (EHRs) and their influence on healthcare delivery in Ghana and other low- and middle-income countries. The principal objectives were to achieve thorough coverage, mitigate bias, and ensure methodological rigor. A systematic search was conducted in major databases, including Google Scholar, PubMed, Scopus, IEEE Xplore, and Web of Science, to identify relevant literature on health and technology. Various keywords, synonyms, and precise terms were utilized in conjunction with Boolean operators (AND, OR), truncation, and phrase searching. The search terms included variations of Electronic Health Records, healthcare delivery and efficiency, implementation, adoption, and factors associated with benefits or barriers. Although the focus was primarily on Ghana, studies from analogous countries were also considered by incorporating terms such as digital health systems, health information systems, and e-health to address terminological variation. Inclusion criteria restricted studies to those published in English between 2008 and 2026, corresponding with the period of accelerated digital health adoption in Ghana. The reference lists of selected articles were manually examined to identify additional studies, not retrieved during the initial database search, using a snowball sampling technique. In total, 24 studies constituted the basis for this review.

Eligibility Criteria

Inclusion and exclusion criteria were set to aid the screening and selection of articles as follows:

Criteria for Inclusion:

Empirical studies that examined the impact of Electronic Health Records on health care service provision efficiency; those on the effect of EHR on service delivery efficiency in Ghana or another low-resource or middle-income country; quantitative, qualitative, and mixed-methods designs; and published in journals or institutional reports were included.

Exclusion Criteria:

Editorials, comments, and non-peer-reviewed reports were excluded; studies without any element of empirical measures or outcomes were excluded; non-English articles were excluded. Also, studies on other health technologies, rather than EHR systems, were excluded.

Study Selection Process

Four major steps of the study selection process were adopted, following the PRISMA guidelines: identification, screening, eligibility, and inclusion. 520 records were obtained from the various searches. By browsing article titles and abstracts, those with clear irrelevant evidence were excluded from further assessment, leaving 140 articles, which were subsequently evaluated for relevance according to the set inclusion criteria. 24 articles qualified for further review. (Alhassan et al., 2025)

Extraction of Data and Analysis

A structured data extraction form was employed to capture key details, including author, publication purpose, study population, sample size, main findings, conclusion, and appraisal score were collected. For the data

analysis, a thematic analysis approach was adopted, yielding 11(eleven) themes namely: Perceived Benefits of EHR on Healthcare Efficiency, Barriers to Effective Implementation, User Acceptance and Behavioral Factors, Training and Capacity Building, Infrastructure and Technological Constraints, Data Security, Privacy, and Confidentiality, Policy, Institutional Support, and Governance, Interoperability and System Integration, Change of Management Strategies, Change Management Strategies, Financial Sustainability and Funding Mechanisms, and Patient Engagement and Perception.

PRISMA Flow Diagram

PRISMA flow diagram in Figure 1 shows the selection process, including 520 records identified, 120 articles assessed for eligibility, and 24 studies included in the systematic review. (PRISMA 2020 flow diagram/ PRISMA statement, 2020). Five major databases- Google Scholar, PubMed, Scopus, IEEE Xplore, and Web of Science- were systematically searched to ensure comprehensive coverage. The search strategy used precise keywords and controlled vocabulary, combined with Boolean operators, truncation, and phrase searches. The primary focus encompassed electronic health records (EHRs), digital health systems, healthcare efficiency, service delivery, and associated implementation factors, benefits, or barriers. The search approach was tailored to address the specific characteristics of each database, and only studies published in English between 2010 and 2026 were deemed eligible. Additionally, a snowball sampling method was employed to identify additional pertinent studies. In total, 24 empirical articles were selected for detailed analysis**.**

