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NAVIGATING THE DIGITAL HEALTH RECORD: BARRIERS TO ELECTRONIC MEDICAL RECORDS IMPLEMENTATION IN SOUTHEAST ASIA: A NARRATIVE REVIEW

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Abstract

Traditional paper-based medical records face multiple limitations, including poor standardization and inefficiency in data retrieval. Electronic Medical Records (EMRs) offer solutions to these limitations and are key to healthcare digitalization. However, EMRs implementation remains inconsistent across Southeast Asia due to varied systemic and contextual barriers. A narrative review was conducted using three databases (PubMed, Scopus, and ScienceDirect) to identify peer-reviewed articles published between 2008 and 2023. Search terms included "Electronic Medical Records," "EMR," and "Southeast Asia." Inclusion criteria focused on studies describing the implementation challenges of EMRs in Malaysia, Indonesia, Vietnam, and Thailand. A total of 22 relevant articles were included. No formal quality appraisal was conducted due to the narrative nature of the review. Several barriers to implementation EMRs were identified such as high initial investment costs, limited IT infrastructure, lack of skilled personnel, resistance to technology adoption, data security concerns, and fragmented governance. While some countries, such as Malaysia and Vietnam, have national frameworks in place, challenges persist in rural access, interoperability, and policy enforcement. Despite growing interest and partial progress in EMRs adoption, Southeast Asian countries face systemic and logistical challenges that hinder full implementation. Coordinated regional strategies, greater investment in capacity building, and strong governance are essential for sustainable digital health transformation in the region.

Keywords: Electronic Medical Records, Information Technology, Barrier

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INTRODUCTION

The global transition toward digital health systems has been driven by the need to enhance the quality, accessibility, and efficiency of healthcare services. The use of Electronic Medical Records (EMRs) is a key part of this change, which are recognized by the World Health Organization (WHO) as a foundational tool for achieving universal health coverage, strengthening health systems, and supporting evidence-based decision-making (World Health Organization, 2016). In high-income countries, EMRs have been demonstrated to make clinical workflows more efficient, improve patient safety, cut down on medical mistakes, and help health data operate together across different levels of care (Janssen et al., 2021).

In contrast, many low- and middle-income countries (LMICs), including those in Southeast Asia, still rely heavily on paper-based systems. These systems are often fragmented, lack standardization, are prone to data loss, and hinder timely access to patient information (Honavar, 2020). EMRs are defined as computerized platforms that collect, store, and display patient data. It offer a solution to these challenges and are increasingly viewed as essential components of healthcare modernization (Zhang & Zhang, 2016).

EMRs can improve healthcare delivery by enhancing diagnostic accuracy, reducing redundant testing, improving continuity of care, and ensuring secure access to patient records (Janssen et al., 2021). Despite these benefits, the implementation of EMRs across Southeast Asia remains inconsistent. Countries such as Malaysia and Thailand have taken steps toward national health information systems (Mohan & Yaacob, 2004; Yingyong et al., 2022), but common obstacles persist. These include high implementation costs, insufficient infrastructure, limited digital literacy among healthcare workers, poor interoperability, and growing concerns about data security and privacy (Ismail & Abdullah, 2011; Kusumasari et al., 2018; Mohd Nor et al., 2019).

Given the complexity of health systems across Southeast Asia, addressing country-specific and cross-cutting barriers to EMR implementation is vital for informing policy development and guiding future investments. This narrative review aims to explore the challenges faced by Malaysia, Indonesia, Vietnam, and Thailand as LMICs in adopting EMRs, and to identify lessons that can guide regional strategies for strengthening digital health capacity.

METHODS

This review adopted a narrative approach to explore the challenges associated with the implementation of Electronic Medical Records (EMRs) in Southeast Asian countries that focused specifically on four countries in Southeast Asia: Malaysia, Indonesia, Vietnam, and Thailand. These countries were chosen due to the availability of published studies and their varying levels of progress in digital health infrastructure for low- and middle-income countries (LMICs). A narrative review was selected due to its flexibility in synthesizing evidence from diverse sources, allowing for a broader exploration of contextual and thematic barriers to EMR adoption.

To identify relevant literature, a comprehensive search was conducted using three online databases: PubMed, ScienceDirect, and Scopus. The search was limited to articles published between 2008 and 2023 and written in English. The following keywords and Boolean combinations were used: "Electronic Medical Records", "EMR", "Southeast Asia",

"EMR implementation challenges", and "digital health in Southeast Asia". Reference lists of relevant papers were also manually screened to capture additional studies. Studies were included if they discussed on:

   i.   EMR implementation status,
  ii.   Barriers or challenges to adoption, or
 iii.   Contextual insights into legal, technical, human resource, or user-related issues.

Articles were excluded if they focused solely on electronic health records (EHRs) in non-clinical settings, discussed unrelated digital health topics, or did not provide country-specific findings.

