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REVIEW

Facilitator and Barrier to Health Information System Use from Health Professionals Perspective: A Scoping Review

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Objective: This study aimed to present factors that potentially influenced system use by identifying facilitator or barrier to acceptance from the perspective of healthcare professionals.

Methods: A scoping review was used in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines. The literature search was conducted on two electronic databases, Scopus and MEDLINE through PubMed, limiting the publication timeframe from January 2013 to December 2023. Moreover, a developed search strategy was used based on keywords and MeSH terms derived from the Population, Concept, and Context (PCC) components. The inclusion criteria were studies that discussed information system in healthcare, incorporated healthcare professionals who directly engaged with health information system (HIS), conducted within healthcare settings, identified facilitator or barrier to the use of information system in healthcare, and were available in full-text English. Barrier and facilitator were considered as factors impeding and promoting HIS use, respectively. The scoping review adopted a thematic analysis.

Results: The results showed that a total of 79 studies met the inclusion criteria and were included in this review. A total of 16 distinct facilitators and 16 barriers were identified, which were then grouped into four categories, comprising colleague and social support, organizational, individual, as well as technological and technical contexts. The most frequently mentioned facilitator was usefulness and simplification of daily tasks, while the predominant barrier was lack of technical support.

Conclusion: The systematic mapping of facilitator and barrier provided a foundation for policymakers and healthcare professionals in decision-making processes to enhance acceptance HIS.

Keywords: health information system, health professionals, facilitator, barrier, electronic health record

Introduction

Effective communication is significantly important in the present healthcare landscape, as inadequacy may lead to conflicts among healthcare providers.[1] The implementation of health information system (HIS) enhances community welfare by improving quality health services, the performance of health professionals, and reducing potential treatment errors.[2] Due to the intrinsic connection with communication processes, the effective use of HIS necessitates healthcare professionals communicating effectively through system, understanding updates and protocols, as well as providing feedback on experiences.[3–5] In the past era of paper records, data has become difficult to interpret, illegible, lost, or incomplete, resulting in limited analysis and insights.[6] HIS is a structured framework that integrates data collection, processing, and reporting to support decision-making, enhance service quality, ensure patient safety, control healthcare financing, improve the overall effectiveness and efficiency of health services.[7–9] The digitization of healthcare data has significantly transformed the responsibilities and tasks of health professionals, leading to increased engagement in technical roles.[10] In principle, good health services require the support of HIS infrastructure.[11] Information system is a fundamental enabler of knowledge management for health services.[12]

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Various types of HIS widely used in healthcare settings include Electronic Medical Record (EMR), Computerized Physician Order Electronic (CPOE), management, immunization information, institutional information, disease management, clinical documentation, and health information exchange networks.[2,13] The benefits of these HIS, such as improved care coordination[14] and enhanced decision-making,[15] are heavily reliant on effective communication facilitated by systems and the communication surrounding use. However, practical use entails both benefits and challenges. The benefits comprise increased efficiency, improved care coordination, and enhanced decision-making.[16,17] Previous systematic reviews showed that all seven quantitative studies focusing on process evaluation signified patient satisfaction with the use of digital health technology in pharmaceutical care delivered by pharmacists.[18] It is important to acknowledge and tackle associated challenges, such as the privacy and security of patient data. Resistance to change among healthcare professionals can also hinder the use and integration of HIS technology into existing workflows.[10,16]

A comprehensive understanding of facilitator and barrier in HIS is essential. This provides benefits, such as enhancing clinical outcomes, streamlining care coordination, optimizing practice efficiencies, and effectively monitoring data over time.[19] On the other hand, awareness of barrier allows organizations to proactively address and mitigate the factors. Digital health technology interventions have proved effective, but the impact on clinical outcomes varies, signifying the need for personalized feedback to ensure consistent and beneficial effects.[20] Important factors affecting system acceptance by users include attitudes, behavioral control, transition costs, service coordination, information management, and the ability to track healthcare outcomes, all of which are facilitator.[21] Meanwhile, financial issues, resistance to change, and IT problems during implementation were commonly mentioned as barrier to the use of Electronic Health Records (EHR) and Health Information Exchanges (HIE).[22]

Understanding the multifaceted challenges associated with HIS implementation is crucial for overall success. Although these challenges include significant barrier encountered by patients in adopting and effectively using systems, concerns regarding the privacy and security of health information,[23] limitations in access to patient portals[24] as well as other digital health interfaces, the perspectives of healthcare professionals are equally critical. Health professionals are the primary users and implementers of HIS in daily practice.[25] Acceptance, effective use, and identification of facilitator and barrier directly impact the successful integration of HIS into clinical workflows,[26,27] ultimately affecting patient care and safety.[19,28]

Barrier and facilitator related to HIS use, as well as the impact on the on-user engagement and satisfaction need to be discussed. Understanding the broader context in which the system is implemented is essential while developing strategies to overcome challenges. Previous systematic reviews have focused only on a single country,[29] a specific region,[30] or emphasized the exploration of acceptance theory.[31] A review from the perspective of healthcare professionals regarding facilitator and barrier, without being limited to a specific region, is needed. In general, scoping reviews are designed to map key concepts and examine studies in an area to provide an overview of the extent and nature of the current literature.[32–34] Therefore, this scoping review aimed to provide thematic summary information on facilitator or barrier to HIS use from the perspective of healthcare professionals, making the scoping review methodology well-suited to explore the available evidence without imposing strict inclusion criteria.

Method

The review follows the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) guidelines[35] (Supplementary Material 1):

Information Sources and Search Strategy

The literature search for this scoping review was conducted on two electronic databases including Scopus, a comprehensive multidisciplinary database with scientific, technical, medical, and social sciences literature as well as MEDLINE through PubMed, a premier source for biomedical and health-related studies. These two databases were selected to provide broad and focused coverage of the relevant literature. To minimize potential bias in the search strategy, several steps were taken. Firstly, the PCC (Population, Concept, Context) framework was applied to define the scope of the search, ensuring that all relevant facets of the study question were considered. The participants (P) consisted of healthcare professionals including, but not limited to, physicians, nurses, pharmacists, and allied health staff, who use HIS. The concept (C) focused on facilitator and

barrier affecting the adoption and use. The context (C) comprises various healthcare settings, including hospitals, clinics, community health centers, and other relevant environments where these systems are implemented.

