

REVIEW

Navigating the Challenges of Hospital Digitalization in Southeast Asia: A Systematic Review

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ABSTRACT

The rapid advancement of digital technologies has transformed healthcare globally, offering opportunities to improve the efficiency, quality, and accessibility of health services. In hospital settings, digitalization involves the adoption of tools such as electronic health records (EHRs), telemedicine, artificial intelligence (AI), Internet of Things (IoT), and healthcare management software. These technologies have the potential to optimize workflows, enhance patient care, reduce operational costs, and support data-driven decision-making. However, the transition from traditional operations to digital systems poses significant challenges, particularly in regions like Southeast Asia, where healthcare infrastructure and policies vary widely between countries. This systematic review aims to explore the challenges of hospital digitalization, particularly in Southeast Asia, focusing on barriers that hinder the adoption, implementation, and integration of digital technologies in hospital settings. As healthcare systems transition towards digitalization, identifying and addressing challenges becomes critical to optimizing hospital operation, improved patient outcomes, and sustainable healthcare delivery. This review seeks to provide a comprehensive understanding of the factors impeding digital transformation, including technological, infrastructural, financial, and human resource limitations. The findings will contribute to identifying strategies and



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policy recommendations to facilitate the smooth transition to digital healthcare. This study followed PRISMA guidelines to ensure systematic and transparent reporting. Articles were retrieved from ProQuest, Semantic Scholar, and PubMed databases, focusing on peer-reviewed literature published in English between 2019 and 2024. Six articles which met the inclusion criteria were analysed, and the findings were categorised to identify common themes. Five themes identified related to the challenges include: (1) System and data organization, (2) Patients as beneficiaries, (3) Human resources, (4) Exposure to digital tools, and (5) Facility environment. Understanding the specific barriers to digitalization is crucial for developing targeted interventions and strategies and helping policymakers, healthcare administrators, and managers to develop practical solutions for sustainable digital transformation in healthcare.

INTRODUCTION

The World Health Organization (WHO) defines digital health technologies as the area focused on creating and utilizing digital tools to enhance health outcomes. This field broadens the traditional idea of eHealth by incorporating a diverse array of connected devices and digital users. Additionally, it includes various applications of digital technologies in healthcare, such as the Internet of Things (IoT), advanced computing methods, big data analysis, artificial intelligence (including machine learning), and robotics (WHO, 2021). Digitalization in medicine involves integrating and applying digital technologies and digitized data (Merriam-Webster, n.d.) to improve healthcare delivery, streamline processes, and managerial flow with the ultimate goal of improved health advocacy and enhanced patient outcomes in the population (Ramalingam, n.d.). This evolving technology is the pillar of universal health care in the future. The 2030 Agenda for Sustainable Development emphasizes how global interconnection and increasing use of

ICTs have a huge capacity to accelerate human progress, reduce the digital gap, and create informed societies (WHO, 2021).

The transformation of healthcare through digital technologies encompasses a wide range of advancements linked to the internet and various digital tools, fundamentally reshaping therapies and best practices for improved health management. In this modern landscape, digital technology is pivotal, driving enhancements in efficiency, precision, and the overall quality of patient care (Stoumpos et al., 2023). A prime example of this evolution is the implementation of Electronic Health Records (EHRs) in hospitals. EHRs are sophisticated digital representations of traditional paper charts, designed to securely compile all pertinent patient information. This secure storage not only protects sensitive data but also ensures that healthcare providers can access vital information promptly. Consequently, EHRs facilitate informed decision-making, enabling clinicians to provide better care tailored to the individual needs of patients. By streamlining processes and enhancing data accessibility, digital transformation significantly contributes to the advancement of healthcare systems, ultimately leading to improved patient outcomes (Yeung et al., 2023).