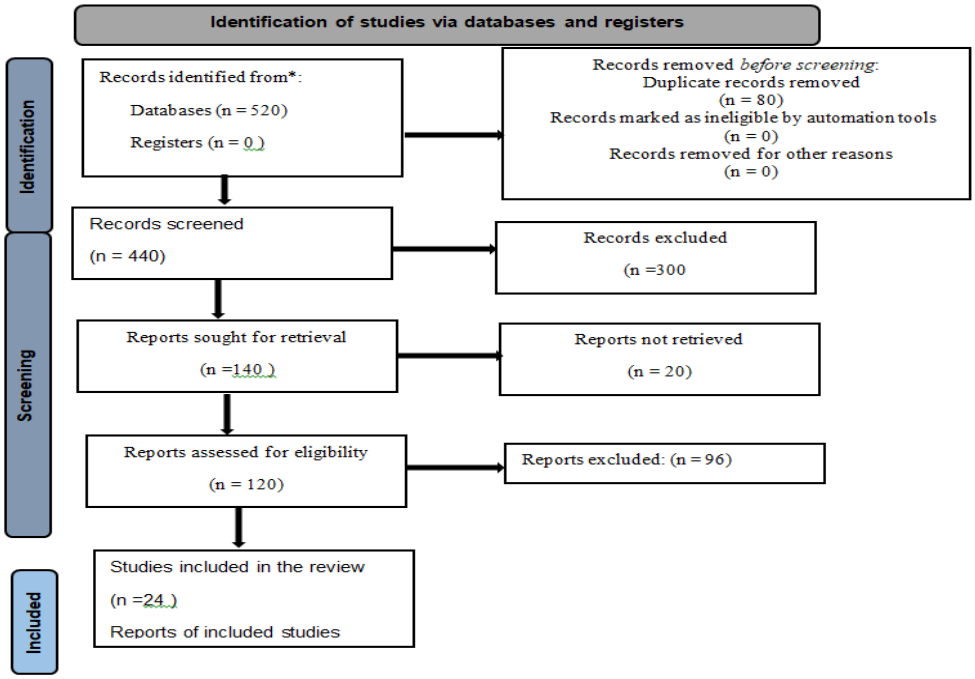

Figure 1 PRISMA Flow Diagram

Source: Field Research, 2026

Table 1: Database Search String

Engine / Database	Search String	Year Filter
Google Scholar	("Electronic Health Record*" OR "EHR" OR "Electronic Medical Record*" OR "EMR" OR "Digital health" OR "Health information system*") AND ("Ghana" OR "Sub-Saharan Africa") AND ("healthcare delivery" OR "service delivery" OR "healthcare efficiency" OR "quality of care")	2010–2026
	("EHR" OR "Electronic Health Record*") AND ("benefits" OR "impact" OR "challenges" OR "barriers") AND ("healthcare" OR "hospital") AND ("Ghana" OR "developing country")	2010–2026

PubMed	("Electronic Health Records"[MeSH] OR "Electronic Medical Records" OR "EHR") AND ("Health Services Efficiency"[MeSH] OR "Healthcare Delivery" OR "Quality of Care") AND ("Ghana" OR "Africa")	2010–2026
	("EHR implementation" OR "Health Information Systems") AND ("adoption" OR "utilization" OR "use") AND ("healthcare facilities" OR "hospitals") AND ("Ghana")	2010–2026
Scopus	TITLE-ABS-KEY ("Electronic Health Record*" OR "EHR" OR "Health information system*") AND TITLE-ABS-KEY ("healthcare efficiency" OR "service delivery" OR "clinical performance") AND TITLE-ABS-KEY ("Ghana" OR "Sub-Saharan Africa")	2010–2026
	TITLE-ABS-KEY ("EHR implementation" OR "Electronic Medical Record*") AND TITLE-ABS-KEY ("barriers" OR "challenges" OR "factors" OR "adoption") AND TITLE-ABS-KEY ("healthcare")	2010–2026
IEEE Xplore	("Electronic Health Record" OR "EHR" OR "Health Information System" OR "e-health") AND ("system implementation" OR "system performance" OR "efficiency") AND ("healthcare" OR "hospital")	2010–2026
	("digital health system*" OR "health information technology*") AND ("infrastructure" OR "network" OR "system reliability" OR "performance") AND ("healthcare")	2010–2026
Web of Science	TS=("Electronic Health Record*" OR "EHR" OR "Health Information System*") AND TS=("healthcare delivery" OR "healthcare efficiency" OR "quality of care") AND TS=("Ghana" OR "Africa")	2010–2026
	TS=("EHR implementation" OR "Electronic Medical Record*") AND TS=("effectiveness" OR "impact" OR "outcomes") AND TS=("healthcare" OR "clinical care")	2010–2026

Source: field research, 2026

Characteristics, Appraisal, and Key Themes

Characteristics of Included Studies

There is significant heterogeneity among the studies included in this review. There are variations in sample size, research methods, study designs, and geographic locations. This diversity highlights the complexities of implementing Electronic Health Records in Ghana. Sample sizes ranged widely across studies. Qualitative research, such as in-depth interviews and exploratory designs, generally involves smaller samples of 15 to 40 participants. Larger quantitative studies, especially those with multi-site or national surveys, had samples exceeding 1,000 respondents (Odei-Lartey et al. 2020; Ngusie et al. 2022). Most cross-sectional quantitative studies used moderate to large sample sizes, typically between 200 and 567 participants (Jha et al., 2009). Studies that focused on particular professional groups, clinicians, nurses, or health information officers, selected 300-400 respondents to ensure representation. Few studies used longitudinal designs. These generally involved smaller samples due to the high costs and logistical challenges of repeated data collection (Campanella et al., 2016).

Existing literature relies mostly on quantitative research methods. Cross-sectional surveys, the most frequent approach, consistently find associations between EHR adoption and improvements in healthcare efficiency (Odei-Lartey et al. 2020; Jha et al., 2009)). These studies use structured questionnaires and validated tools to assess system usability, workflow efficiency, data accessibility, and user satisfaction. Statistical analyses such as regression, correlation, and multivariate modeling highlight these links. Fewer studies use qualitative methods, including in-depth interviews, focus groups, and case studies, which reveal common user experience challenges and organizational or socio-cultural influences on EHR adoption (Boateng et al., 2020). Mixed-methods designs combine survey data with interviews or observations, and findings suggest this approach enhances contextual understanding through methodological triangulation (Jha et al., 2009)).

