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A REVIEW OF HEALTH INFORMATION SYSTEMS IN MALAYSIAN PUBLIC HOSPITALS: CURRENT PRACTICE, BENEFITS, AND BARRIERS

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Abstract

Hospital Information System (HIS) is one of the important pillars in current healthcare system practice worldwide. The study initiated after a review revealed a scarcity of applications and studies on HIS in Malaysia's public hospital setting. This scoping review aims to explore the current practice, benefits, and barriers associated with Health Information Systems (HIS) in Malaysian public hospitals. Utilizing the PRISMA guidelines, relevant literature was sourced from the SCOPUS database, focusing on publications from 2012 to 2022. A total of nine studies were selected for analysis. The review reveals that, despite being introduced early, the implementation and utilization of HIS in Malaysian public hospitals remain limited and slow. HIS offers substantial benefits, including improved clinical documentation, administrative efficiency, and enhanced quality and coordination of care. However, several barriers hinder its successful implementation, categorized into five main areas: financial, organizational, behavioral, technological, and support-related. Addressing these challenges is essential for realizing the full potential of HIS in improving patient care and hospital efficiency. This review serves as a baseline for identifying critical issues and guiding future improvements in Malaysia's public healthcare sector.

Keywords: Health Information System, Public Hospitals, Malaysia, Barriers, Benefits

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INTRODUCTION

A hospital Information System (HIS) is defined as integrated electronic systems that collect, store, retrieve and display overall patients' data and information such as the history of patients' information, results of laboratory tests, diagnoses, billing and other related hospital procedures which are used in several departments within hospitals (Ismail & Abdullah, 2012). In the year 2001 Ministry of Health claimed Hospital Selayang as the first in the world that provide a comprehensive ICT paperless system with THIS (Ministry of Health Malaysia, 2009). Although the system used in Selayang Hospital was adopted and adapted from the system provider in the United States, implementation of the system as comprehensive as at the Selayang Hospital has never been done before in the United States. This is due to the complex nature of the health services system in the US where the facilities are in a hospital (Hassan, 2012).

HIS has several components, for example, Clinical Information System (CIS), Financial Information System (FIS), Laboratory Information System (LIS), Nursing Information System (NIS), Pharmacy Information System (PIS), Picture Archiving Communication System (PACS) and Radiology Information System (RIS) (Biomedical Informatics Ltd., 2006). According to Biomedical Informatic Ltd. (2006), the HIS could have two or more HIS components whereby these components are linked to one another. Each component has different characteristics, based on its usage, department and users (Ismail et al., 2015).

In Malaysia, the implementation of Hospital Information System (HIS) in Malaysian Public Hospitals are divided into three categories, known as Total Hospital Information System (THIS), Intermediate Hospital Information System (IHIS) and Basic Hospital Information System (BHIS). This implementation is based on the hospital size and number of beds (Nurul Izzatty Ismail, 2015). The forms of integrated information systems that are installed are different among the HIS's hospitals. The THIS, IHIS and BHIS have different components of information systems installed in their hospitals (Hassan, 2012). The different classification of HIS is determined by different components of the Information System (IS) being implemented in the hospitals. THIS's hospitals are also known as paperless hospitals because they have completed HIS components. While IHIS and BHIS use the hybrid system, which maintains both electronic and manual systems. This is because both IHIS and BHIS's hospitals adopted only several forms of IS (Ismail et al., 2015).

The integration is so deep and extensive that it is not only between software applications but also between applications and modalities or equipment especially in the radiology, laboratory, intensive care and operating theatres where the system is interfaced directly into the equipment and whatever data or image produced by such equipment will go directly on-line into the system. Patient's medical records, guidelines and clinical protocols are instantly available and can be assessed in one integrated workstation at any place and at any time in the hospital, provided that the user has proper authority to access the information (Hospital Selayang, 2022).

The importance of HIS concerning administrative and financial aspects, the healthcare workers are primarily interested in the impact on improving the quality of care. HIS will improve the quality and efficiency of healthcare institutions, from small practices to large centres. One study suggested that electronic healthcare records have the potential to decrease medical errors by providing improved access to necessary information, better communication, and integration of care between different providers and visits, and more efficient documentation and monitoring. However, overall improvements in patient outcomes associated with healthcare

informatics are still not yet well documented. In particular, the effect of the implementation of HIS on inpatient adverse events, inpatient mortality, and the readmission rate for specific conditions has yet to be explored (Lovis & Debande, 2015).

HIS provide a common source of information about a patient's health history, and doctors' schedule timing. The system has to keep data in a secure place and control who can reach the data in certain circumstances. HIS also enables healthcare organizations to collect, store, manage, analyze, and optimize patient treatment histories and other key data. These systems also enable healthcare providers to easily get information about macro environments such as community health trends. HIS can benefit a healthcare organization in several ways. To realize these benefits, however, the organization must put the proper technological infrastructure in place. This includes both fundamental software and hardware requirements. Effective implementation of HIS requires a secure wireless network, which connects all associated devices and enables information to be accessed and shared from anywhere within the organization. It's also critical to have convenient workstations from which providers, nurses, technicians, and administrators can access records. These may include desktops, laptops, and/or tablets (Abdollah Salleh, 2021) Ohio University, 2020).