When comparing digital healthcare to traditional healthcare, several advantages become evident. Digital healthcare has the potential to enhance precision in patient diagnosis and treatment, largely due to the integration of advanced technologies such as artificial intelligence and big data analytics. These technologies enable healthcare providers to analyse vast amounts of data quickly, leading to more accurate assessments and tailored treatment plans for individual patients (Alkema et al., 2003). Furthermore, digital healthcare systems tend to be less error-prone. Traditional methods often rely on manual data entry and paper records, which can lead to miscommunication and mistakes. In contrast, digital platforms can automate processes, reduce human error, and

provide real-time updates, thereby improving patient safety and care quality (Yeung et al., 2023). Besides that, Artificial Intelligence (AI) has emerged as a transformative force in various fields, particularly in healthcare, where its application in predictive analytics is revolutionizing how medical professionals approach patient care. By leveraging vast amounts of data, AI enhances the ability to identify potential risks, diagnose diseases accurately, and formulate effective treatment plans. As this technology continues to evolve, it holds the promise of further enhancing the quality and efficiency of healthcare services (Rovira-Simón et al., 2022).

Despite these benefits, the implementation of digital healthcare technologies faces significant challenges. The healthcare sector is traditionally conservative and often resistant to change, and integrating disruptive technologies into established practices can create hurdles related to regulatory compliance, the need for training healthcare staff, and concerns about data security and patient privacy. In addition, substantial upfront investment and the complexity of new systems can limit widespread adoption, making it crucial for stakeholders to navigate these barriers carefully to fully realize the benefits of digital healthcare (Yeung et al., 2023). For example, in Malaysia, only 20% of hospitals and 6% of clinics were reported to be using electronic medical records (EMR) as of March 2024 (Bernama, 2024). Regionally, readiness is also heterogeneous as Indonesia's Ministry of Health reported a mean digital maturity score of 2.73/5 across 146 participating provinces, districts and cities in its 2023 assessment while ASEAN-wide analyses continue to highlight cross-cutting gaps such as fragmentation, interoperability, and trust in data governance and cybersecurity (Healthcare IT News, 2024).

Against this backdrop, Southeast Asia was selected as the focus of this review because hospital digitalization is increasingly

prioritised, yet implementation occurs within highly diverse health systems and uneven digital readiness. The ASEAN Digital Masterplan 2025 underscores the need to accelerate adoption of trusted digital services, particularly in sectors such as health where trust relies on strong cybersecurity and digital data governance (ASEAN Secretariat, 2021), while persistent differences in access and infrastructure across countries may constrain hospital connectivity, interoperability, and equitable digital service delivery (OECD, 2023). Hence, the objective of this systematic review is to explore and identify the challenges of hospital digitalization in Southeast Asia, focusing on barriers that hinder the adoption, implementation, and integration of digital technologies in hospital settings.

OBJECTIVE

This systematic review aims to explore and investigate the challenges associated with hospital digitalization, particularly in Southeast Asia, by identifying the barriers that impede the adoption, implementation, and integration of digital technologies in hospital settings. As healthcare systems transition toward digital transformation, addressing these challenges is crucial to ensuring efficient hospital management, enhanced patient outcomes, and sustainable healthcare delivery.

This review seeks to systematically identify and categorize the obstacles hindering digital transformation, offering a comprehensive understanding of the key factors that limit the successful integration of digital technologies. It aims to address the following objectives:

1. Identification of Main Challenges: To analyze the primary barriers to hospital digitalization, encompassing technological, infrastructural, financial, and human resource constraints.
2. Classification of Challenges: To categorize these barriers into specific domains;

technological, organizational, financial, regulatory, and workforce-related which highlight the multifaceted nature of digital transformation challenges.

3. Contextual Variations: To examine how these challenges manifest across different healthcare systems, geographic regions, and hospital types, providing insights into disparities in digital adoption and implementation.
4. Research Gaps and Future Directions: To identify limitations in the existing literature on hospital digitalization challenges and propose areas for further investigation to bridge these gaps.
5. Implications for Policy and Practice: To offer evidence-based recommendations for policymakers, healthcare administrators, and stakeholders, ensuring that digital healthcare transformation is efficient, inclusive, and sustainable.

By achieving these objectives, this systematic review aims to contribute to the broader understanding on hospital digitalization, providing valuable insights for stakeholders navigating the complexities of digital healthcare implementation. This study seeks to facilitate a more seamless, effective, and equitable transition toward digitalized hospital systems in the future to eventually improve healthcare service delivery and patient care in Southeast Asia.