Secondly, the search strategy was developed by translating the PCC components into relevant keywords and MeSH terms. For example, 'healthcare professionals' and related terms were used to represent the Population, 'acceptance and barrier' represented the Concept, while "hospital", "clinic", and 'community health' represented the Context, with 'health information systems' as the primary topic of focus.

Thirdly, the search terms were combined using Boolean operators (AND, OR) to refine the search and retrieve the most relevant studies. The combination strategies were carefully considered to capture the most relevant studies and minimize irrelevant studies. The full strategy using a combination of medical subject heading terms and text words is presented in Table 1. A scoping review methodology was selected due to the broad and heterogeneous nature of the study question. Given the wide range of HIS, technologies, and healthcare settings, a scoping review allowed effective mapping of the existing evidence and identifying key concepts, rather than focusing on a specific intervention or outcome, as in a systematic review. This approach was suitable for exploring the overall landscape of facilitator and barrier in the field.[33]

Eligibility Criteria

To minimize potential bias in the selection of studies for this scoping review, clear and objective eligibility criteria were established in line with the PCC framework. The scoping review included original observational or experimental that met the following criteria:

1. Healthcare professionals directly engaged with HIS, including but not limited to physicians, nurses, midwives, pharmacists. This criterion ensured that the perspectives and experiences captured are from individuals who directly interact with HIS in professional roles, providing relevant insights into facilitator and barrier.
2. Focused on the assessment of HIS, defined as an integrated and interoperable system designed to manage healthcare data, including various functions namely collecting, storing, managing, and transmitting data of patients, operational management of hospitals, and supporting healthcare policy decision.[36] This provides a clear and consistent definition of the core concept under investigation, ensuring that the included literature focuses on comprehensive HIS rather than isolated technologies or systems with limited functionality.
3. Identify facilitator or barrier to HIS use by healthcare professionals.[37] This criterion directly addresses the question of the scoping review, ensuring that the included studies provide data relevant to understanding the factors influencing HIS use.

Table 1 Literature Search Strategy

Code	Search Items
PUBMED	
#1	*((((((Health information systems[MeSH Terms]) OR (information systems[MeSH Terms])) OR (medical order entry systems[MeSH Terms])) OR (clinical pharmacy information systems[MeSH Terms])) OR (medical records systems, computerized[MeSH Terms])) OR (computerized physician order entry system[MeSH Terms])) OR (electronic health record[MeSH Terms])*
#2	*((Healthcare professionals[MeSH Terms]) OR (healthcare workers[MeSH Terms])) OR (health personnel[MeSH Terms])*
#3	*Acceptance OR barrier (All Field)*
#4	*Hospital OR community health centers OR public primary healthcare centers (All Field)*
#5	*#1 AND #2 AND #3 AND #4*
SCOPUS	*((TITLE-ABS-KEY ((*"Health information systems" *OR* "information systems" *OR* "medical order entry systems" *OR* "clinical pharmacy information systems" *OR* "medical records systems, computerized" *OR* "computerized physician order entry system" *OR* "electronic health record"*)) AND TITLE-ABS-KEY ((*"Healthcare professionals"*) OR (*"healthcare workers"*) OR (*"health personnel"*)) AND TITLE-ABS-KEY ((*"Acceptance" *OR* "barrier"*)) AND TITLE-ABS-KEY ((*"Hospital" *OR* "community health centers" *OR* "public primary healthcare centers"*))) AND PUBYEAR > 2012 AND PUBYEAR < 2024 AND (LIMIT-TO (LANGUAGE, "English")))*

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4. Studies conducted within healthcare setting (eg, hospitals, clinics, community health centers). This ensures that the results are relevant to real-world healthcare environments where HIS is implemented and used, enhancing the applicability of the review results to practice.
5. Availability of full text in English. Limiting inclusion to English language studies allows for a comprehensive understanding and accurate synthesis of the evidence, mitigating potential misinterpretations due to translation limitations.
6. Published between 2013 and 2023. This timeframe was selected to capture the contemporary landscape of HIS adoption and use. The starting year of 2013 was selected to focus on more recent developments and challenges in the field, considering the rapid evolution of health information technology in the past decade. The end year of 2023 ensures the inclusion of the most up-to-date studies available at the time of the search.

Exclusions criteria comprised:

1. Studies lacking full-text availability. The exclusion of these studies ensures that a thorough assessment of the methodology and results can be conducted, as crucial information may be missing from abstracts or other limited-access formats.
2. Conference proceedings, letters, editorials, commentaries, posters, reviews, and presentations. These publication types generally provide preliminary results, opinions, or summaries rather than in-depth analyses of original study. Focusing on original observational or experimental studies ensures a more robust and detailed evidence base for the scoping review.
3. Studies focusing on mobile phone devices. While mobile health (mHealth) is relevant, the focus of this review is on integrated and interoperable HIS. Excluding studies solely on individual mobile phone applications helps to maintain the scope on more comprehensive healthcare data management systems.

Study Selection

Relevant studies identified through title and abstract screening were independently evaluated by two authors (NY, QAK). Subsequently, a thorough evaluation of the full-text versions was independently conducted against the eligibility criteria. This dual review further minimized the risk of selection bias by ensuring that the final inclusion of studies was based on a consistent and agreed-upon application of the criteria. In cases of disagreements that could not be resolved, the other three authors (SDA, AAS, and RA) were available to act as adjudicators. Consensus was adopted for final resolution in all cases of disagreement. This multi-reviewer approach with a clear mechanism for resolving conflicts reduced the potential for subjective bias in the final selection of studies.

Extraction and Management Data

The data extraction process was primarily undertaken by NY and QAK, while SDA checked and verified the data extraction process. This independent verification step further minimized the risk of extraction errors, ensuring the accuracy and completeness of the extracted data. Any discrepancies or doubts identified during this verification process were discussed and resolved through consensus among all three authors. Data were extracted using predefined extraction tables and manually recorded in Microsoft Excel 2010. The use of predefined tables ensured that all relevant data points were systematically collected across all included studies, reducing the potential for information bias due to inconsistent extraction. The characteristics of each extracted article included general information (author, year of publication, study location), objectives, type of HIS, methods (study design, population, sample size, data collection methods), key results (facilitator and barrier), and funding.