Cross-sectional studies are the predominant research design. This limits the ability to establish causal relationships, but it helps identify associations between EHR use and healthcare outcomes. Some studies use longitudinal and quasi-experimental designs to examine the effects of EHR implementation over time. Experimental designs are rare, mainly due to practical and ethical constraints on controlled experiments in healthcare. Most studies focus on Ghana and other low- and middle-income countries, although some data come from high-income regions. Widespread challenges in program implementation, along with regional obstacles, highlight the effects of infrastructure, staffing, and institutional readiness on EHR adoption (Kellermann & Jones, 2013). The diversity of research methods shows the evolution of EHR research. It also highlights the need for more longitudinal and experimental studies to fill research gaps.

Evaluation of Included Studies' Quality

The methodological quality of the included studies was evaluated using three established instruments, including the Joanna Briggs Institute (JBI), Critical Appraisal Tools for quantitative research, Mixed Methods Appraisal Tool (MMAT) for studies combining qualitative and quantitative methods, and Critical Appraisal Skills Programme (CASP) framework for qualitative research. These instruments ensured standardized evaluation, revealed that the studies generally exhibited moderate to high methodological rigor, and enhanced confidence in the reported results. Building on this, the JBI framework identified quantitative studies as high quality because of well-defined populations, appropriate sampling strategies, and validated instruments, as reported by Mensah et al. (2024) and Agyeman et al. (2025). These studies used robust statistical methods to examine relationships between electronic health record (EHR) adoption and healthcare outcomes. However, significant limitations remained; the study relied heavily on self-reported data, which may introduce response bias, and utilized only cross-sectional study designs, which restrict the ability to infer causality. Similarly, the CASP framework showed that most qualitative studies met high-quality standards. These studies contributed valuable contextual insights into user and organizational behavior patterns. However, common limitations included insufficient documentation of researchers' reflexive processes, which complicates bias assessment, and incomplete reporting of data saturation, potentially undermining the trustworthiness of the findings.

Turning to mixed-methods research, the MMAT assessment found that most studies achieved moderate quality standards. These studies typically combined quantitative and qualitative data through methodological triangulation. However, occasional failures to integrate both data types reduced their capacity to provide comprehensive findings, as highlighted by Osei and Kumi (2021). Together, evidence from quantitative, qualitative, and mixed-methods studies provides a reasonable basis for drawing valid conclusions regarding the impact of EHR systems on healthcare efficiency. Quantitative approaches yield statistically significant associations and generalizability, while qualitative analyses offer essential insights into user and organizational experiences. Mixed-methods research seeks to integrate these strengths, though with varying degrees of success. Persistent limitations remain, such as the lack of longitudinal designs in quantitative studies, which restricts causal inference. Although mixed-methods research attempts to address this limitation by incorporating qualitative perspectives, incomplete integration often undermines these efforts. Similarly, insufficient reflexivity in qualitative studies reduces their trustworthiness and the value they contribute to mixed-methods designs. Recognizing these interconnected limitations underscores ongoing methodological challenges. Ultimately, synthesizing the findings highlights the need for future research that intentionally combines robust longitudinal quantitative approaches with comprehensive qualitative investigation, particularly within well-integrated mixed-method frameworks, to establish a more reliable evidence base.

Table 2: Summary of Quality Appraisal of Included Research

Study Type	Appraisal Tool Used	Quality Rating	Strengths	Limitations
Quantitative Studies	JBI	High	Clearly defined populations; appropriate sampling; use of validated instruments; robust statistical analysis	Reliance on self-reported data; cross-sectional design limits causal inference

Qualitative Studies	CASP	High	Clear research objectives; appropriate qualitative methods; systematic analysis (e.g., thematic analysis); rich contextual insights	Limited reporting of reflexivity; insufficient discussion of data saturation
Mixed-Methods Studies	MMAT	Moderate	Methodological triangulation; integration of quantitative and qualitative data; enhanced contextual interpretation	Weak integration between methods in some studies; limited depth in analysis

Source field research, 2026

Methodological Rigor and Expanded Recommendations

In this review, the coding of studies was done carefully to make sure the findings are trustworthy. Each reviewer read and coded the studies separately using a structured form. When there were disagreements, the reviewers met to discuss and reach a common decision so that no single opinion dominated the process. To check consistency, inter-coder reliability was assessed, which confirmed that the coding was applied in a similar way by all reviewers. This strengthens confidence in the themes that were identified.

Thematic Key Findings

This section summarizes findings from 24 studies on the impact of Electronic Health Record (EHR) systems in Ghana. This analysis identified several interrelated themes that clarify the advantages and limitations of EHR implementation. Eleven major themes emerged as determinants of EHR effectiveness; they are elaborated as follows:

Perceived Benefits of EHR on Healthcare Efficiency

The literature shows that EHR systems enhance healthcare efficiency by enabling rapid access to patient records, reducing redundant tasks, and enhancing the precision and uniformity of clinical data (Agyeman et al, 2025; Mensah & Amoah, 2024). EHR adoption improves coordination of patient care across departments and ensures that comprehensive patient histories are promptly maintained to meet clinical needs. Studies in tertiary hospitals in Accra and Kumasi report that EHR implementation reduces patient waiting times and administrative processing. These findings suggest that EHR systems can improve workflow efficiency and support more effective evidence-based clinical decision-making.