METHODOLOGY

1. Study Design

This study is a systematic review, conducted by following The Preferred Reporting Items for Systematic Reviews (PRISMA) statement guidelines to ensure transparency and comprehensive reporting format (M.J., McKenzie, J.E., Bossuyt, 2021). The PRISMA guidelines provide a framework for systematic reviews, facilitating rigorous documentation of the selection, assessment, and analysis of the challenges associated with hospital digitalization in Southeast

Asia. We systematically identified, selected, and synthesized relevant literature related to our research question by adhering to the guidelines and following a predefined protocol to improve the credibility and reproducibility of our review. The initial part of identifying and searching for relevant articles was conducted on 11th of October 2024.

To further assess the quality of included studies, the Joanna Briggs Institute (JBI) critical appraisal tools were used for qualitative studies involved (Lockwood et al., 2015).

2. Study Framework

To help in defining the key components of a research question and objective, and making it easier to conduct focused and relevant searches for literature, we used PICO framework (CASP, n.d.).

Table 1: PICO Framework for this systematic review

Full review question:	
What are the challenges of digitalization of health care in Southeast Asian countries?	
Population	Healthcare providers (e.g., doctors, IT staff, administrators), patients, and healthcare organizations in hospital care settings across Southeast Asia.
Intervention	Digitalization of hospital care, including the use of Electronic Health Records (EHRs), telemedicine, healthcare management software, and other digital tools for health care.
Comparison	Current technology.
Outcome	• Identification of barriers and challenges to digital transformation, such as skill gaps, infrastructure limitations, financial constraints, and organizational resistance. • Improved understanding of factors influencing the adoption, efficiency, and sustainability of digital healthcare technologies.

3. Eligibility Criteria

The eligibility criteria for this systematic review define the specific requirements to meet to be included in the analysis. These criteria is to

ensure that the review is focused, relevant, and methodologically sound as follows.

Table 2: Eligibility criteria

Criteria Category	Inclusion Criteria	Exclusion Criteria
Access	Open access	Studies that are not accessible without institutional access.
Publication Date	Published from 2019 until 2024.	Published less than year 2019.
Publication Type	Peer-reviewed journals	Non-peer-reviewed articles, opinion pieces, editorials, or blog posts.
Content	Address challenges associated with the digitalization of hospital management and delivery of care.	Studies not explicitly related to challenges of hospital digitalization.
Context	Relevant to hospital settings.	Non-hospital settings or unrelated fields
Language	English language only	Articles in languages other than English.

Search Method

This systematic review focuses exclusively on published articles. The databases searched include ProQuest, Semantic Scholar, and PubMed. A thorough search was conducted using all identified keywords in the titles, abstracts, and index terms associated with each article. The search was restricted to articles in English and published between 2019 and 2024. This search strategy ensures that the review captures the most recent developments and challenges in the digital transformation of healthcare in Southeast Asia.

The keywords will be aligned with Medical Subject Headings (MeSH) terms to enhance precision and consistency. Boolean operators (AND/OR) were used to construct the search strategy, as follows: ("challenges" OR "barriers") AND ("digitalization" OR "digital transformation") AND ("hospital care") AND

("Southeast Asia" OR "Malaysia" OR "Singapore" OR "Brunei" OR "Thailand" OR "Indonesia" OR "Myanmar" OR "Laos" OR "Cambodia" OR "Philippines" OR "Vietnam").

This search strategy ensures that the review captures the most recent developments and challenges in the digital transformation of healthcare in Southeast Asia.

Selection of Studies

Following the search, all identified citations were grouped and imported into Mendeley Reference Manager (Elsevier, 2024), where duplicates were removed. Two independent review authors screened the titles and abstracts of the identified studies for eligibility based on predefined criteria. Studies that did not meet the eligibility criteria were excluded at this stage. Full-text articles of potentially relevant studies were then retrieved and assessed. Only those studies meeting the inclusion criteria were retained for further analysis.

All selected articles underwent quality assessment prior to data extraction. The quality of studies was evaluated using Joanna Briggs Institute (JBI) critical appraisal tools for qualitative research (Lockwood et al., 2015). The two reviewers conducted the assessments independently to ensure objectivity. Any disagreements in quality ratings were resolved through discussion until a consensus is reached, with a third reviewer serving as an arbiter to ensure consensus.