Data Analysis and Synthesis

Based on the heterogeneity of the data concerning population, type of HIS examined, and methodological approaches, a qualitative narrative synthesis was undertaken to address the broad study question of this scoping review. The primary method of data analysis included a thematic content analysis of the extracted facilitator and barrier to HIS adoption and use by two authors (NY and QAK) independently. In this process, each extracted facilitator and barrier was subjected to

content analysis through the coding of relevant keywords. The process allowed for cross-verification of emerging themes and reduced the risk of individual bias influencing the categorization of results. Disagreements in coding or theme assignment were resolved through discussion and consensus among the two primary authors. Following the independent coding, the identified keywords were categorized into four themes based on previous studies.[30,38] These categories provided facilitator and barrier of HIS for understanding the key contextual domains, including colleague and social context, organizational, individual, as well as technological and technical. Colleague and social context were defined as the role of co-workers and leaders who have a good understanding and knowledge of digital system in creating a shared awareness to motivate users toward increasing acceptance and intention to adopt technology in the workplace.[39] Organizational context refers to readiness of policymakers in preparing infrastructure and resources (finance and human resources with the potential to master information technology).[40] Individual context is defined as capacity in the implementation of system, including experience, age, attitudes and behavior towards technology, ability to be trained/learned, intention to use, perceptions, expectations of system, knowledge, and awareness of system/technology.[41] Technological context of the study was described as the capacity and availability of information technology with technical support to increase acceptance and use of the system.[17] Additionally, each facilitator and barrier was analyzed through the lens of the 2023 World Bank classification settings, annually updated by July 1 based on Gross National Income (GNI) per capita from the preceding calendar year.[42] The specific GNI per capita thresholds for each income group served as crucial benchmarks. These include low-income country (LIC), lower middle-income country (LMIC), upper middle-income country (UMIC), and high-income country (HIC), with GNI per capita of $1135 or less in 2022, between $1136 to $4465, $4466 to $13,845, and $13,846 or more, respectively.

Quality Assessment

QAK conducted the evaluation of included studies to determine methodological quality assessment, with additional independent verification performed by SDA. Any discrepancies between the reviewers (QAK and SDA) were resolved through consensus. This step ensured that judgments were not solely reliant on a single individual interpretation, thereby reducing the risk of subjective bias. The quality assessment process for the included studies was based on the method adopted. Studies using qualitative method were assessed using JBI Critical Appraisal Checklist for Qualitative Research.[43] Similarly, those that applied the cross-sectional method were subjected to the JBI Critical Appraisal Checklist for Cross-Sectional Research.[44] Studies using mixed method were assessed using the Mixed Methods Appraisal Tool.[45] These checklists incorporate specific criteria designed to evaluate various aspects of study quality, thereby minimizing bias arising from a lack of clear assessment criteria. Studies scoring higher than 70%, between 50% and 70%, and less than 50%, were categorized as high, medium quality, and low quality, respectively. The pre-defined categorization of quality scores (high, medium, and low) based on established thresholds provided a consistent and transparent approach to interpreting the assessment results, reducing potential bias in the overall quality rating of the included studies.

Result

Study Selection

The PRISMA flowchart showing the literature selection steps is presented in Figure 1. A comprehensive search across Scopus and MEDLINE through PubMeddatabases resulted in 676 references potentially meeting the inclusion criteria. Following a selection process, comprising duplicate removal as well as titles and abstracts evaluation, 148 studies were reviewed for full-text eligibility assessment. Finally, 79 that met the inclusion criteria were included in the review.

Study Characteristic

Table 2 shows the characteristics of the studies included in the analysis. The majority (14 studies, 17.7%) were conducted in the United States of America[21,47–59] and in 2015.[55,57,60–71] In terms of data collection, 48 studies used cross-sectional study design,[8,21,47,50,52–55,60–62,64–66,71–104] 18 used qualitative,[48,49,51,56,59,63,67,68,105–114] and 13 used mixed methods,[57,58,69,70,115–123] respectively. The study with the largest number of participants at 6443 was by Vitari et al.[91] The most commonly used type of