Barriers to Effective Implementation

Multiple barriers hinder the full realization of EHR benefits. High acquisition, implementation, and maintenance costs are major challenges for underfunded facilities (Boateng et al., 2020). Organizational resistance to change often stems from insufficient technical support and workflow disruptions caused by electronic documentation. Partial adoption often results from financial constraints, inadequate planning, and limited stakeholder engagement. These challenges highlight the need for strategic planning and resource allocation to ensure successful EHR implementation.

User Acceptance and Behavioral Factors

User attitudes, perceptions, and digital literacy are critical for EHR system adoption. Although users may recognize the utility of EHR systems, adoption is often slowed by resistance to change, concerns about increased workload, and doubts about technological reliability (Jha et al., 2009; Ngusie et al., 2022). Older staff and healthcare workers with limited IT skills show greater resistance. Evidence suggests that mentoring, peer support, and demonstrations of system benefits help overcome behavioral barriers, highlighting the importance of human-centered approaches to technology adoption.

Training and Capacity Building

Training significantly influences the effectiveness of electronic health record (EHR) systems. Facilities that implement regular training observe higher rates of staff adoption and more effective system utilization (Ngusie et al., 2022; Ngusie et al., 2022). Enhanced understanding of the system leads to reduced errors and increased staff confidence, thereby improving overall operational efficiency (Ngusie et al., 2022). Conversely, inadequate training leads to lower system adoption, more errors, and staff resistance to change (Odei-Lartey et al. 2020). Limited familiarity with the technology causes healthcare workers to miss features that could improve efficiency or patient care (Ngusie et al., 2022). Ongoing education, on-the-job support, and continuous professional development are essential to maximize the benefits of EHR investments (Ngusie et al., 2022); Ngusie et al., 2022).

Infrastructure and Technological Constraints

EHR systems need a reliable infrastructure to operate effectively. Studies show that hospitals in rural areas rely on power backups, internet connectivity, and up-to-date hardware and software, but these resources often experience frequent downtime (Boateng et al., 2020; Jha et al., 2009)). Infrastructure gaps disrupt clinical operations, reduce staff trust in the systems, and impair performance. To ensure effective EHR operations, organizations must invest in advanced technological infrastructure, including backup power and stable network connections.

Data Security, Privacy, and Confidentiality

Patient data security strongly influences decisions about adopting and using healthcare systems. Healthcare providers are concerned about unauthorized access, potential data breaches, and insufficient privacy protection legislation (Mensah & Amoah, 2024). Evidence suggests that organizations must implement strong data security measures, including clear access controls and comprehensive data protection policies, to build user trust in EHR systems.

Policy, Institutional Support, and Governance

Successful EHR system implementation requires strong organizational leadership, clear policy frameworks, and effective governance. Institutions with robust leadership and clear regulatory guidance achieve higher adoption rates, better system integration, and sustained operations (Ngusie et al., 2022; Boateng et al., 2020). Inadequate governance, lack of national standards, and poor inter-hospital coordination hinder interoperability, slow system expansion, and reduce operational efficiency.

Interoperability and System Integration

Interoperability is essential for EHR systems to deliver their full benefits. Research shows that non-standardized systems create operational silos, impede data sharing between departments and facilities, and disrupt patient care, reducing clinical effectiveness (Jha et al., 2009)). Successful integration requires interoperable software platforms and data standards that support information exchange in line with institutional policies.

Change Management Strategies

The method of EHR system implementation strongly influences project outcomes. Organizations that use gradual implementation, stakeholder engagement, and effective complaint-handling achieve better operational performance and higher user satisfaction (Ngusie et al., 2022). Abrupt transitions or poor management increase resistance and disrupt workflows, reducing adoption rates. These findings highlight the importance of strong change management frameworks to guide operational transitions.

Financial Sustainability and Funding Mechanisms

Sustained financial resources are essential for maintaining EHR system operations. Facilities that secure funding through budget allocations, donor contributions, and government support are better able to update software and

provide staff training (Boateng et al., 2020). Funding shortfalls lead to recurrent system breakdowns and hinder ongoing software development.

Patient Engagement and Perception

Patient understanding and attitudes toward EHR systems influence adoption rates. Positive patient experiences with digital record-keeping encourage greater provider usage, while skepticism and privacy concerns are barriers (Mensah & Amoah, 2024). Hospitals should include patient education, consent processes, and effective communication strategies to enhance EHR acceptance and perceived value.