In total, 22 articles were selected after screening titles, abstracts, and full texts as in Figure 1. These included peer-reviewed original research articles, policy papers, and case studies. Although a formal critical appraisal of the included studies was not conducted, the selection process emphasized relevance, credibility of sources, and regional diversity. Key findings were then extracted and synthesized according to recurring themes and contextual challenges reported by healthcare professionals and policymakers.
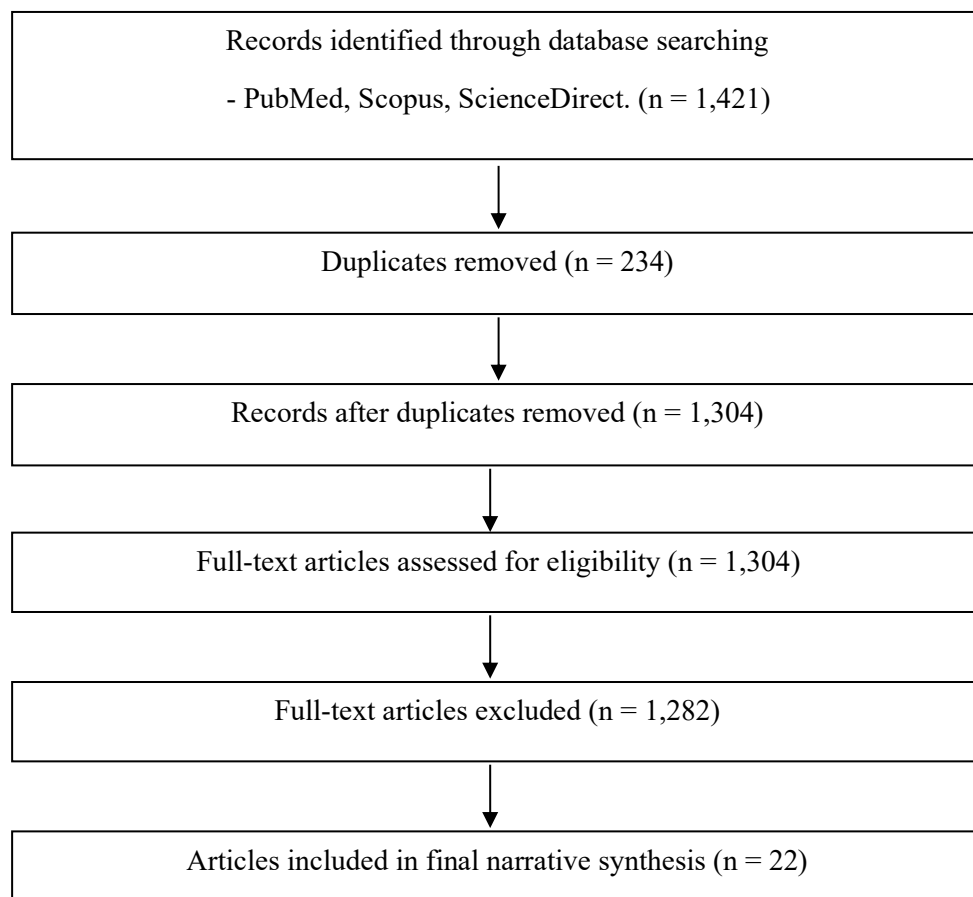

Figure 1: Flow chart

RESULTS

The results of this review were derived from 22 articles and reports that explored EMR implementation challenges in Malaysia, Indonesia, Vietnam, and Thailand as in table 1. The findings are synthesized into six recurring themes: (1) Infrastructure limitations, (2) Funding constraints, (3) Human resource and training gaps, (4) Data security and privacy concerns, (5) Legal and policy environment, and (6) User acceptance and system usability.

1. Infrastructure Limitations

Across all four countries, inadequate digital infrastructure was a critical barrier, particularly in rural and remote areas. In Indonesia and Vietnam, limited access to reliable internet and hardware such as lack of clinical-room computers, Local Area Network (LAN) or servers significantly hindered EMR use in primary care settings (Afrizal et al., 2019; Nguyen et al., 2011). Thailand and Malaysia, while more advanced in digital capacity, also faced challenges in integrating EMRs across fragmented hospital systems (Mohd Nor et al., 2019; Ngamsuriyaroj et al., 2011).

2. Funding Constraints

The high cost of EMR design, deployment, and maintenance was commonly cited. Malaysia, despite its early adoption of digital health strategies, struggled to sustain funding across all public facilities (Mohan & Yaacob 2004; Mohd Nor et al., 2019). Similarly, Indonesian studies noted disparities between urban and rural investment, with eastern provinces often underserved (Tilaar & Sewu, 2023).