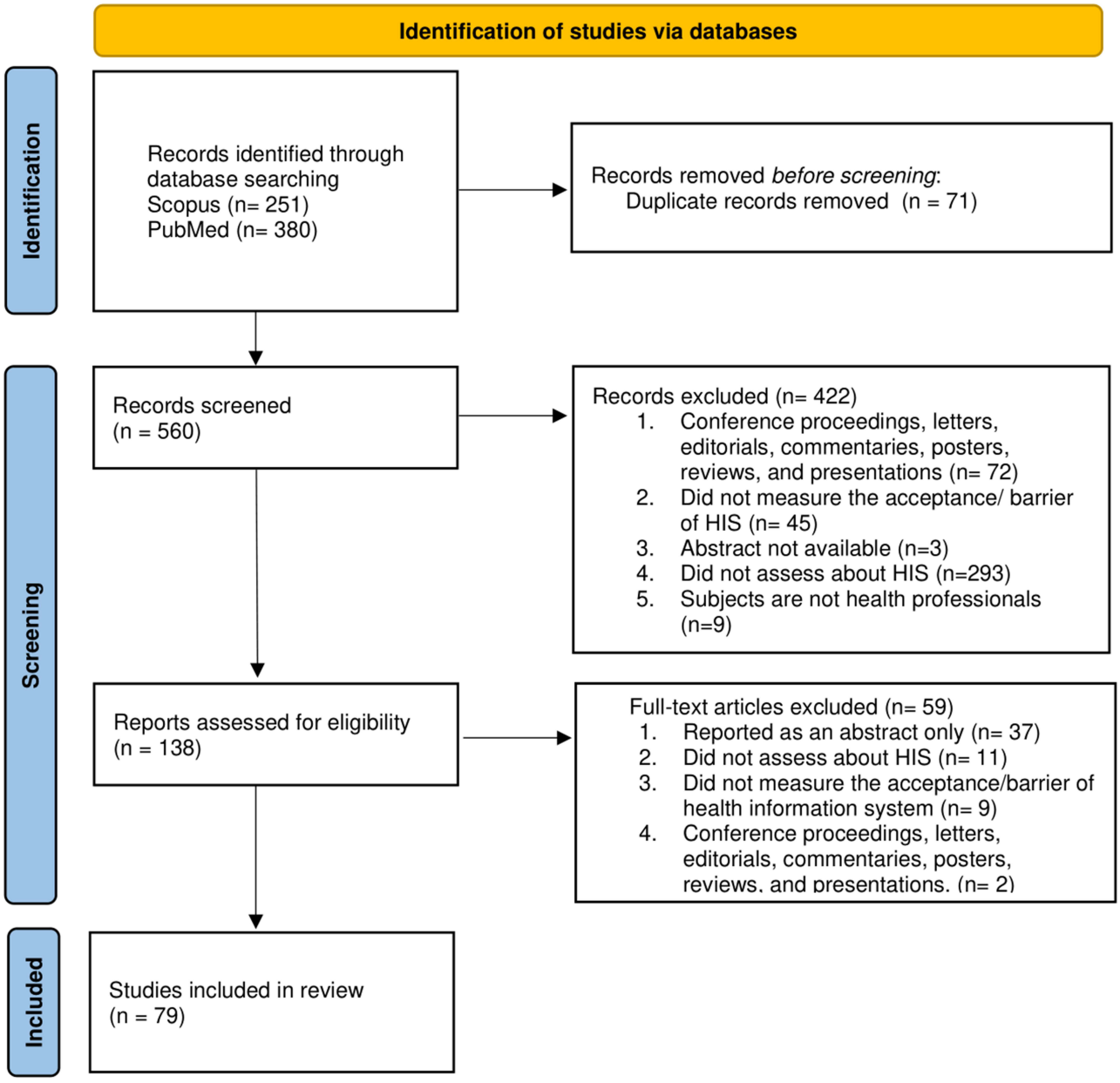

Figure 1 PRISMA Flowchart of Study Selection Process. Adapted from Page M J et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021; n71 10.1136/bmj.n71. Creative Commons.[46]

HIS was electronic health records.[1–9,21,47–53,55,60,61,64–68,72,74,75,77,78,82,86,88–93,96,100,102,103,106–109,111,115,118,119] Physicians[47,51–53,56–58,60,61,63,69,70,82,83,86,87,89,90,92,100,101,112,114,117–119,122] and nurses[8,50,55,64,66,67,71,74,75,78,79,94,95,97,98,105,106,108] were the 2 healthcare professionals commonly selected as subjects for investigations (Supplementary Material 2).

Main Result

The review explored facilitator and barrier across various contextual perspectives (Supplementary Material 3). Organizational context showed facilitating conditions regarding HIS use as the most frequent facilitator, as shown by the results from 11 studies. HIC and LMIC were the focus of the most discussions (4 studies each), as presented in Figure 2. However, the lack of consensus responsibility was identified as a significant barrier, with results from 13 studies outlining the impact. HIC had the highest number of discussions, while no LMIC addressed the issue. From an individual

Table 2 Studies Characteristics

Characteristic		N (%)	Reference
Country	United State of America (USA)	14 (17.9)	[16,32–44]
	Iran	9 (9.5)	[5,45,63,70,78,84,86,91]
	Netherlands	5 (7.1)	[49,82,92,93,103]
	Taiwan	5 (6.0)	[47,71,73,76,83]
	France	4 (4.8)	[48,77,85,102]
	Australia	4 (4.8)	[72,88,94,95]
	Jordan	4 (4.8)	[51,61,64,87]
	Canada	3 (3.6)	[50,81,104]
	Saudi Arabia	3 (3.6)	[52,75,90]
	Ethiopia	3 (3.6)	[79,89,101]
	Iraq	2 (3.6)	[60,69]
	Belgium	2 (2.4)	[58,105]
	Ghana	2 (2.4)	[65,67]
	Malaysia	2 (2.4)	[59,66]
	United Kingdom (UK)	2 (2.4)	[62,96]
	Argentina	1 (1.2)	[53]
	Europe	1 (1.2)	[97]
	Hongkong	1 (1.2)	[106]
	Indonesia	1 (1.2)	[107]
	Malawi	1 (1.2)	[54]
	Italy	1 (1.2)	[74]
	Singapore	1 (1.2)	[55]
	Sweden	1 (1.2)	[56]
	Switzerland	1 (1.2)	[98]
	Thailand	1 (1.2)	[108]
	Bangladesh	1 (1.2)	[68]
	Finland	1 (1.2)	[109]
	Taiwan, USA	1 (1.2)	[57]
	India, Singapore	1 (1.2)	[100]
	USA, German	1 (1.2)	[80]
	Bangladesh, Nepal, Tanzania	1 (1.2)	[109]
Years of Publication	2014	7 (8.9)	[39,41,43,79,82,84,104]
	2015	14 (17.7)	[40,42,45,47–57]
	2016	7 (8.9)	[35,71,78,80,81,85,99]
	2017	9 (11.4)	[33,34,38,69,83,86,91,96,107]
	2018	4 (5.1)	[37,61,70,77]
	2019	9 (11.4)	[5,16,36,63–65,68,75,76]
	2020	7 (8.9)	[59,62,74,92,101,103,106]
	2021	8 (10.1)	[58,60,67,73,94,95,98,109]
	2022	7 (8.9)	[32,66,72,93,97,105,108]
	2023	7 (8.9)	[44,87–90,100,102]
Type of HIS	Electronic Health Record (EHR)	40 (50.6)	[16,32–38,40,45,47,50–54,58,60,61,63,64,68,72, 74–79,82,86,92–97,101,104,105]
	Electronic Hospital Information Management System	10 (11.4)	[5,48,57,62,65,67,70,84,107,109]
	Computerized Decision Support System (CDSS)	5 (5.1)	[49,55,56,99]
	Health Information Exchange	4 (5.1)	[39,41,98,108]
	Nursing Information System	4 (5.1)	[71,80,83,91]
	Poison Information Systems (PIS)	2 (2.5)	[59,66]
	Clinical Information System	1 (1,3)	[85]
	Clinical Pathways (CPs) Software	1 (1,3)	[103]
	Computerized Physician Order Entry System	1 (1,3)	[43]
	Electronic Point-of-Care System	1 (1,3)	[42]
	Electronic Product Information (ePI) System	1 (1,3)	[106]
	Picture Archiving and Communication Systems (PACS)	1 (1,3)	[69]
	The PharmaCloud Systems	1 (1,3)	[73]

(*Continued*)

Table 2 (Continued).