HIS is one of the important pillars in current healthcare system practice worldwide. The study initiated after a review revealed a scarcity of applications and studies on HIS in Malaysia's public hospital setting. The issues highlighted in this analysis serve as a baseline for identifying core issues and barriers to future improvement in Malaysian public hospitals. The review aims to identify the current practice of HIS in public hospitals in Malaysia based on current literature, to identify the overall benefits of the HIS system in terms of organization level (staff workload) and the patient (satisfaction and service delivery) and to identify barriers to the implementation of HIS in hospitals in Malaysia based on the review literature.

METHODS

Study Protocol

PRISMA guidelines for scoping review were used to conduct this review. The procedure for data collection and analysis and eligibility requirements were determined in advance.

Search Strategies

SCOPUS databases were used to identify eligible studies. The search was limited to articles written in English. All related articles will be synthesized to gather relevant information: the current practice of Health Information Systems in both public and private hospitals in Malaysia, their benefits and barriers. An extensive search using the following search terms was conducted on SCOPUS databases between January 2012 and December 2022 to locate relevant articles: Health information system" OR "Hospital information system" OR "information system" AND "public hospital" OR "government hospital" OR "private hospital" AND practices OR benefit OR advantage OR interest OR challenge OR barrier AND Malaysia. Free full-text articles were downloaded, and duplicates were removed. All remaining references were then imported into Mendeley software to continue for screening and data extraction processes.

Selection of Studies

The electronic searches of the mentioned database yielded a total of 18 articles. All retrieved studies were subjected to a preliminary screening based on titles, abstracts, and publication years. Fourteen articles were sought for retrieval, but only one could be downloaded. Another three articles were eliminated because they did not meet the inclusion and exclusion criteria (n=3) or were qualitative studies (n=1). As a result, ten articles were included in this review because they met the criteria. Figure 1 depicts the PRISMA flow diagram of the articles selected for analysis.