Contextual Adaptation and Localization: Customizing EHR systems to local operational processes, cultural practices, and language requirements is essential for successful adoption and integration. Systems tailored to local conditions are more user-friendly, leading to higher adoption rates and smoother integration. Contextual adaptation allows EHR systems to align with existing digital practices and tools, supporting operational sustainability. The eleven identified themes show that EHR systems in Ghana operate through the interplay of technological, organizational, behavioral, financial, policy, and contextual factors. Realizing the full potential of EHR systems requires integrated approaches that include robust infrastructure, ongoing capacity development, effective governance, secure data management, sustainable funding, and context-specific design. These interconnected elements together enhance healthcare delivery efficiency, patient care quality, and public access to medical services.

Synthesis of the study's findings

A synthesis of 24 empirical studies shows that Electronic Health Record (EHR) systems contribute positively to healthcare service delivery in Ghana by improving workflow efficiency, enhancing access to patient information, and supporting clinical decision-making. Across the reviewed literature, consistent evidence indicates that EHR adoption reduces administrative workload, minimizes duplication of tasks, and improves coordination of care across departments (Odei-Lartey et al. 2020; Ngusie et al., 2022). These improvements collectively strengthen service delivery efficiency within healthcare facilities. However, the evidence also demonstrates that these benefits are not uniformly experienced across all settings. The effectiveness of EHR systems is strongly shaped by contextual and infrastructural conditions. Persistent challenges such as unstable electricity supply, weak internet connectivity, limited interoperability between systems, and inadequate technical support significantly reduce system performance, particularly in rural and resource-constrained facilities (Boateng et al., 2020; Jha et al., 2009). These limitations disrupt workflow continuity and reduce user confidence in the systems. Beyond infrastructure, human and organisational factors also play a decisive role in shaping EHR outcomes. Staff digital literacy, perceived usefulness, system usability, and organisational readiness consistently influence adoption and sustained use. Studies show that where continuous training, leadership support, and user engagement are present, EHR systems are more effectively utilised and integrated into routine clinical practice. In contrast, inadequate training and resistance to change contribute to underutilisation and partial adoption. Financial sustainability also emerges as a critical determinant of long-term system performance. Facilities with stable funding are better able to maintain systems, upgrade software, and support ongoing staff training, while underfunded institutions experience system breakdowns, outdated infrastructure, and reduced operational efficiency (Boateng et al., 2020). The success of EHR implementation, therefore, depends not only on digital adoption but also on the strength of the broader health system within which it operates.

Table 3: Literature Synthesis of 24 primary research studies

Author	Purpose of the Study	Study Population	Sample Size	Main Findings	Conclusion	Appraisal Score
Odei-Lartey et al. (2024)	Assess EHR impact on workflow	Health professionals	263	Improved workflow and faster access to patient data	EHR enhances efficiency but requires infrastructure	High

Abdulai & Adam (2020)	Assess readiness for EHR adoption	Health workers	284	Low readiness due to limited ICT skills	Training is critical for adoption	High
Tilahun & Fritz (2015)	Evaluate EHR adoption	Health professionals	422	Low adoption linked to inadequate training	Capacity building is essential	High
Biruk et al. (2014)	Assess information system utilization	Health workers	339	Low utilization due to poor ICT skills	Training improves usage	High
Woldemariam et al. (2023)	Assess data quality improvement	Health workers	356	Improved data completeness and accuracy	EHR enhances data quality	High
Ngusie et al. (2022)	Evaluate EMR utilization	Health professionals	412	Low usage due to limited digital literacy	Training and support are required	High
Ngusie et al. (2022)	Assess EMR use in facilities	Health workers	403	Poor utilization due to infrastructure gaps	An improved ICT infrastructure is necessary	High
Ojo & Popoola (2015)	Examine EMR adoption factors	Healthcare workers	312	Adoption is influenced by user competence	Training enhances uptake	High
Kipturgo et al. (2014)	Assess EMR system success	Health staff	193	Improved efficiency and record management	EMR improves service delivery	High
Oluwagbemiga et al. (2016)	Assess EMR use in Nigeria	Health workers	250	Low adoption due to poor infrastructure	Strengthening technical systems is essential	High
Nzinga et al. (2019)	Evaluate system adoption context	Health workers	237	Adoption is influenced by organizational context	Context is critical for implementation	High
Wayne et al. (2012)	Evaluate EMR system performance	Health staff	150	Improved reporting and data use	EMR supports healthcare delivery	Moderate
Douglas et al. (2010)	Evaluate system utilization	Health workers	128	Training levels influence adoption	Capacity building is needed	Moderate
Wolfe et al. (2013)	Assess EMR system performance	Healthcare providers	164	Improved workflow efficiency	EMR enhances service delivery	Moderate