Characteristic		N (%)	Reference
Study design	Cross-sectional	48 (60.7)	[5,16,32,35,37–40,45,47,48,50–52,57–90]
	Qualitative	18 (22.8)	[33,34,36,41,44,49,53,54,91–100]
	Mixed- methods	13 (16.5)	[42,43,55,56,101–109]
Number of participants	10–199	43 (54.8)	[16,33–38,41–44,51–54,56,59,62,66,67,69,72,75,76,81, 83,86,90–100,102,103,105,106,109]
	200–999	31 (38.1)	[5,32,39,40,45,47,49,50,55,57,58,60,63,65,68,70, 71,73,74,78–80,82,84,87–89,101,104,108]
	1000–4999	5 (6.0)	[48,61,64,85,107]
	5000–6443	1 (1.2)	[77]
Type of Participants	Physician	26 (35.5)	[32,36–38,41–43,45,47,49,55,56,68,69,72,73,75,76, 78,86,98,103–105,108]
	Nurse	20 (26.3)	[5,35,40,50,52–54,60,61,64,65,80,81,83–85,91,94]
	Healthcare professionals	16 (21.1)	[33,34,48,51,54,62,63,66,67,70,77,79,97,101,107]
	Pharmacist	3 (3.9)	[16,39,106]
	Physician and Nurse	6 (7.9)	[58,74,82,85,95,99]
	Physician and Pharmacist	1 (1.3)	[93]
	Physician and Midwives	1 (1.3)	[96]
	Physician, Nurse, and Pharmacist	1 (1.3)	[59]
	Physician, Nurse, and Midwives	1 (1.3)	[109]

context perspective, positive behavior and attitude were outlined as the primary facilitator for HIS use, according to the results from 27 studies. Negative perception was identified to be a prominent barrier, as signified by 10 studies. In the technological context, the usefulness and daily task-simplifying of HIS were identified as the most substantial facilitator, with evidence from 22 studies supporting this observation. Conversely, the lack of technical support was identified as a significant barrier, with 19 studies identifying the impact. In the social context, support from experienced friends was identified as an influential facilitator, judging by the results from 11 studies. Lack of leadership role was recognized to be a significant barrier, based on evidence from 12 studies.

Quality Assessment

A quality assessment was conducted, and the results showed that there were no low-quality identified in the qualitative and mixed-method studies (Supplementary Material 4). Among the qualitative studies, 13 and 5 were categorized under high and moderate quality, respectively. Similarly, in the mixed method, 11 and 2 were classified under high and moderate quality. Regarding the cross-sectional studies, the majority of 36 studies were determined to be of high quality, with 9 classified under moderate quality. Meanwhile, only 2 studies were considered to be of low quality, as both lacked clear descriptions of inclusion criteria, subject and setting explanations, standard criteria for the measured conditions, and details of the statistical analysis adopted.

Discussion

This review outlined the multifaceted nature of facilitator and barrier toward the implementation and use of information system and technology by healthcare professionals, ranging from individual, technological, organizational, and social contexts. This classification provided a comprehensive understanding of the diverse factors. By organizing these facilitator and barrier into specific categories, a deeper insight into the multifaceted nature of the challenges and opportunities associated with HIS use was acquired.

Individual Context

In LIC, the identified facilitator in individual contexts was limited to positive attitude and behavior,[68,93,103] alongside possessing good IT knowledge.[93,103] A positive attitude and behavior, comprise maintaining an optimistic outlook on life, expecting improvement and success, as well as viewing the bright side of challenging situations.[124] HIC, UMIC, and