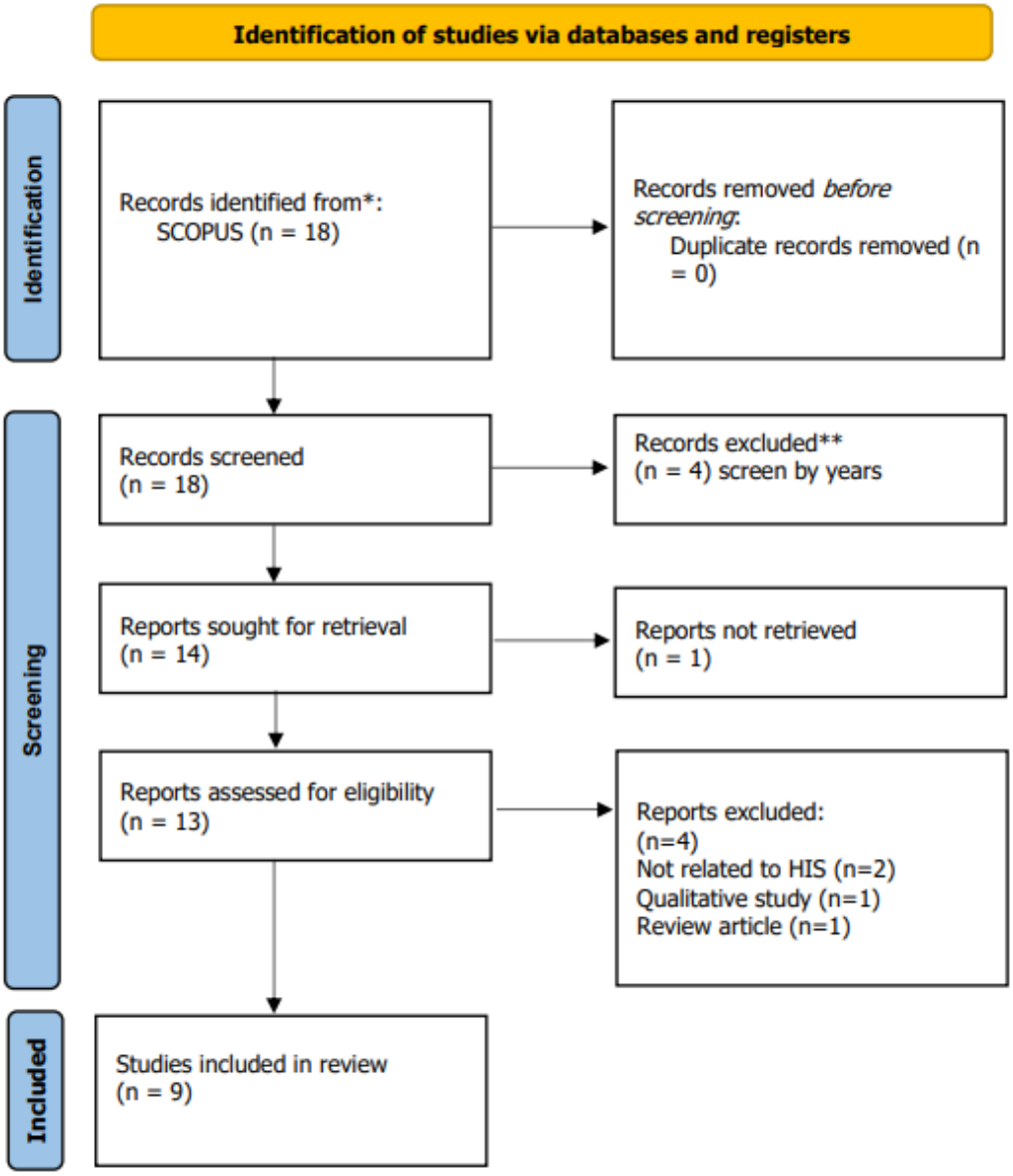

Figure 1: PRISMA flow diagram

Data Extraction and Analysis

The relevant findings were retrieved from the publication included in the study and assessed according to the following research questions:

1. What is the current practice of Health Information Systems in both public and private hospitals in Malaysia based on available works of literature?
2. What are the benefits of implementing a Health Information System in both public and private hospitals in Malaysia?
3. What are the major barriers or challenges in implementing HIS in both public and private hospitals in Malaysia?

The findings were tallied and organized under the following headings: context, practice or applications, benefits and lastly, barriers in the implementation of the Health Information System. Table 1 in the result section contains the research findings from the works of literature retrieved.

RESULTS

In total, we identified nine literature sources for inclusion in this scoping review. Overall, our findings indicate a languid pace of research on this topic in Malaysia. The majority of the publications published are from public hospitals. There are few articles describing HIS at private hospitals, and the only one discovered in the review is qualitative research. Recent studies focus on the benefits of adopting and integrating a Health Information System (HIS) in the practice environment and barriers to implementing and effectively using various technological systems. Only one source focus on factors determining the effective use of Electronic Health Records (EHR). A summary of articles related to the current use of HIS is presented in Table 1.

Table 1: Summary of Benefits and Barriers of Health Information System

Author	Context	Practice/ Application	Benefits	Barriers
(Salleh et al., 2021)	Government hospital	Electronic Health Records	• The paper described on factors determining the effective use of EHR among users in government hospitals. The EHR performance is influenced most by its system quality.	**NA**
(Osman et al., 2021)	Government hospital	Bluetooth Low Energy (BLE) based Real-time Location System implementation in the Emergency and Trauma department with HIS integration	• The mean ATC (waiting) time has significantly dropped from 46.67 minutes to 37 minutes when RTLS us introduced in the ETD workflow	**NA**

Author	Context	Practice/ Application	Benefits	Barriers
(Abd Razak et al., 2020)	Government Hospital	Basic Hospital Information System (BHIS), Intermediate Hospital Information System (IHIS), Total Hospital Information System	**NA**	• The four major challenges in the HIS implementation are support, human, technology and infrastructure, and software limitation. • HIS integration is still one of the key issues for HIS's success. • To ensure the successful integration of the system, organizations need the necessary financial and technological resources.
Lokhman M.T., Abdul Rasam A.R., Mohd Noor A.M. (2012)	Government hospital	Developing a GIS-based information analysis and system that allows patients to obtain information about necessary treatment in a hospital based on specialist services given	• Mapping helps patients to find the nearest hospital more easier • It could analyze the shortest distance to the hospital from the patients' location	**NA**

Author	Context	Practice/ Application	Benefits	Barriers
(Che Pa & Jasin, 2018)	Government hospital	proposes a guideline in ensuring a success implementation of IS in Malaysian government hospitals	• manage hospital's medical information related to patient care • manage administrative and financial information	**Human factors** • Resistance to change • Priority • Preference • Impression **Software limitations** • System's complexity • Wrong workflow • System Integration • Redundancy • Efficiency **Technology** • Compatibility • Availability • Network stability support • Technical • Peer influence • Enforcement • Monitoring

Author	Context	Practice/ Application	Benefits	Barriers
(Ahmadi et al., 2017)	Government hospital	proposed the initial theoretical framework based on the combined Technology Organization Environment (TOE), institutional theory, and Human Organization Technology (HOT) fit model.	• access patient's treatment records efficiently • better service to patients. • Improves work efficiency • successful integration of systems will allow data sharing across department/hospitals	• relative advantage • compatibility • security concern • hospital size • mimetic pressure-competitors • vendor support • perceived technical competence of IS staff • employees' IS knowledge
(Ahmadi et al., 2015)	Government hospital	Integrates the established Technology-Organization-Environment (TOE) framework with the recently developed Human-Organization-Technology (HOT) fit model to uncover factors influencing the hospital's choice to implement a HIS	• better service • top management support • work efficiency improves	• relative advantage • compatibility • complexity • centralization & formalization • IS infrastructure • Top management support • Business competition • Vendor support • Government policy