Madanian et al. (2012)	Assess system usability	Healthcare providers	210	Usability issues affect adoption	Improve system design	Moderate
Chao et al. (2013)	Evaluate EHR usability	Clinicians	175	System complexity limits effectiveness	Simplification of interfaces is required	Moderate
Bah et al. (2011)	Examine adoption barriers	Health workers	220	Resistance and skill gaps identified	Human factors must be addressed	Moderate
Kijsanayotin et al. (2009)	Evaluate adoption determinants	Health professionals	349	Social and technical factors influence use	Adoption is multi-factorial	High
Yusof et al. (2008)	Assess system success factors	Health system users	300	System quality affects performance	An integrated system approach is needed	High
Gagnon et al. (2012)	Assess adoption and acceptance	Health professionals	251	User acceptance influences success	Training and awareness required	Moderate
Weiner et al. (2023)	Evaluate EHR implementation strategies	Health systems/users	Not stated	Implementation strategies shape outcomes	Context-sensitive implementation is required	High
Tsai et al. (2020)	Assess digital health system effectiveness	Healthcare data users	Not stated	Digital systems improve outcomes	Data-driven care enhances performance	High
Kutney-Lee et al. (2021)	Examine health IT and care quality	Nurses & hospitals	>1,000	Health IT linked to improved patient outcomes	IT improves the quality of care	High
Richesson et al. (2021)	Evaluate EHR data standardization	Health data systems	Not stated	Standardization improves interoperability	Data governance is essential	High

Source: Field research, 2026

RESULTS, DISCUSSIONS, AND RECOMMENDATIONS

Results

The analysis identified seven interrelated themes: perceived benefits for healthcare efficiency; barriers to implementation and user acceptance; training and capacity building; infrastructure constraints; data security and privacy concerns; and policy and governance factors. These themes show that both technological and contextual factors influence the effectiveness of EHR systems. The findings show that EHR systems positively impact healthcare delivery. They enhance workflow efficiency, reduce patient waiting times, improve data accuracy, and enable timely clinical decision-making (Odei-Lartey et al. 2020; Ngusie et al. (2022). These improvements result from faster access to patient records, less task duplication, and better coordination of care across departments. However, these benefits are not experienced equally across settings. The effectiveness of EHR systems is limited by infrastructure and systemic challenges, such as unreliable electricity, inadequate internet connectivity, limited system interoperability, and insufficient technical support (Boateng et al., 2020; Jha et al.,

2009). These challenges are especially pronounced in rural and resource-poor areas, where frequent system disruptions further reduce user trust. In addition to these technological barriers, successful adoption and sustained use of digital technologies also depend on factors such as digital literacy, perceived usefulness, and ease of use. Facilities that offer continuous training, user support, and well-designed systems report higher acceptance rates and more effective utilization. Conversely, inadequate training and poor system usability contribute to user resistance and underutilization.

Overall, the results suggest that while EHR systems can enhance healthcare efficiency, their success relies on effective interaction between technology and users. Success also depends on the broader functioning of the health system.

Discussion

Building from the results, a review of 24 studies demonstrates that Electronic Health Record (EHR) systems have markedly improved healthcare in Ghana. Facilities using EHRs access patient records instantly, reduce paperwork, and ensure greater data accuracy. Care teams coordinate more efficiently, reducing patient wait times and speeding up clinical decision-making (Mensah & Amoah, 2024; Ngusie et al., 2022). As detailed in Section 3.4, digital health systems transcend mere technological updates; they optimize operations and raise care standards. Still, EHR impact hinges on specific technologies, organizational workflows, funding, leadership, and staff attitudes. Despite these strengths, EHR implementation faces numerous hurdles. Costs extend beyond purchase to deployment, upkeep, and repair. Smaller clinics and those in low-resource areas encounter the greatest barriers. Transitioning from paper-based to digital systems can disrupt routines, especially without sufficient technical support. In rural settings, unstable internet and weak electricity further block implementation (Boateng et al., 2020; Jha et al., 2009). Successful EHR adoption demands organizational readiness and ongoing support; without these, use remains limited. Human factors are pivotal in EHR adoption. Staff buy-in hinges on perceived value, user-friendliness, and digital skills. Many healthcare workers, especially those used to manual routines, may initially resist. Comprehensive training, reliable technical support, mentorship, and gradual rollout foster adaptation (Ngusie et al., 2022). Emphasizing user engagement and sustained support is crucial to successfully integrating EHRs.

Effective EHR deployment depends on robust infrastructure, including reliable electricity, internet connectivity, and interoperable hardware. Governance with decisive leadership, clear policies, and streamlined procedures is also crucial. Deficiencies or ambiguous management structures impede EHR adoption and system performance (Ngusie et al., 2022; Boateng et al., 2020). Trust is key to EHR adoption. Staff and patients raise issues about data privacy and security. Lacking clear assurances of confidentiality, users may hesitate to fully use EHR systems (Mensah & Amoah, 2024). Strong data protection is vital for earning trust and achieving widespread adoption. Sustained funding is a hurdle for EHR upkeep. Clinics with stable government support, grants, or other sources can upgrade systems and train staff. Facilities with inconsistent funding often face broken equipment, outdated software, and poorly trained personnel (Boateng et al., 2020). Long-term financial planning is as vital as initial investment. EHR systems must fit local workflows, languages, and practices to promote meaningful use. Overly complex or poorly adapted systems go underutilized, despite technical sophistication (Jha et al., 2009). These findings highlight the need for EHR strategies that are sensitive to technology, training, funding, security, and local requirements.