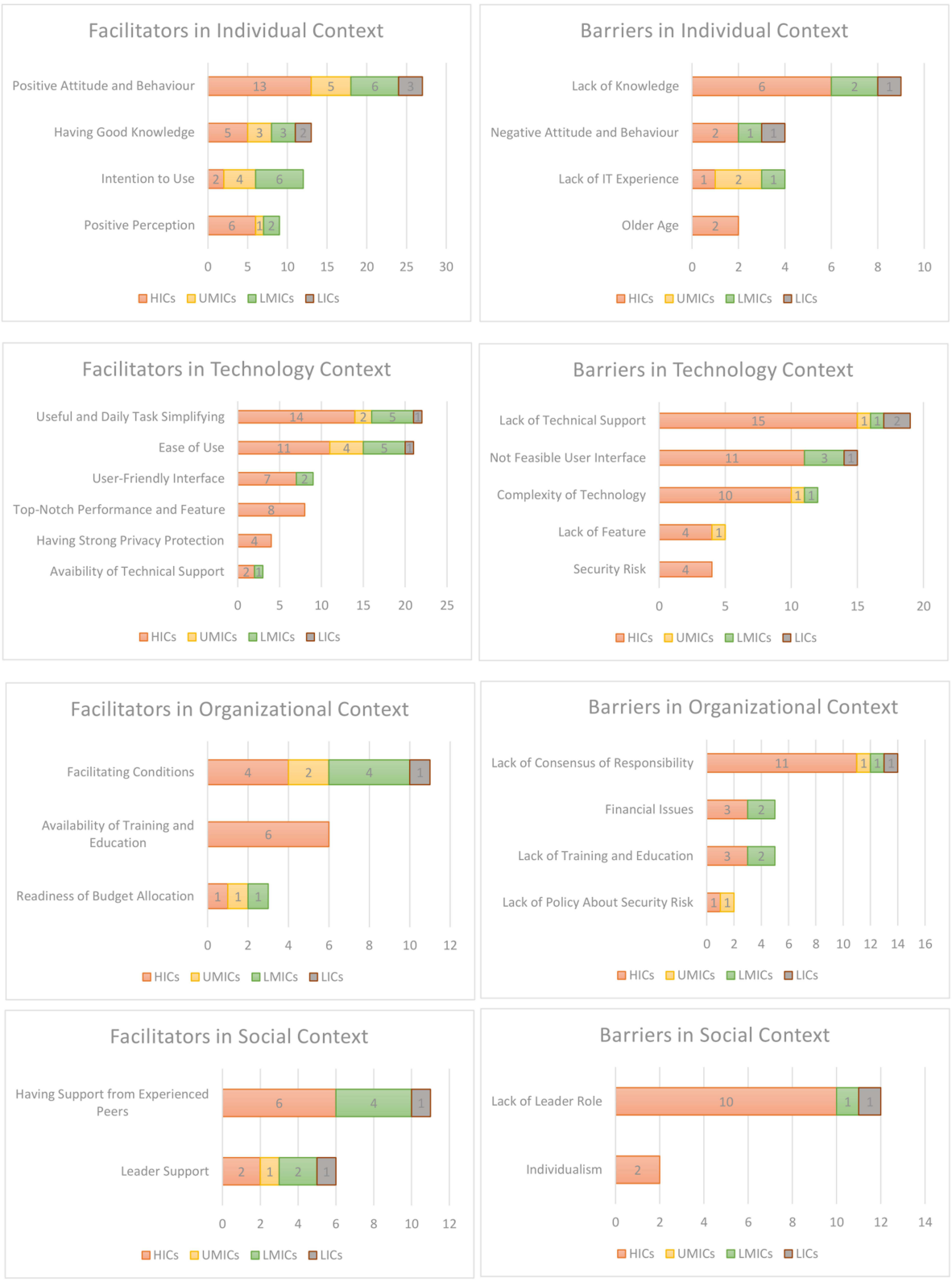

Figure 2 Facilitator and Barrier of Utilization of HIS.

LMIC recognized a broader spectrum of facilitator in individual contexts, including previous IT experience, positive attitude and behavior, intention to use, positive perception, and good knowledge. Studies showed that subjects with a positive perception of HIS usefulness, often due to good IT knowledge or experience, tend to have a more positive

attitude towards the application in work, perceiving it as facilitator rather than barrier.[125] Furthermore, the intention to use HIS significantly strengthened this relationship, specifically when users believe in the positive impact towards HIS.[125] This implies that the effective adoption of HIS could be significantly improved by training initiatives to enhance health workers confidence in using system and by clearly communicating the benefits to increase motivation.

The most prevalent barrier in the individual context across HIC, UMIC, LMIC, and LIC was negative perception towards the use of new technology in the implementation of HIS. Barrier in individual contexts was nearly the same in all categories of countries, signifying a shared struggle in addressing barrier toward HIS implementation. To overcome negative perceptions, there is a need to actively acquire positive information and experiences. This enables healthcare professionals to effectively handle the inevitable challenges faced in demanding healthcare settings.[126] Negative perceptions often arise from a natural tendency to focus more on negative information. Consciously combating this bias by identifying positive aspects can be instrumental in reshaping perceptions.[127] However, lack of IT experience was not mentioned as barrier in LIC, which can be attributed to limited exposure to complex system and a greater emphasis on addressing resource constraints.[128] A combination of technological enhancements, capacity-building activities, and data quality assessment with a feedback system has proven to be effective in enhancing IT experience.[129]

Evidence increasingly shows the challenges arising from a lack of human-centered design in HIS, directly impacting performance in healthcare settings. For example, inadequate HIS planning, lack of training for professionals, and inadequate preparation for unplanned system disruptions can all lead to compromised healthcare quality and increased risks to patient safety.[130] Additionally, studies show systemic issues within HIS that can be partly attributed to a lack of proper consideration for human capabilities and limitations during the design and implementation stages.[131,132] To optimize performance and ensure patient safety, a complete understanding of the cognitive, physical, and organizational dimensions of healthcare professionals interaction with these technologies must be achieved through user usability testing.[133]

Technology Context

The most prominent facilitator across diverse economic settings was the ability to be useful and simplify daily tasks. This suggests that regardless of the economic context, health professionals value technology known to demonstrably ease workload, streamline routines, and ultimately improve efficiency in daily operations. This is consistent with the understanding that the core value proposition of HIS lies in the ability to optimize workflows and reduce administrative burdens.[134] Similarly, ease of use and a user-friendly interface were mentioned, showing that when technology is easy to navigate, it reduces resistance towards change and enhances user satisfaction, ultimately contributing to better integration and utilization.

Emphasis on top-notch performance and having strong security protection was predominantly articulated by HIC only. The pursuit of top-notch performance was in line with the importance of ensuring seamless and efficient functioning of HIS technology, thereby optimizing healthcare delivery and administrative processes.[135] The emphasis on these aspects was driven by the crucial need to maintain the highest levels of data privacy and security, particularly due to the sensitive nature of healthcare information.[136] This signified that HIC was proactive in recognizing the security risk threat to technology use and having good awareness of the potential threats posed by security vulnerabilities. The vulnerability to security breaches, data theft, and unauthorized access presents a universal challenge transcending economic distinctions.[137,138]

The fact that LMIC and LIC specifically mentioned "Availability of Technical Support" as facilitator, but not "Top-Notch Performance" or "Strong Security", suggests HIS adoption is likely in an early stage where basic functionality and support are the main needs. Therefore, both may not be focused on the more complex demands of strong security and high-level performance that become more critical with advanced HIS integration. HIC did not cite "Availability of Technical Support" as facilitator, probably due to the perception as a bare minimum. Reliable technical support is a given and not a key driver for HIS use, likely focused on more advanced features of the technology. Although HIC may have greater resources for addressing security risks, it is essential for UMIC, LMIC, and LIC to also prioritize strong security measures to safeguard sensitive health information.[136] Acknowledging and addressing this shared concern present the commitment to mitigating risks and promoting a secure environment for health information management.[139] In the modern world, a diverse set of technologies including the Internet of Things, blockchain, mobile health apps, cloud platforms, and integrated forms, are being leveraged to strengthen the security and privacy of healthcare information.[140]