Data Extraction

Data extraction from the chosen studies was conducted independently by two review authors utilizing a structured data extraction tool designed specifically for this review. The tool was developed to identify and capture essential variables or information required to address the research questions and objectives of the review. The variables were selected for their relevance to the topic and their alignment with the objectives of the systematic review. The researchers established inclusion criteria

for data types by evaluating the data sources frequently utilized in hospital digitalization and the challenges and barriers in Southeast Asia. After finalizing the key variables, the structured tool was employed to facilitate systematic, consistent, and comprehensive data extraction from each included study. This method reduced bias and guaranteed that all pertinent information was recorded accurately and consistently throughout the dataset.

The data extracted for this systematic review included the following details:

- Study characteristics: Author, year, country, and type of publication.
- Type of challenges reported: Ethical, technical, societal, or organizational.
- Context: hospital setting
- Proposed solutions or strategies to overcome challenges, if any.

The summary of the extracted data and study details is presented in Table 4, providing a comprehensive overview of the studies included in the review.

Data Analysis

Key information from the selected studies was systematically extracted, ensuring all relevant data points were captured in a structured manner. This approach facilitated a detailed and consistent analysis.

The extracted data were then analysed thematically to identify common themes, patterns, and trends across the literature. Findings were organized into meaningful categories that outlined the challenges of hospital digitalization.

Moving beyond a purely quantitative assessment, the findings were synthesized and presented in a narrative format. This qualitative approach offered a deeper, more nuanced interpretation of the data, bringing to light key themes, relationships, and points of convergence or divergence across the included studies. The narrative synthesis provided a comprehensive exploration of the primary challenges associated with hospital

digitalization, offering valuable insights into its complexities and implications.

The synthesized findings were meticulously interpreted in alignment with the research questions and objectives of the systematic review. A thorough examination of hospital infrastructure and administration, research limitations, and existing gaps in the literature provided deeper insights into the challenges of hospital digitalization. These findings contributed to a comprehensive understanding of its role in hospital system management, guiding evidence-based recommendations for future research and practical applications.

Data Examination and Integration

The retrieved data underwent thematic analysis to discern patterns, trends, and gaps within the included research. Challenges were classified into specific domains, offering a coherent framework for analysis. Qualitative findings were synthesized narratively, enhancing the depth and context of the results. This integrated methodology facilitated a thorough comprehension of the problems related to hospital digitalization.

Compiling, Condensing, and Presenting Findings

The results were compiled and presented in an organized manner to guarantee clarity and coherence. Challenges were delineated across the specified categories, emphasizing discrepancies and similarities among the investigations. Visual tools, such as tables and conceptual diagrams, were employed to present an overview of the findings, but the narrative account elucidated the intricacies of each problem. This method facilitated an equitable portrayal of both quantitative and qualitative dimensions of the data. The findings were contextualized within established public health frameworks and theories, facilitating significant conclusions.

Consultation and Expert Contributions

Expert consultations were conducted to improve the review's relevance and application. Public health professionals, researchers, and policymakers were involved to corroborate the findings and offer further insights. Their comments were crucial in recognizing ignored difficulties and enhancing the interpretation of the data. This iterative procedure guaranteed that the review's results were anchored in academic rigor and practical significance. The evaluation sought to integrate expert perspectives to connect research with practical application, offering actionable insights for the hospital digitalization.

Ethical Considerations

As this was a review of existing literature, no primary data collection involving human subjects has been conducted. However, ethical considerations, including appropriate citation and acknowledgement of sources, were strictly adhered to. This systematic methodology ensured that the review comprehensively represented the challenges of hospital digitalization, providing valuable insights for researchers, policymakers, and practitioners seeking to advance this transformative field.

RESULTS

Search Outcome

The literature review was performed following PRISMA guidelines to select eligible articles (M.J., McKenzie, J.E., Bossuyt, 2021). The search strategy resulted in 3485 citations, with 2106 from ProQuest, 251 from Semantic Scholar, and 369 from PubMed. These citations were obtained through electronic database searches and were limited to articles published in English. Out of these, 313 were duplicates. Furthermore, 25 relevant articles were identified, and the full texts were retrieved and analysed. 19 studies were excluded, and 6 studies met the review inclusion criteria (Figure 2).