Author	Context	Practice/ Application	Benefits	Barriers
(Humaidi et al., 2014)	Government hospital	Based on the expanded Health Belief Model, investigate the information security awareness elements influencing user compliance behavior toward Health Information System (HIS) security policies.	**NA**	• susceptible to threat. • Lack of knowledge on information security threat • employees not aware of information security policies implemented by organization
Abdullah Z.S. (2012)	Government hospital	to assist in minimizing problems and/or potential concerns encountered by hospital information system (IS) implementers	**NA**	• Lack of support from top management & project management can affect IS implementation success • Lack of openness among employees could restrict system enhancement • Qualitative and single-site studies dominate many prior researches on implementation studies.

Table 2: Type of HIS implemented in Public Hospitals in Malaysia and its component.

Type of HIS	Name of Hospitals	Component of HIS used	Number of beds
THIS (large size)	Hospital Sultan Haji Ahmad Shah, Hospital Pandan Hospital Putrajaya, Hospital Selayang, Hospital Sedang, , Hospital Sg. Buloh, Hospital Sungai Petani, Hospital Ampang, Hospital Sultanah Zahirah, Hospital Alor Setar, and Hospital Bintulu	PMS, CAIS, LIS, PIS, RIS, PACS, AIS, FIS, SIS, PIS	> 400 beds
IHIS (medium size)	Hospital Lahad Datu and Hospital Keningau	PMS, CIAIS, LIS, PIS	> 200 beds
BHIS (small size)	Hospital Tunku Ja'afar , Hospital Kuala Penyu, Hospital Kuala Batas, Hospital Pitas, Hospital Kunak, and Hospital Setiu, Hospital Port Dickson	PMS and CAIS	< 200 beds

PMS: Patient Management System, CAIS: Clinical Access Information System, LIS: Laboratory Information System, PIS: Pharmacy Information System, RIS: Radiology Information System, PACS: Picture Archiving and Communication System, AIS: Administration Information System, FIS: Financial Information System, SIS: System Inventory System, PIS: Personal Information System

Source: Abd Razak et al., 2020

Table 3: Categories of Barrier of Health Information System

References	Categories	Factors
(Che Pa & Jasin, 2018) **(Ahmadi et al., 2015)**	Financial barrier	• Limited financial resources • High operation and maintenance cost
(Ahmadi et al., 2017) **(Ahmadi et al., 2015)** **(Abdullah, 2012)**	Organization	• Hospital size • Mimetic pressure from competitor • Centralization & formalization • Business competition • Government policy • Minimal evidence base • Top management support
(Che Pa & Jasin, 2018) **(Ahmadi et al., 2015)** **(Humaidi et al., 2014)** **(Abd Razak et al., 2020)**	Behavioural	• Low acceptance level – hesitancy to change • Lack of user skill • Priority • Preference • Impression • Knowledge • Lack of awareness of security policies
(Che Pa & Jasin, 2018)	Technology	• Interoperability of implemented system • Failure in data adjustment • Wrong work flow

(Ahmadi et al., 2017) **(Humaidi et al., 2014)** **(Abd Razak et al., 2020)**		• Complex system • Redundancy • Efficiency • System integration • Data security
(Che Pa & Jasin, 2018) **(Ahmadi et al., 2017)** **(Ahmadi et al., 2015)** **(Abdullah, 2012)** **(Abd Razak et al., 2020)**	Support	• Lack of facilities (computer, laptop) for user • Enforcement • Monitoring • Peer influence • Vendor support

DISCUSSION

The subheadings below are used to describe in great detail the implementation of Health Information Systems in Malaysian public and private hospitals. However, due to the scarcity of published reports and articles from private hospitals, the focus of the discussion will be on Health Information Systems in public hospitals.

The Current Practice of Health Information Systems in Malaysia

The Hospital Information System (HIS) is a coordinated electronic framework that collects, stores, restores and displays patient data and information. The data include patient history, clinical test results, treatments, billing, and other related information so that it can be used and analyzed for the benefit of patients and the government (Che Pa & Jasin, 2018; Hertin & Al-Sanjary, 2018; Osman et al., 2021).

According to the articles gathered for this review, Health Information Systems (HIS) have been implemented in Malaysian healthcare organizations for quite some time. The Malaysian HIS initiative began in 1997 with the Telemedicine flagship, which aims to provide better healthcare services to society (Abd Razak et al., 2020). The need for HIS implementation in Malaysia was critical at the time because public hospitals served a larger number of patients, resulting in longer wait times for services. HIS was introduced as part of the Lifetime Health Plan (LHP) project, which focused on digitalizing the healthcare sector (Ahmadi et al., 2015).