3. Human Resource & Training Gaps

A lack of IT support personnel and clinical training emerged as another shared issue. In Indonesia and Vietnam, health workers often lacked computer literacy, and dedicated IT staff were either absent or underutilized (Anh et al., 2023; Kusumasari et al., 2018). Even in Malaysia, frontline staff reported difficulties using EMR templates, particularly without regular system support (Shaharul et al., 2023).

4. Data Security & Privacy Concerns

Fear of data breaches and uncertainty around data protection laws were prominent, especially among healthcare providers. Malaysian physicians expressed concern over the misuse of EMRs, despite the presence of the Personal Data Protection Act 2010 (Ismail & Abdullah, 2011). Indonesian and Vietnamese respondents also highlighted a lack of clarity on data access, encryption standards, and patient consent (Anh et al., 2023; Mathai et al., 2017).

5. Legal and Policy Environment

Malaysia and Thailand have introduced EMRs related frameworks, but governance inconsistencies persist. In Vietnam, the absence of a standardized national patient ID system complicates record sharing across hospitals (Tran et al., 2022). Indonesian policy mandates EMR use in primary health care yet fails to require the presence of IT support at facility level (Tilaar & Sewu, 2023).

6. User Acceptance & System Usability

Many healthcare workers resisted EMR adoption due to unfamiliarity with digital platforms, fear of change, or perceptions of increased workload. In Malaysia and Thailand, usability issues such as non-intuitive interfaces, poor system layout, and difficulty navigating patient dashboards led to user frustration and burnout (Chotchaisuwatana et al., 2011; Shaharul et al., 2023).

Table 1: Summary of Articles Regarding Challenges in Implementing Electronic Health Records.

Theme	Description	Examples & Country Highlights	References
Infrastructure Limitations	Inadequate digital infrastructure, especially in rural/remote areas.	Indonesia & Vietnam: Limited internet access, lack of clinical-room computers. Malaysia & Thailand: Integration issues across fragmented hospital systems.	Afrizal et al., 2019; Mohd Nor et al., 2019; Ngamsuriyaroj et al., 2011; Nguyen et al., 2011
Funding Constraints	High costs for EMR design, deployment, and maintenance; uneven investment.	Malaysia: Difficulty sustaining funding despite early adoption. Indonesia: Urban–rural funding disparity, eastern provinces underserved.	Mohan & Yaacob, 2004; Mohd Nor et al., 2019; Tilaar & Sewu, 2023
Human Resource & Training Gaps	Lack of IT support staff and insufficient user training.	Indonesia & Vietnam: Low computer literacy, few IT staff. Malaysia: Difficulty using EMR templates without support.	Anh et al., 2023; Kusumasari et al., 2018; Shaharul et al., 2023
Data Security & Privacy Concerns	Fear of breaches, unclear laws, low awareness of data rights.	Malaysia: Concerns persist despite Personal Data Protection Act 2010. Indonesia & Vietnam: Unclear encryption standards, weak consent processes.	Anh et al., 2023; Ismail & Abdullah, 2011; Mathai et al., 2017

Legal & Policy Environment	Fragmented governance and policy gaps hinder adoption.	Malaysia & Thailand: EMR frameworks exist but inconsistent. Vietnam: No standardized patient ID system. Indonesia: EMR mandated in PHC, but no IT staff requirement.	Tilaar & Sewu, 2023; Tran et al., 2022
User Acceptance & System Usability	Resistance to change, perceived workload increase, interface issues.	Malaysia & Thailand: Poor interface design, difficult navigation, burnout risk.	Chotchaisuwatana et al., 2011; Shaharul et al., 2023

DISCUSSION

This narrative review examined the barriers to implementing Electronic Medical Records (EMRs) in low- and middle-income countries (LMICS): Malaysia, Indonesia, Vietnam, and Thailand. While each country is at a different stage of digital health transformation, this review highlights both shared challenges and context-specific nuances that have shaped EMR adoption in the region.

One of the most common barriers across all four countries is insufficient infrastructure, particularly in rural or remote areas. Indonesia and Vietnam, for instance, face significant gaps in reliable internet connectivity and basic hardware availability in primary care settings (Afrizal et al., 2019; Anh et al., 2023). Even in Malaysia and Thailand where national health IT strategies have been rolled out on issues of system integration and rural inclusion remain. These infrastructure limitations not only affect system performance but also contribute to delays in implementation and data entry.

Financial constraints were another consistent theme. The initial costs of developing, deploying, and maintaining EMR systems remain high, especially for low-resource settings. Malaysia's early Telemedicine Blueprint (Mohan & Yaacob, 2004) created a strong foundation, but sustaining funding across all healthcare levels has proven difficult (Mohd Nor et al., 2019). In contrast, Indonesia's progress has been uneven due to large geographical disparities and limited budget allocations in less-developed provinces (Tilaar & Sewu, 2023).