After searching three electronic databases, a total of 6 articles were identified

that satisfied the inclusion criteria for this systematic review. All articles are assessed for quality using JBI appraisal tools and the results are summarized in Table 3.

The details regarding the selected and appraised articles in this systematic review, such as the author's name, year of publication, study design, number of participants, objectives, and a summary of the results, are outlined in Table 4.

Characteristics of studies

The synthesis encompassed a comprehensive review of studies examining the challenges of hospital digitalization. Spanning publications from 2019 to 2024, these studies utilized diverse methodological approaches, including quantitative and qualitative designs such as questionnaires, online surveys, in-depth interviews, and focus group discussions. The geographical scope covered the entirety of Southeast Asia, incorporating insights from countries such as Singapore, Malaysia, the Philippines, and Thailand.

Thematic Analysis

This systematic review examined the evidence

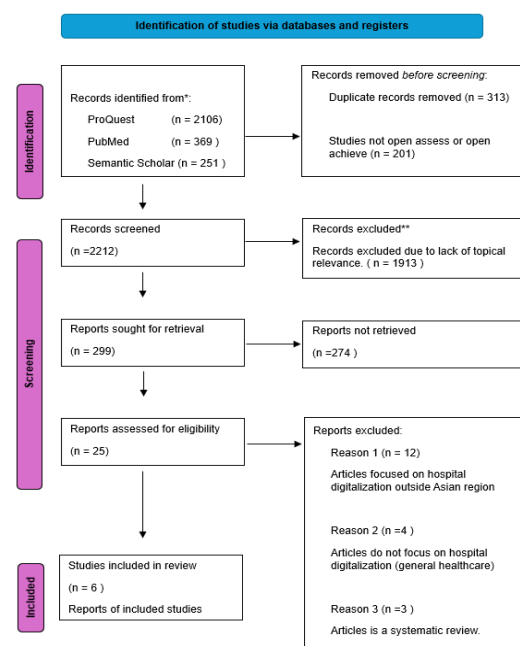


Figure 1: PRISMA 2020 flow diagram for the systematic review.

Table 3: PJBI critical appraisal checklist for qualitative research

No	Author	1	2	3	4	5	6	7	8	9	10	Score
1	(Zainal et al., 2023)	+	+	+	+	+	-	+	+	+	+	9
2	(Binedell et al., 2020)	+	+	+	+	+	-	+	+	+	+	9
3	(Loh et al., 2024a)	+	+	+	+	+	-	+	+	+	+	9
4	(Abd Razak et al., 2020a)	+	+	+	+	+	-	-	+	+	+	8
5	(Ebardo & Celis, 2019a)	+	+	+	+	+	-	-	+	-	+	7
6	(Noonpakdee, Phothichai, & Khunkornsiri, 2019)	+	+	+	+	+	-	-	+	-	+	7

Table 4: Summary of included literatures

Author, year, country	Study design	Participant	Objective	Theme
(Zainal et al., 2023) Singapore	Qualitative study (Individual interviews)	44 junior doctors	This study aims to explore the perspectives of medical trainees on the impartation of digital competencies in Singapore's medical school curricula	Limited exposure to digitalization in medical school curriculum. 1. Lack of flexibility and dynamism within the curriculum 2. Dated learning style 3. Limited access to Electronic Health Records 4. Gradual uptake of digital technologies in the healthcare sector 5. Lack of an ecosystem that promotes the culture of innovation 6. Lack of guidance from qualified and available mentors
(Binedell et al., 2020) Singapore	Quantitative and Qualitative study (Online survey)	113 patients	To explore the barriers of using digital technology among prosthetics and orthotics patients	1. Cost 2. Lack of skills and training 3. Effectiveness 4. Accessibility 5. Suitabilities 6. Organization priorities
(Ebardo & Celis, 2019a) Philippines	Qualitative study (FDG)	Healthcare Executives from three hospitals in Manila	To understand the barriers in the EMR adoption at an organizational level	1. Technology • Complexity • Weak infrastructure • Poor interface design 2. Organization • User resistance • Unskilled IT staff 3. Environment • Privacy regulation compliance • Medical school orientation

concerning the challenges encountered by IT staff, managers, healthcare providers, and patients in the utilisation of technology and digital advancements in healthcare management. The selected articles were analysed, and the findings were categorised to identify common themes within the category. Five themes were identified concerning the challenges which include: (1) system and data organization, (2) patients as beneficiaries, (3) human resources, (4) exposure to digital tools, and (5) facility environment.