Interpretation of Key Findings

Based on the discussion, a key interpretation of the findings is that EHRs streamline clinical operations, optimizing workflows and reducing patient wait times by improving information access (Odei-Lartey et al. 2020; Ngusie et al. 2022). However, improvements depend on infrastructure and support. Organizations lacking these foundations lose many of the advantages of EHRs (Boateng et al., 2020; Jha et al., 2009). Adoption requires readiness, clear roles, and integration into routine operations.

Comparison across Studies

Building from the interpretation given, a comparative analysis of the studies uncovers both consensus and discrepancy. While quantitative research consistently reports tangible improvements, such as reduced paperwork, enhanced data access, and improved patient management (Odei-Lartey et al. 2020; Darko et al., 2021; Kijsanayotin et al., 2009), these outcomes contrast with qualitative investigations that often emphasize on-the-ground challenges and contextual barriers. This contrast clarifies where evidence is strongest and where complexities require further investigation. Conversely, qualitative investigations uncover barriers such as unintuitive interfaces, disruptive transitions, and resistance to altering established routines (Boateng et al., 2020; Amponsah et al., 2021). This qualitative perspective contrasts with quantitative findings by exposing complexities that broad outcome measures may obscure. Mixed-methods studies affirm that installing EHRs alone is inadequate. Focused training, solid infrastructure, and unwavering organizational investment are crucial to converting expected gains into lasting improvements (Jha et al., 2009)). Without these essentials, EHR use falters.

Explanation of Patterns and Differences

Based on the comparison across studies, the Differences in EHR success stem mainly from contextual factors. Urban facilities typically benefit from superior infrastructure, greater technical support, and involved management. In contrast, rural centers struggle with unreliable connectivity, frequent power loss, and scarce resources (Kipturgo et al., 2014; Gagnon et al., 2012). Reliable infrastructure is pivotal for EHR performance. Power or internet interruptions can halt system operations entirely. Furthermore, proficient staff bolsters system effectiveness; greater digital competence correlates with more robust EHR utilization (Ngusie et al., 2022; Ngusie et al., 2022). User views strongly shape EHR uptake. Positive perceptions of usefulness and usability encourage engagement, while resistance grows when changes feel forced, or users lack digital skills, especially among senior employees (Odei-Lartey et al. 2020; Ngusie et al. 2022). Strong leadership and organizational support enable smooth EHR integration (Ngusie et al., 2022; Abdulai & Adam, 2020). System design and ongoing support are critical. EHRs that align with current workflows are adopted quickly, whereas complex systems hinder adoption (Abdulai & Adam, 2020; Tilahun & Fritz, 2015). Continued support and sustained investment are vital to maintaining effective EHR operations (Ngusie et al., 2022).

Implications for Policy Development and Intervention Practices

A synthesis using 24 studies highlights the need for Ghana to establish comprehensive policies and strategic interventions to enable effective implementation of electronic health records (EHRs). While EHRs improve healthcare efficiency, this benefit alone is insufficient; successful adoption and sustainability depend on coordinated efforts at both system and organizational levels. Persistent structural, technical, and organizational challenges must be addressed to avoid hindering progress (Odei-Lartey et al. 2020; Ngusie et al. 2022).

Policy Relevance

The evidence demonstrates the necessity for a comprehensive, nationally coordinated digital health strategy. Implementation of EHR systems should not be regarded simply as a technical transfer to clinics. Relevant policies must prioritize interoperability, underpinned by clear standards and regulations, to ensure consistent information flow and continuity of care (Jha et al., 2009). Data privacy protection is paramount, as robust privacy regulations cultivate trust among healthcare professionals and patients, particularly amid widespread security concerns (Mensah & Amoah, 2024). Equity constitutes a fundamental concern. Numerous facilities, particularly those located outside major cities, lack essential resources such as reliable electricity and stable internet access. Empirical studies reveal significant gaps in these areas. Should policies fail to address such disparities, EHR implementation will disadvantage considerable segments of the population (Boateng et al., 2020; Kipturgo et al., 2014). Prioritization of infrastructure improvements is required to ensure equitable access.

Implementation Strategies

Introducing new technology into clinical settings is ineffective without sufficient funding, reliable infrastructure, and robust leadership support. Unreliable electricity supply and unstable internet connectivity undermine system performance and diminish users' confidence in EHRs. Addressing these issues is essential (Boateng et al., 2020). Training constitutes a critical component. Regularly scheduled sessions develop digital competencies, enhance staff confidence, and facilitate broader system adoption, especially among individuals less familiar with digital health tools (Ngusie et al., 2022; Ngusie et al., 2022). Continuous technical support is necessary to maintain system functionality and mitigate disruptions (Ngusie et al., 2022).