Nonetheless, the implementation of HIS has not yet been fully implemented in all public hospitals for various reasons, which will be covered in the following section. There are 139 hospitals with 18 referral and tertiary hospitals in Malaysia at the moment. The HIS in Malaysia currently being implemented in Malaysia is according to hospital size, which is categorized into the number of beds available, specialties and budgets. Basic Hospital Information System (BHIS) is for small size hospitals, Intermediate Hospital Information System (IHIS) is for medium size hospitals, and lastly, Total Hospital Information System (THIS) is designed for larger hospitals size (Abd Razak et al., 2020). For the record, Hospital Selayang was the first paperless hospital that ran THIS in Malaysia in 1997, followed by Hospital Putrajaya in 2000 (Salleh et al., 2021). Hospital Selayang has implemented Electronic Medical Records (EMR), which aims to improve the provision of health services by focusing on patients' management and information system at the organizational level. The following Table 2 shows examples of public hospitals in Malaysia implementing HIS and its component.

Various components of HIS were designed and developed to improve the overall service provided in hospitals in Malaysia ever since the HIS was first introduced. Some components of HIS include Patient Management System (PMS), Clinical Access Information System (CAIS), Laboratory Information System (LIS), Pharmacy Information System (PIS), Radiology Information System (RIS), Picture Archiving and Communication System (PACS), Administration Information System (AIS), Financial Information System (FIS), System Inventory System (SIS), Personal Information System (PIS) and many more.

In addition to the components of the HIS implemented in Malaysian hospitals, this review identified additional applications that enhance the efficacy of HIS. For instance, a GIS-based information system enables patients to access pertinent data regarding hospital services and treatments (Lokhman et al., 2012). Preliminary studies on the use of Bluetooth Low Energy (BLE) based on a Real-time Location System (RTLS) with the integration of HIS in the emergency department have shown a significant reduction in patient waiting time (Osman et al., 2021).

According to the study, only 15.2% of Malaysian hospitals are system-based, and less than 10% of 139 public hospitals are classified as HIS (Abd Razak et al., 2020; Ahmadi et al., 2017; Hertin & Al-Sanjary, 2018). According to a separate study, only 18 public hospitals in Malaysia currently use HIS (Wai et al., 2022). Consequently, this demonstrates the slow implementation and acceptance of HIS in Malaysian hospitals. In Malaysian hospitals, the reformation of HIS is influenced by a number of factors, including human, technological, infrastructure, software, and support issues (Wai et al., 2022). These concerns will be discussed in detail in the subsequent section.

The Benefits of Health Information Systems Implementation in Malaysia

The benefits of HIS can be viewed in three aspects: organization, staff and patients. In an organization, the main advantages of HIS are keeping up the privacy of patients' information, enhancing healthcare value and boosting productivity, including managing administrative and financial information and the hospital's medical information related to patient care. The study's findings that HIS significantly improves the value of healthcare and increases efficiency are consistent with previous research (Buntin et al., 2011; Chaudhry et al., 2006; E. Youssef, 2014; Fernández-Alemán et al., 2013; Nguyen et al., 2014). Therefore, information systems' efficient and effective use can help organizations improve their people management efforts. Concurrently, investing in organization-related information systems would enhance the quality of decision-making and increase organizational competitiveness.

Meanwhile, in staff, the results reveal that HIS reduces duplicating work, decreases the end user time in archiving patients and administrative information, and improves staff communication. HIS frequently come with features that let medical professionals secure access to patient data and manage electronic health records (EHRs) and picture archiving and communication systems (PACSs) locally and remotely via mobile devices (Mosa et al., 2012). One study found that patient care via mobile devices improved communication between doctors and nurses in inpatient wards (Ozdalga et al., 2012). More than 80% of respondents in the medical school healthcare providers and students poll said they used mobile devices to interact with colleagues regarding patient care via e-mail, phone, and text messages (Wallace et al., 2012). Texting was described as a more efficient mode of communication than phone calls or in-person meetings. Doctors can also access patients' treatment records efficiently, giving better service to patients and improving work efficiency. Similarly seen in international studies which support the generic benefits of HIS, including quick access to information and information control (Altarawneh & Al-Shqairat, 2010; Delorme & Arcand, 2010; Lina, 2019). Successful

integration of systems also will allow data sharing across departments or hospitals, which is supported by (Ahmadi et al., 2017).

The main benefits of HIS to patients are reducing waiting time, treating patients more proficiently, refining their presence and making procedures shorter. HIS could also enhance patient safety and quality of care in other countries (Carayon, 2010; Chaudhry et al., 2006; Karsh, 2004; Kaye et al., 2015). Meanwhile, a study in Johor utilized the Geographical Information System (GIS) data to improve HIS usage. It helps patients by identifying the fastest route to the hospital from their location and assisting patients in obtaining information about essential treatment in a hospital based on specialist services provided (Lokhman et al., 2012).