DISCUSSION

The integration of systems for successful hospital care digitalization faces several significant challenges, including system incompatibility, complexity, and data duplication (Abd Razak et al., 2020). The diverse range of vendors developing specialized applications for various medical departments within hospitals exacerbates these issues, making data integration challenging (Haux, 2006). This integration is crucial for achieving

interoperability and ensuring effective communication among disparate systems. To address these challenges, organizations must have sufficient financial and technological resources. A proposed solution is to establish a dedicated coordination unit. This unit would act as a central reference for all IT and system developers (vendors), facilitating a cohesive approach to enhance future integration efforts (Abd Razak et al., 2020b). Furthermore, the collaboration between IT and healthcare providers requires a top-management approach to adapt the mindset of appreciation to the significant of digitalization in order for the formulation of data governance that will be a stepping stone to data integration (Noonpakdee, Phothichai, & Khumkornsiri, 2019).

One of the key factors in ensuring successful digitalization is the engagement of healthcare professionals, including junior doctors who are often at the frontline of care delivery. As highlighted by (Zainal et al., 2023) it is essential to consider the perspectives of the younger generation (Fu et al., 2024) of medical professionals when designing and implementing healthcare reforms. Their experiences with digital tools and insights into the healthcare system can provide valuable feedback for policymakers and administrators, ensuring that digitalization efforts align with practical needs and realities in clinical settings. (Ebardo & Celis, 2019a) also demonstrated the same challenge among healthcare executives where medical curriculum didn't equip these healthcare providers with necessary knowledge regarding digital tools and technology during their education. A significant number of healthcare providers lack sufficient training in digital technologies throughout their education, resulting in a skills gap that requires attention. The unfamiliarity with new systems may lead to resistance among staff, who might feel overwhelmed by the complexity and rapid evolution of digital innovations.

Enhancing healthcare practitioners' competencies for the digital era requires a coordinated and sustained collaborative effort (Iedema et al., 2004) among educators, healthcare institutions, and government stakeholders. This initiative must begin well before practitioners enter hospitals and clinics, through comprehensive reforms in medical curricula that integrate emerging technologies and digital health skills (Shimizu et al., 2023). However, broader evidence outside Southeast Asia suggests that uncertainty about return on investment (ROI) and other cost-related concerns can slow digital health adoption (Abramson et al., 2014) which may also reduce organisational willingness to fund training and change management at the level needed for sustained use. Further, ROI may not be realised automatically after implementation and can depend on how well organisations leverage digital systems for process and workflow change. Preparing future generations of healthcare professionals therefore demands continuous adaptation to evolving technologies, access to a supportive ecosystem, structured mentorship from experienced practitioners, and seamless engagement with electronic platforms to ensure they are well-equipped for the challenges of modern healthcare.

In the digital era, patients play a pivotal role as the primary clients of healthcare services. Their perspectives, experiences, and engagement are essential in shaping healthcare delivery models, particularly as technology transforms the landscape. Patient-centred care which is an approach that prioritizes the preferences, needs, and values of individuals has become increasingly relevant with the rise of digital platforms and virtual healthcare tools. Incorporating patients' perspectives into the design and delivery of digital healthcare ensures that technological advancements are aligned with real-world needs and expectations. Healthcare providers, educators, and policymakers must work together to empower patients, bridge

digital divides, and foster collaborative care environment. A patient-centric approach, supported by innovative digital technologies, is key to building resilient and inclusive healthcare systems for the future.