The lack of trained personnel and ongoing support systems also emerged as a core barrier. In Indonesia and Vietnam, many healthcare workers are not expert in using computers, and the absence of dedicated IT staff places additional pressure on already strained clinical teams (Gesulga et al., 2017; Kusumasari et al., 2018). Even in Malaysia, users report frustration with EMR templates, unclear workflows, and insufficient training, which can lead to reduced system use and increased burnout (Shaharul et al., 2023).

Additionally, concerns about data privacy and security were commonly reported. Malaysian physicians, for instance, remain apprehensive despite the enforcement of the Personal Data Protection Act 2010 (Ismail & Abdullah, 2011). Vietnam's emerging use of blockchain-based systems offers promise but raises questions about centralized data risks and patient consent procedures (Anh et al., 2023). This remarks the need for harmonized legal frameworks and digital ethics training across the region.

The policy environment also varies greatly. Malaysia and Thailand have national-level digital health strategies, whereas Vietnam and Indonesia are still consolidating fragmented policies and piloting various EMR systems (Ngamsuriyaroj et al., 2011; Tran et al., 2022). The lack of a universal patient ID in Vietnam affects record portability and interoperability.

The user acceptance remains a persistent issue. Many clinicians view EMRs as time-consuming or difficult to navigate. In Thailand, for example, cases of miscoding diagnoses due to poor system design have been documented, affecting clinical accuracy (Chotchaisuwatana et al., 2011). It is important to design EMR systems that are compatible with clinical workflows and involve healthcare workers in their development.

Despite these challenges, several lessons and opportunities emerge. First, successful adoption depends on inclusive system design that considers both urban and rural realities. Second, sustained training and technical support must be built into EMR programs, especially for first-line staff. Third, regional collaboration, including shared standards, templates, and policy frameworks, could accelerate progress across the ASEAN region.

The findings highlight the need for implementation strategies that align national policies with local practice. A one-size-fits-all model will not work in Southeast Asia but by learning from each other's experiences, countries in the region can move closer to an integrated, secure, and patient-centred digital health future.

To make EMRs truly work for the region, the first step is getting the basics right such as stable internet, reliable electricity, and enough computers in clinics, especially in rural and remote areas. Rolling out in phases, starting with smaller pilot sites, can help identify and fix problems before a nationwide launch. Funding also needs to be long-term and realistic covering not just the initial setup, but also training, technical support, upgrades, and cybersecurity. At the same time, systems should speak the same "digital language" across facilities by using common standards, open APIs, and a shared patient identifier. This prevents the frustration of isolated, non-compatible platforms.

The problem cannot be resolved by technology alone. People need to feel confident using the system. That means having trained IT staff available in health facilities, regular refresher training for clinicians, and "super users" among the users who can guide others on the job. The EMR itself should be designed with the user in mind that easy to navigate, not overloaded with unnecessary clicks, and able to work offline when needed. Data security and privacy must be more than just words in a policy, and they should be everyday practice through proper access controls, encryption, and regular security drills.

The progress should be tracked in simple, meaningful ways such as how complete and timely patient records are, how often the system is up and running, and how satisfied users feel with it. Lessons learned should be shared widely, both within countries and across the region. An ASEAN-led group could help pool resources, set shared standards, and bring down costs. Research should assess if EMRs enhance care, reduce costs, and function effectively in rural areas to support evidence-based decisions.

This review looked only at Malaysia, Indonesia, Vietnam, and Thailand, so the findings may not reflect experiences in other Southeast Asian countries especially high-income settings like Singapore, which already has a well-established EMR system. We focused on English-language, peer-reviewed articles, so important local-language or grey literature may have been missed. The studies we included were very different from each other in terms of setting, system type, and outcomes measured, which made direct comparisons difficult and meant we could not do a formal pooled analysis. Our search was up to 2023, so more recent changes in policy or technology may not be captured, and there is always the chance that studies showing no results or challenges were less likely to be published.

CONCLUSION

The move toward Electronic Medical Records (EMRs) is an essential step in modernising healthcare across Southeast Asia, yet progress remains uneven. In Malaysia, Indonesia, Vietnam, and Thailand, common challenges such as patchy internet in rural areas, limited

funding, lack of trained IT staff, privacy concerns, and fragmented policies that cause slow adoption. While each country's situation is different, the shared struggles of weak infrastructure, low user confidence, and system usability issues show that these are not isolated problems, but regional ones.

EMR adoption is not just about installing new software, it is about changing the way health systems work. This requires steady investment, stronger laws, and ongoing support for the people using these systems every day. Working together as a region with sharing lessons, setting common standards, and closing the digital gap between cities and rural areas may help turn EMRs from a promising idea into a practical reality. When implemented properly, this leads to improved health records and faster, more coordinated care for millions.

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