Above all, HIS performance is influenced most by its system quality. As highlighted in one study by (Salleh et al., 2021) on factors determining the effective use of EHR among users in government hospitals, knowledge quality improved user performance. The systems used to access patient information, results, and reports can also generate and disseminate new medical knowledge for effective problem resolution and decision-making by varied care providers. In addition, system compatibility was also the most substantial system quality component. The systems' structure and content that suit the providers' working styles will reduce workload by minimizing data input and documentation and eventually increase task productivity. A cross-sectional survey conducted in southern Taiwan hospitals indicated that ease of use and HIS efficiency positively influenced job satisfaction and care professionals' work performance (Chang et al., 2012). Similarly, an online survey of 219 California residents revealed that system quality, information quality, and service quality metrics positively influenced physicians' work (Tsai et al., 2020).

The Barriers in the Implementation of Health Information Systems in Malaysia

Despite the great concern and apparent interest in adopting and implementing health information systems, significant hindrances were identified from the review of the included papers. In Malaysia, seven articles describe the barrier to implementing health information systems successfully in local settings. The main obstacle can be categorized into the financial, organizational, behavioral, technology, and support, as described in Table 3. Generally, in the financial barrier, the main factor involved is the high cost of implementation of HIS throughout the country as only limited number of hospitals are implementing HIS. In addition, the failures approach as the system needed a high operation and maintenance cost as some software needs regular updates and servicing (Che Pa & Jasin, 2018). A study was done in Saudi Arabian hospitals that discussed a similar issue, claiming that other than lack of funding and expensive implementation and maintenance costs, minimal focus was given to such cost-benefit studies to be done in understanding the benefits of the HIS systems (Khalifa, 2013).

The organization plays a crucial role in implementing and transforming the health information system in the health system. The organization's barriers are focused on how the organization plays a role in supporting the usage or continuation of the system in the applied environment. The top management in the organization may develop an idea of unimportance to use the HIS because of the small hospital size or increased pressure to apply the system despite

lacking adaptability due to competitors causing inadequacy and incapability of the system in both situations (Ahmadi et al., 2015). Also, limited policies to support the implementation and integration of HIS with centralization of the decision-making hinder the conducive environmental practice of related systems (Abdullah, 2012) (Ahmadi et al., 2017). Similar findings were found in another study from the hospital setting in Iran and scoping review from European countries where a lack of organizational commitment impacts the success of HIS implementation (Keshvari et al., 2018) (Stamatian et al., 2013).

On the other hand, the human factor plays an essential role in the success of HIS implementation in a hospital system. A computerized information system requires skilled personnel for its effective operation, while a deficiency of skilled workforce can become a significant issue (Che Pa & Jasin, 2018). Inadequate training and short courses to enhance the knowledge of the program and basic computer science creates a domino effect from the ignorance of the healthcare worker, leading to hesitancy to change and different priorities and preferences in using the system. Despite recognizing the value of learning information systems, a lack of knowledge of the system initiates poor awareness of data security and application, causing lack of productivity in healthcare services. With this, the worker may have a negative perception in accepting the system and demotivate themselves and their ability to use the system (Ahmadi et al., 2017; Humaidi et al., 2014). In the meantime, from the physician's perspective, they found that inadequate awareness of the healthcare provider about the benefits of HIS creates a significant gap in success (Malekzadeh et al., 2018).

Failure of the vendor or commercial provider to supply the hospital with a properly usable system is another technological barrier (Abd Razak et al., 2020). The lack of interoperability of implemented system and failure in data adjustment significantly impact the negligence of HIS implementation. Instead of supporting the daily working system, functionality with no specified or inapplicable workflow to the respective teams with wrong workflow and complex system for the user holds the plan's efficiency (Humaidi et al., 2014). Other than that, the deficiency of the integrated system, for example, in sharing patient data between treating departments, causes redundancy and ineffectiveness, which may affect the data sharing for treatment and service to a patient. Understanding ownership of the system is also crucial as some departments who claim the system is theirs may not be willing and confident to share the data due to issues of confidentiality and security of the data (Ahmadi et al., 2017; Che Pa & Jasin, 2018). Nevertheless, inadequate planning for implementing and using HIS creates a similar issue (Malekzadeh et al., 2018).

Despite the implementation of HIS, poor enforcement and monitoring contributed to the failure of HIS performance. Comprehensive enforcement from multiple levels involving top management, middle manager, and immediate supervisors are needed to ensure the sustainability of the implemented system. Regular monitoring is also a principle task as it helps to identify any failure from the beginning, and prevention activities can be applied to ensure smoothness of the progress towards application (Che Pa & Jasin, 2018). The vendor with technical expertise is definite in guaranteeing the progress of implementation. The unavailability of a fast and knowledgeable team to help and support any critical issues that arise

and to solve in a short duration of time impacts the continuation of the process (Ahmadi et al., 2017). Moreover, the lack of facilities for the user and peer influence, with fewer coworkers using the system, caused an absence of motivation to involve and support the implementation (Che Pa & Jasin, 2018). For example, the partial rollout of THIS in Hospital Sultanah Aminah Johor faced delays due to insufficient IT staff training and outdated infrastructure (Hassan, 2012). Conversely, Hospital Selayang successfully implemented THIS due to strong top-down support and adequate investment in system integration (Salleh et al., 2021). While in some countries, another transparent barrier related to infrastructure support is poor internet availability, driving poor real-time access in the system, causing HIS to be impossible to be carried out (Anwar & Shamim, 2011).