Challenges associated with the use of digital tools in hospital care digitalisation significantly impacts patients and their experiences within the healthcare system. A significant challenge is the digital divide, which results in disparities in access to technology, thereby affecting patient engagement and the utilisation of digital health solutions. Individuals from underprivileged backgrounds may be deprived of essential devices or stable internet connections required to utilise digital platforms. Other may encounter hinderance in forms of limited skills in browsing, no access to electronic gadget and coming from the technological complexity of digitalization itself (Ebardo & Celis, 2019b; Loh et al., 2024b). Healthcare providers must prioritise patient education initiatives that are tailored to varying levels of digital familiarity to overcome this barrier. This may include providing tailored training sessions, detailed guides, or specialised support personnel to help patients utilise digital health platforms effectively. Educating patients can improve their confidence in utilising technology for health management, resulting in enhanced health outcomes. Finally, it is essential to ensure that digital tools are developed with consideration for the patient experience (Sawesi et al., 2016). Poorly designed and complex platforms may result in user frustration and diminished satisfaction. Complex interfaces and cumbersome processes for scheduling appointments or accessing health information can impede engagement and deter patients from using these tools. Engaging patients in the design and evaluation stages of digital health tools is essential for obtaining insights into their needs and preferences (Fernández et al., 2023). Intuitive and user-friendly digital interfaces in healthcare systems can increase patient acceptance and engagement, thereby

improving the overall effectiveness of digital health initiatives (Wang et al., 2022).

The implementation of digitalisation in hospital care is frequently hindered by external constraints too. Logistic conditions, including limited internet connectivity and inadequate supporting infrastructure, pose environmental threats that necessitate the enhancement of technological advancements (Harahap et al., 2023). This strengthening is essential for hospitals to leverage these developments, thereby accelerating and expanding the digitisation process and improving the quality of care. The utilisation of information systems and technology should be regarded as a strategic method for attaining competitive advantage in the context of digitalisation. This strategic role should be optimised to improve effectiveness, efficiency, and productivity in the hospital setting. Collaboration and coordination among government entities and relevant authorities are essential to enhance efforts in addressing environmental challenges, particularly those associated with network issues and infrastructure. Without this effort, differences in resources and infrastructure can lead to unequal adoption of technologies that eventually intensify existing healthcare inequities. Therefore, investment in infrastructure, including reliable internet connectivity and advanced hardwares, as well as targeted funding for digital transformation in underserved regions, is essential for achieving equitable digitalisation (Kaboré et al., 2022).

Beyond the included Southeast Asian studies, evidence from the United States highlights additional organisational barriers that were not prominent in our included dataset. A statewide survey of long-term care facilities in Texas reported that the most frequently cited barrier to EHR implementation was lack of capital resources to invest (46.0%), followed by lack of technical infrastructure (35.0%), insufficient time (29.2%), difficulty inputting historic medical record data (27.0%),

and lack of technical support staff (21.2%) (Wang & Biedermann, 2012). This suggests that, alongside infrastructure and usability constraints, financial capacity, time required for implementation, and data migration workload can also be major determinants of digitalisation progress, even outside Southeast Asia.

Privacy and data protection were also highlighted as environmental challenges due to lack of policies and guidance from the government with additional burden to healthcare providers in ensuring data privacy (Ebardo & Celis, 2019b). Nonetheless, laws and policies alone are insufficient to deter criminal activities, despite the existence of explicit penalties. Policy breaches remain feasible despite the presence of deterrents. Conversely, a system that inhibits processing halts the user before executing an unauthorised action. Protection at the system level is evidently more effective than that provided by policies; however, it is not feasible to protect all aspects in this manner, necessitating the continued use of policies (Yigzaw et al., 2022).

Way Forward

This systematic review's findings have significant implications for practice in healthcare digitalisation and indicate the need for a phased, accountable approach to implementation. In the short term, hospitals and healthcare institutions leaders and managements should prioritise the creation of comprehensive training programs to enhance the digital competencies of healthcare professionals. Considering the identified gaps in healthcare providers familiarity with digital tools, it is essential to design these programs to provide a gradual and supportive learning experience, especially for individuals who may exhibit resistance to change or possess limited technological proficiency. Clinical department heads, nursing leaders, and hospital IT units should institutionalise mentorship and "digital champion" models to facilitate knowledge sharing between

experienced users and novices and to promote a culture of continuous learning. Furthermore, incorporating patient perspectives into the design and implementation of digital health tools is crucial. Healthcare organisations can enhance patient engagement and satisfaction by designing user-friendly interfaces and offering clear guidance, which may result in improved health outcomes.