The predominant barrier often cited is the lack of technical issues. However, the nature of technical issues experienced by LIC and LMIC differs significantly from those encountered by HIC and UMIC. LIC and LMIC frequently face perceived technical problems such as poor internet access leading to slow system performance, inadequate computer infrastructure limiting efficient HIS use, and unreliable power supply leading to data loss due to lack of automatic saving.[93,103] However, HIC and UMIC encounter minor technical issues, such as frequent and disruptive bubble messages, the absence of a "help" button for immediate assistance with technical problems, and other relatively minor technical matters.[57,110,113,116,119]

The complexity of technology, lack of essential features, and non-feasible user interface collectively pose significant barrier to effective HIS use. The intricate nature of modern technology often results in HIS platforms being overly complex, making it challenging for effective navigation and use by healthcare professionals.[141] Additionally, the absence of crucial features in system hinders the ability to meet the diverse needs of healthcare providers and organizations, leading to suboptimal functionality.[142] The presence of a non-feasible user interface further elevates the usability issues, diminishing user experience and making it arduous for individuals to interact with the system.[143,144] These barrier significantly impede the integration and effective HIS use in healthcare technology landscape, thereby impacting the delivery of quality patient care and the overall efficiency of healthcare processes.

Technology barrier in HIS is a direct consequence and deeply intertwined with human performance.[145] The capacity of healthcare professionals to work efficiently and effectively is directly limited by poorly designed HIS that often ignore human-centered design principles.[146] Systems with technical problems, difficult-to-use interfaces, or unreliable performance led to increased mental effort, a higher risk of errors, and interruptions in established clinical workflows.[147] The mismatch between health IT design and how humans think and work reduces productivity while also endangering patient safety.[130] The frustration and mental overload caused by poorly designed or difficult technology can result in workarounds, lower user satisfaction, and the failure to realize the intended benefits of HIS.[148] This emphasizes the critical importance of putting human-centered design principles first in the development and implementation of HIS to maximize both system effectiveness and human performance in healthcare.

Organizational Context

Facilitating conditions appear as a relevant facilitator across all income levels. These conditions comprised a range of crucial elements such as conducive policy frameworks,[60,62,80,82,96,121] robust infrastructure,[53,64,72,73,78,79,82,90,98,104,115,149] and proficient human resources,[110,112] collectively creating a conducive environment. The prevalence of mentions across diverse income levels presented the universal recognition of the crucial role played by facilitating conditions in driving the effective use of technology.[150,151] Since each country aims to improve healthcare system, recognizing facilitating conditions remains a key factor.

Availability of training and education was recognized as a crucial facilitator for successful HIS use, particularly in HIC.[72,102,109,110,112,114] In well-resourced settings such as HIC, organizations are likely to invest more in comprehensive training programs to ensure proper system adoption and maximize the benefits of HIS. This facilitator being predominantly conveyed reflected an effort to prioritize continuous learning and skill development in leveraging technological advancements in healthcare system.[152] The implementation of new technology, such as HIS, requires comprehensive training for effective use, supporting the growth of both the individual and the organization.[153] Therefore, training plays a crucial role in enhancing individual skills as well as driving organizational growth and success. The training programs are crucial for ensuring the desired outcomes of implementation are defined and measured.[154]

HIC, UMIC, and LMIC recognized the importance of substantial budget allocations for the implementation and sustainability of HIS. This collective awareness is grounded in the understanding that adequate financial resources are essential for the successful deployment and long-term viability of HIS in healthcare system.[155] LIC did not consistently elaborate the availability of budgetary allocations as facilitator. This disparity can be attributed to several factors, including limited financial resources, competing healthcare priorities, challenges in budget transparency and allocation, as well as a lack of comprehensive strategic planning.[156] In LIC, the perception that budget availability is not facilitator might point to it being a more fundamental limitation requiring urgent attention to be addressed. The infrequent mention

of budget availability suggests that while financial commitment is essential for HIS implementation, it is likely that having a budget is considered a basic necessity rather than a frequently recognized positive facilitator.

HIC mentioned financial issues as barrier, while LICs did not, suggesting the need for closer examination. This discrepancy in acknowledgment may be attributed to the varying financial,[157,158] resources availability, and educational landscapes between the two categories of countries.[159] In HIC, financial constraints might relate to the high costs of implementing and maintaining sophisticated, integrated HIS, including advanced security features, interoperability solutions, and continuous upgrades.[160] These countries might face budgetary competition for cutting-edge technologies and encounter challenges in justifying the return on investment for complex HIS implementations.[161] On the other hand, LIC might focus on the more fundamental matters that need to be in place before money problems for specific HIS including no electricity or internet, not enough trained people, or no existing systems. In these situations, not having significant money for investment in HIS might be assumed and not specifically pointed out as barrier.[162]

The lack of consensus regarding responsibility was the most commonly cited barrier to effective HIS use across diverse healthcare landscapes. The absence of clearly defined roles and responsibilities results in an impaired collaboration between practitioners,[49,51,67] diminished trust in information from other healthcare providers,[48,51,56,61,71,99,108,109,111,112,123] and uncertainty surrounding documentation duties.[78,93,109] These challenges arise due to ambiguous accountability, with practitioners uncertain of who is responsible for key tasks such as result follow-up, order entry, and record updates.[127,163] Irrespective of income status, all countries struggle with this barrier, experiencing limited information flow, disjointed care, and compromised patient outcomes due to nebulous governance in health information management.[164] Therefore, responsibility consensus should be established as a universal priority to facilitate optimal HIS use.

Awareness regarding the lack of policy on risk security is predominantly evident in HIC[120] and UMIC,[122] while it should logically be a universal concern across all countries, regardless of income level.[165] The relative silence from LIC might not necessarily show the absence of such risks, but rather a potential lack of resources, expertise, or prioritization in identifying and articulating these concerns.[166] Since HIC and UMIC show an absence of robust risk security policies, there is a need for a more concentrated effort to address this critical aspect of HIS implementation.[165] This necessitates the development and dissemination of best practices, the provision of technical assistance, and fostering international collaboration to establish universal standards and guidelines for HIS risk security policy.