Recommendation

Throughout time, strengthening health information systems has become a need and necessary implementation to fulfil universal health care. Improving system quality is one of the critical features in determining the success of HIS implementation. For instance, knowledge quality had the greatest positive effect on effectiveness and the most significant positive impact on performance. Housemen can benefit from past patient care for similar problems supplied by doctors with more experience. Through collaboration with experienced doctors, specialists may also be able to improve their medical practices. Different specialists with different specialities will record each clinical procedure in EHRs, which will be shared and improved by other responsible doctors. Besides that, system compatibility is another critical aspect that needs to be focused on during system adoption.

The system should suit care providers' clinical tasks to reduce their workloads from minimal data entry and documentation work, increasing task productivity. Another essential aspect of HIS reformation in Malaysian public hospitals is strong and committed leadership and governance. We have witnessed shifting leadership inside Malaysia's Ministry of Health, and the priority has shifted each time. If the government is dedicated to and prioritizes the adoption of HIS in public hospitals, more funding will undoubtedly be allocated to improve HIS in Malaysia, including workforce and infrastructure. Top management commitment and technology support are crucial in enforcing and integrating HIS in daily practice in the healthcare system. More focus and support should be given to enhancing the highlighted barrier from the review as a permanent solution to the HIS implementation issue in Malaysia.

Compared to countries like Singapore and Thailand, where national HIS strategies have seen higher adoption rates through centralized policy and infrastructure investment, Malaysia's adoption has been slower and more fragmented. Singapore's National Electronic Health Record (NEHR) and Thailand's Health Data Center demonstrate stronger interoperability and centralized governance models, which Malaysia could emulate. This review underscores the need to align HIS implementation with Malaysia's National Digital Health Blueprint 2021–2025, which emphasizes integrated, patient-centric digital health ecosystems. Future initiatives should also align with the Twelfth Malaysia Plan, particularly strategies under Pillar 2: Strengthening Healthcare Systems.

As for the limitation of this study, we conclude that less interest was given in publishing for this topic, causing a minimal number of papers to be included. This review was limited by the small number of eligible studies (n=9) found through SCOPUS. Attempts to expand the database search were constrained by limited open-access availability. Thus, findings should be interpreted with caution due to potential selection bias.

CONCLUSION

Based on this review, despite the earlier introduction of HIS in Malaysian hospitals, the use of HIS in public hospitals remains low and is progressing slowly. However, this review supports the HIS potential to improve patient care and clinical documentation, such as improved documentation quality, higher administration efficiency, and improved quality, safety, and care coordination. On the contrary, five main barriers – financial, organization, behavioural, technology & support; caused the failure to implement HIS successfully in Malaysia.

REFERENCES

Abd Razak, N., Ithnin, N., & Zamri Osman, M. (2020). Investigating the Barriers of Health Information System implementation in Malaysian Public Hospitals. IOP Conference Series: Materials Science and Engineering, 769(1). https://doi.org/10.1088/1757-899X/769/1/012054

Abdollah Salleh. (2021). Information Systems in Health Care | HEALTHCARE SERVICE DELIVERY. https://drdollah.com/hospital-information-system-his/

Abdullah, Z. S. (2012). Hospital information systems implementation: Testing a structural model. Proceedings - ICIDT 2012, 8th International Conference on Information Science and Digital Content Technology, 1, 74–81.

Ahmadi, H., Nilashi, M., & Ibrahim, O. (2015). Organizational decision to adopt hospital information system: An empirical investigation in the case of Malaysian public hospitals. International Journal of Medical Informatics, 84(3), 166–188. https://doi.org/10.1016/j.ijmedinf.2014.12.004

Ahmadi, H., Nilashi, M., Shahmoradi, L., & Ibrahim, O. (2017). Hospital Information System adoption: Expert perspectives on an adoption framework for Malaysian public hospitals. Computers in Human Behavior, 67, 161–189. https://doi.org/10.1016/j.chb.2016.10.023

Altarawneh, I., & Al-Shqairat, Z. (2010). Human Resource Information Systems in Jordanian Universities. International Journal of Business and Management, 5(10), 113–127. https://doi.org/10.5539/ijbm.v5n10p113

Anwar, F., & Shamim, A. (2011). Barriers in Adoption of Health Information Technology in Developing Societies. IJACSA) International Journal of Advanced Computer Science and Applications, 2(8).

Buntin, M. B., Burke, M. F., Hoaglin, M. C., & Blumenthal, D. (2011). The benefits of health information technology: A review of the recent literature shows predominantly positive results. Health Affairs, 30(3), 464–471. https://doi.org/10.1377/hlthaff.2011.0178

Carayon, P. (2010). Human factors in patient safety as an innovation. Applied Ergonomics, 41(5), 657–665. https://doi.org/10.1016/j.apergo.2009.12.011

Chang, I. C., Li, Y. C., Wu, T. Y., & Yen, D. C. (2012). Electronic medical record quality and its impact on user satisfaction - Healthcare providers' point of view. Government Information Quarterly, 29(2), 235–242. https://doi.org/10.1016/j.giq.2011.07.006

Chaudhry, B., Wang, J., Wu, S., Maglione, M., Mojica, W., Roth, E., Morton, S. C., & Shekelle, P. G. (2006). Systematic Review: Impact of Health Information Technology on Quality, Efficiency, and Costs of Medical Care.