System design also warrants consideration. Intuitive EHR software that integrates seamlessly into daily workflows promotes staff adoption, whereas cumbersome and complex systems frequently elicit resistance (Abdulai & Adam, 2020; Tilahun & Fritz, 2015). Leadership is vital; managerial facilitation of change increases staff engagement and enhances organizational readiness for technological adoption (Ngusie et al., 2022). Implementing a system without continuous oversight is insufficient. Regular feedback, along with systematic monitoring and evaluation, enables clinics to identify challenges, refine processes, and sustain the functionality of such systems (Jha et al., 2009).

CONCLUSION

The study, therefore, concludes that although Electronic Health Record systems are an essential instrument for improving healthcare service delivery, their effectiveness is fundamentally dependent on the conditions under which they are implemented. In the absence of sustained investment in reliable infrastructure, continuous professional training, committed institutional leadership, and coherent policy coordination, EHR systems are unlikely to achieve their full operational and clinical potential. Under such constraints, their contribution to efficiency, data quality, and patient care outcomes will remain limited and uneven across health facilities.

Recommendations

Based on the evidence, the recommendations go beyond individual facilities and point to national reforms. Ghana needs a clear interoperability framework so that patient data can move easily between hospitals and clinics. Health workers should be given digital literacy training and certification to ensure they can use EHR systems effectively. Minimum infrastructure standards must be set, covering reliable electricity, internet access, and basic hardware before EHR systems are introduced. Finally, sustainable financing models should be developed, moving away from short donor projects and embedding EHR funding into the national health budget, while also exploring public–private partnerships. These steps will make EHR systems more reliable, equitable, and sustainable across the country.

Realizing the full benefits of EHRs in Ghana requires substantial investment in digital infrastructure, including reliable power supplies and stable internet connectivity across all healthcare facilities (Boateng et al., 2020). The Ministry of Health, in collaboration with the Ghana Health Service, should prioritise sustained investment in digital health infrastructure to support the effective implementation of Electronic Health Records. This includes improving internet connectivity, ensuring stable power supply systems, and developing interoperable platforms that allow seamless data exchange across facilities. A national EHR integration framework should also be enforced to standardise system design and improve coordination across the health sector. This approach reflects experiences from countries such as Rwanda, where a coordinated national digital health strategy has strengthened interoperability across health facilities, and Estonia, where a fully integrated national EHR system supports real-time sharing of patient information across the entire healthcare system.

At the facility level, hospital and health administrators should establish strong governance structures to guide the use of EHR systems. This involves setting clear operational protocols, integrating EHR tasks into routine clinical workflows, and conducting regular system audits to ensure compliance and efficiency. In addition, dedicated budgetary allocations should be made for system maintenance, upgrades, and technical support rather than treating EHR implementation as a one-time project. Similar practices are observed in the United Kingdom’s National Health Service, where hospital trusts operate structured digital governance systems to monitor

performance and compliance, and in Canada, where hospitals allocate sustained funding for the continuous improvement of electronic health systems.

Training institutions and facility management teams within the Ghana Health Service should institutionalise continuous professional development programmes focused on digital health competence. EHR training should not be occasional but embedded as a core requirement for all health workers, covering system use, data accuracy, cybersecurity, and troubleshooting skills. This mirrors practices in the United States, where ongoing Health Information Technology training is embedded within healthcare professional development frameworks, and in Singapore, where digital health literacy is systematically integrated into workforce training and capacity building.

Health workers themselves should take responsibility for ensuring accurate, timely, and consistent use of EHR systems in routine clinical practice. They should also actively engage in feedback processes to identify system challenges and support continuous improvement. In countries such as Denmark, clinicians are required to maintain high standards of digital documentation as part of national healthcare quality assurance systems, while in Australia, structured clinician feedback mechanisms are used to continuously refine and improve electronic health platforms.

Policy makers and digital health regulators should develop and enforce a comprehensive national digital health policy that defines clear standards for data governance, privacy protection, interoperability, and system compliance. Regulatory bodies should also ensure that health facilities meet minimum digital readiness requirements before accreditation. This is consistent with Estonia's strict legal framework governing digital health data exchange and the United Kingdom's regulatory approach, where NHS Digital enforces national standards for data security and interoperability across healthcare institutions.

Originality of the Study

This study makes a distinct contribution to the growing body of literature on Electronic Health Records by focusing specifically on the Ghanaian healthcare context, where evidence remains limited and fragmented. While existing studies have largely examined EHR adoption from a general perspective or within high-income health systems, this study situates the discussion within a resource-constrained environment, where infrastructural, organisational, and human capacity challenges shape system performance in more complex ways. By doing so, it provides a more context-sensitive understanding of how digital health tools function in practice rather than in theory. A key element of originality lies in the study's integrated analytical approach, which does not treat EHR outcomes as purely technical outcomes. Instead, it brings together infrastructural, institutional, human, and policy dimensions to explain performance variations across healthcare facilities. This multidimensional perspective helps move the discussion beyond simple adoption narratives and instead explains why EHR systems succeed in some settings while underperforming in others. The study also adds value by linking empirical findings with international comparative evidence, showing how global best practices translate, or fail to translate, within the Ghanaian health system. This comparative framing strengthens understanding of implementation gaps and highlights the structural conditions required for effective digital transformation in low and middle-income countries.

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