Coherent and actionable digital health policies that tackle existing challenges and promote a conducive environment for digitalisation should be a long-term strategy way forward. Policymakers must prioritise the reduction of the digital divide through the allocation of resources aimed at enhancing digital infrastructure, particularly in marginalised communities. This involves investing in dependable internet connectivity and supplying essential equipment to guarantee equitable access to digital health solutions. Additionally, it is essential to establish clear guidelines concerning data privacy and security to foster trust between patients and healthcare providers. Policies must prioritise a collaborative framework, promoting engagement among stakeholders across various sectors of academia, technology, and healthcare to participate in discussions that influence the future of digital health. Regular evaluations of policy effectiveness are essential for refining strategies and ensuring alignment with the changing demands of the healthcare landscape.

Furthermore, subsequent research led by academic institutions, health ministries, and hospital networks must focus on addressing the identified gaps in this review, especially the obstacles encountered by healthcare providers and patients in the adoption of digital tools. Longitudinal studies may offer insights into the effects of digital health interventions on patient outcomes and the changing perceptions and experiences of healthcare professionals adapting to these technologies. Furthermore, examining the

effectiveness of customised patient education programs would enhance our understanding of demographic engagement with digital platforms. Research should investigate optimal strategies for engaging patients in the co-design of digital health solutions, prioritising their needs in technological advancements. Finally, research evaluating the long-term sustainability and scalability of successful digital health initiatives can offer guidance for wider implementation throughout hospital care environment, thereby fostering a more inclusive and effective healthcare system.

Strength

The strength of this study lies in its comprehensive database searches, which included Proquest, Semantic Scholar, and PubMed, ensuring a wide range of relevant literature. Adherence to PRISMA guidelines enhanced the transparency and completeness of the review process. Additionally, the use of the Joanna Briggs Institute (JBI) critical appraisal tools ensured a rigorous quality evaluation of the included studies, further strengthening the reliability of the findings. This review was guided by a well-defined research question, focusing on identifying the challenges of digitalization in health care, which allows for targeted analysis and effective problem-solving. The inclusion of studies across different populations and healthcare settings provided a broad perspective on challenges experienced by various stakeholders, such as patients, medical workers, IT experts, and policymakers, within diverse demographic and geographic contexts among Southeast Asian countries.

The focus on qualitative studies provided in-depth, context-specific insights into the systemic, organizational, and human resource challenges associated with digitalization. Independent data extraction and quality assessments by multiple reviewers minimized the risk of bias, further enhancing the objectivity and credibility of the review.

Limitation

This review only evaluated articles published in English between 2019 and 2024 and excluded studies published in other languages. Book chapters and grey literature were not included, which may have provided additional insights into the challenges of digitalization in healthcare systems. While the review adheres to PRISMA guidelines and employs JBI critical appraisal tools, it is important to acknowledge the potential influence of biases and methodological limitations within the included studies on the overall outcomes. Furthermore, some studies did not achieve high appraisal scores, indicating variability in study quality that could affect the reliability and strength of the conclusions drawn.

CONCLUSION

Digital technology is redefining the landscape of healthcare, driving unprecedented changes in the way services are delivered. Advancements in virtual platforms, digitalization strategies, and enhanced connectivity are not only accelerating the transformation of healthcare delivery but also paving the way for more efficient, accessible, and patient-centered care. To fully harness the potential of these technologies, healthcare systems must overcome existing barriers, including skill gaps, infrastructure limitations, and resistance to change. A coordinated effort among policymakers, educators, and healthcare institutions will be essential in ensuring that the workforce is prepared for this digital evolution, enabling sustainable improvements in clinical outcomes and patient experiences. To strengthen the evidence base and guide implementation in Southeast Asia, future research should prioritise testing interoperability through real-world pilot projects that link data across hospitals and levels of care, evaluating costs and cost-effectiveness to support scaling decisions, and studying clinician adoption such as training, usability features, and workflow changes that may improve sustained use.

CONFLICTS OF INTERESTS

The authors have no conflicts of interest to declare.

DATA AVAILABILITY STATEMENTS

No datasets were generated or analyzed during the current study. This article is a narrative review based primarily on previously published literature.

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