The adoption of HIS is significantly influenced by the basic contrasts in policy and funding structures between high-income and low-income settings. HIC often benefits from substantial public and private investment in digital infrastructure, coupled with supportive national policies that mandate or incentivize HIS implementation, promote interoperability, and ensure data security.[167] This conducive environment fosters widespread adoption and sophisticated system development. Conversely, LICs frequently face significant hurdles due to limited financial resources, fragmented or non-existent national digital health strategies, and competing priorities for healthcare spending.[156] Consequently, HIS adoption in these settings is often piecemeal, underfunded, and struggles with infrastructural limitations and a lack of cohesive policy frameworks, leading to a digital divide in healthcare capabilities.

Social Context

Support from peers and the influential role of leadership were widely acknowledged as key facilitator in effective HIS use. The crucial role of peer networks includes sharing best practices, knowledge exchange, and mutual encouragement, all of which contributed to successful implementation.[168] These results are in line with social learning theory, positing that individuals learn and adopt new behaviors by observing and interacting with others within social network.[169] Furthermore, effective leadership plays a crucial role in championing technological advancements, fostering a culture of innovation, and garnering support for change initiatives.[170] With social support being strongly emphasized, it appears that efforts focused on enabling peer learning and mentorship programs could be particularly impactful in advancing successful HIS adoption, specifically in settings facing resource limitations.[171]

The absence of effective leadership and an environment characterized by individualism presented significant barrier to successful HIS use in healthcare settings. Inadequate leadership could hinder the development and implementation of cohesive strategies for integration, leading to fragmented efforts and a lack of organizational buy-in.[172,173] A leader's absence or lack of engagement can cause healthcare workers to feel unsure, resist change, and not commit to new HIS,

obstructing the implementation. Meanwhile, a leader who models autonomy, accountability, teamwork, and patient-focused improvement can prevent these barrier.[174] HIC often identified individualism to be a prominent barrier, as the emphasis on self-reliance and autonomy may impede the collective efforts required for comprehensive implementation and use.[175] Addressing these barrier necessitates effective leadership to drive cohesive strategies and a shift towards a collaborative culture that prioritizes the collective benefit of HIS in healthcare system.[176] This result implies that addressing systemic issues related to leadership and organizational culture may be more critical than focusing solely on individual attitudes when seeking to promote effective HIS implementation.

Public Health Implication

Comparing successful and failed HIS adoptions provides valuable insights, allowing the identification of key facilitator and barrier by studying instances of significant improvements and critical shortcomings in healthcare delivery and efficiency. For example, successful implementations often show strong leadership support, comprehensive user training, robust technical infrastructure, and a user-centered design approach consistent with existing workflows. Conversely, unsuccessful cases show barrier such as inadequate stakeholder engagement, insufficient funding, poor system usability, lack of interoperability, and resistance to change. Understanding these differentiating factors offers valuable lessons for policymakers, healthcare administrators, and implementers aiming to maximize successful HIS adoption and avoid common mistakes.

Facilitator identified in this scoping review show key elements supporting successful HIS implementation, ultimately improving patient care through better information access and decision-making. These facilitator will enhance healthcare system efficiency through streamlined workflows and resource management. Equally, barrier underscore the challenges requiring attention for effective adoption and the realization of these benefits. This review of facilitator and barrier provides a foundation for informed decision-making by policymakers and healthcare professionals to enhance HIS acceptance.

The adoption of HIS is significantly shaped by overarching policy landscapes. Facilitator and barrier identified in this review offer valuable insights for policymakers aiming to optimize HIS adoption and effectiveness.[177] This understanding can contribute to targeted interventions and policies that address barrier and leverage facilitator to optimize information system use in healthcare, ultimately leading to improved delivery, better patient outcomes, and a positive impact on public health. To reduce resistance and foster greater acceptance, policymakers should prioritize early and continuous engagement of healthcare professionals,[178] invest in comprehensive training and support,[179] clearly articulate the benefits of HIS for patient care and workflow efficiency,[180] establish and enforce stringent data security and privacy policies,[181] adopt a user-centered design approach,[130] as well as establish robust communication channels for feedback.[178] Drawing upon global best practices, policymakers should also consider investing in interoperable infrastructure, establishing clear national standards (including for data security and privacy), prioritizing user participation in system design, ensuring adequate and sustainable funding, as well as promoting collaboration across healthcare organizations.[179] By strategically addressing these areas with a strong emphasis on data security and privacy, policymakers can create an enabling environment for successful HIS adoption, contributing to a more efficient, patient-centered, and secure healthcare system.

Strength, Limitation, and Future Study

A key strength of this study lies in the approach, which allows for a broad mapping of the landscape, capturing a diverse range of factors influencing HIS adoption and use as perceived by health professionals. The review helps to inform policymakers of the factors that facilitate or hinder the use of information system or technology by healthcare professionals. Facilitating factors or barrier to the use of information system or information technology have been presented. However, this study also presents a limitation including the literature search conducted using terms that may not have comprised all publications in the databases, no further contact existed with the authors of the papers to validate the content analysis of the review, grey literature was excluded, no risk of bias assessment was performed, results were presented descriptively, and only English language studies were included. Although this scoping review primarily focused on facilitator and barrier to the use of core HIS functionalities from the perspective of daily healthcare professional interaction, the growing influence of Artificial Intelligence (AI) and broader digital health trends on the evolution of these systems must be acknowledged. Studies suggest that AI capacity to revolutionize clinical decision-making and improve health outcomes has potential

applications in healthcare,[182] presenting significant implications for future HIS design and implementation. By leveraging AI as a preferred method for handling big data in healthcare, analytical algorithms can enhance EHRs through big data analytics, enabling healthcare providers to deliver better clinical services by filtering and categorizing large datasets for enhanced data interpretation.[183,184] Future studies should explore how the integration of AI-powered tools and the broader digital health ecosystem impacts facilitator and barrier identified in this review. Moreover, the long-term impact of specific HIS functionalities on measurable patient outcomes should be explored as well as economic evaluation as a basis for information technology system development policy. Understanding these factors remains crucial for stakeholders implicated in the design, implementation, and maintenance of HIS.

Conclusion

In conclusion, these results underscore the critical need for targeted interventions that enhance technical support, address user resistance, and streamline HIS training programs to ensure widespread adoption. Future studies should investigate both the economic evaluation of HIS implementations and long-term impacts on healthcare efficiency and patient outcomes, alongside an exploration of the evolving influence of AI and the broader digital health ecosystem on HIS adoption.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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