Che Pa, N., & Jasin, N. M. (2018). A prevention model for the failure of hospital information systems in Malaysian government hospitals. Journal of Telecommunication, Electronic and Computer Engineering, 10(1–10), 67–73.

Delorme, M., & Arcand, M. (2010). HRIS implementation and deployment: A conceptual framework of the new roles, responsibilities and competences for HR professionals. International Journal of Business Information Systems, 5(2), 148–161. https://doi.org/10.1504/IJBIS.2010.030626

E. Youssef, A. (2014). A Framework for Secure Healthcare Systems Based on Big Data Analytics in Mobile Cloud Computing Environments. The International Journal of Ambient Systems and Applications, 2(2), 1–11. https://doi.org/10.5121/ijasa.2014.2201

Fernández-Alemán, J. L., Señor, I. C., Lozoya, P. ángel O., & Toval, A. (2013). Security and privacy in electronic health records: A systematic literature review. Journal of Biomedical Informatics, 46(3), 541–562. https://doi.org/10.1016/j.jbi.2012.12.003

Gregersen, E. (2022). 5 Components of Information Systems | Britannica. Britannica. https://www.britannica.com/list/5-components-of-information-systems

Hassan, R. (2012). Implementation of Total Hospital Information System (THIS) In Malaysian Public Hospitals: Challenges and Future Prospects. International Journal of Business and Social Research (IJBSR), 2(2), 33–41. https://doi.org/10.18533/ijbsr.v2i2.189

Hertin, R. D., & Al-Sanjary, O. I. (2018). Performance of hospital information system in Malaysian public hospital: A review. International Journal of Engineering and Technology (UAE), 7(4), 24–28. https://doi.org/10.14419/ijet.v7i4.11.20682

Hospital Selayang. (2022). Total Hospital Information System (THIS). https://hselayang.moh.gov.my/en/about-hospital/what-is-this

Humaidi, N., Balakrishnan, V., & Shahrom, M. (2014). Exploring user's compliance behavior towards Health Information System security policies based on extended Health Belief Model. IC3e 2014 - 2014 IEEE Conference on e-Learning, e-Management and e-Services, 30–35. https://doi.org/10.1109/IC3e.2014.7081237

Ismail, N. I., & Abdullah, N. H. (2012). AN OVERVIEW OF HOSPITAL INFORMATION SYSTEM (HIS) IMPLEMENTATION IN MALAYSIA. English, March, 1200–1208.

Ismail, N. I., Abdullah, N. H., & Shamsuddin, A. (2015). Adoption of Hospital Information System (HIS) in Malaysian Public Hospitals. Procedia - Social and Behavioral Sciences, 172, 336–343. https://doi.org/10.1016/j.sbspro.2015.01.373

Karsh, B. T. (2004). Beyond usability: Designing effective technology implementation systems to promote patient safety. Quality and Safety in Health Care, 13(5), 388–394. https://doi.org/10.1136/qshc.2004.010322

Kaye, J., Whitley, E. A., Lund, D., Morrison, M., Teare, H., & Melham, K. (2015). Dynamic consent: A patient interface for twenty-first century research networks. European Journal of Human Genetics, 23(2), 141–146. https://doi.org/10.1038/ejhg.2014.71

Keshvari, M., Yusefi, A. R., Homauni, A., Omidifar, R., & Nobakht, S. (2018). Barriers for the Using of Information Systems in Hospitals: A Qualitative Study. Shiraz E-Medical Journal 2018 19:8, 19(8), 66180. https://doi.org/10.5812/SEMJ.66180

Khalifa, M. (2013). Barriers to Health Information Systems and Electronic Medical Records Implementation. A Field Study of Saudi Arabian Hospitals. Procedia Computer Science, 21, 335–342. https://doi.org/10.1016/J.PROCS.2013.09.044

Lina, M. A. (2019). Human Resource Information System (HRIS): An Important Element of Modern Organization. Global Disclosure of Economics and Business, 8(2), 61–66. https://doi.org/10.18034/gdeb.v8i2.98

Lokhman, M. T., Abdul Rasam, A. R., & Mohd Noor, A. M. (2012). Reforming health care facility using geographical information system. Proceedings - 2012 IEEE Control and System Graduate Research Colloquium, ICSGRC 2012, lCSGRC, 267–270. https://doi.org/10.1109/ICSGRC.2012.6287174

Lovis, C., & Debande, B. (2015). Hospital Information System.

Malekzadeh, S., Hashemi, N., Sheikhtaheri, A., & Hashemi, N. S. (2018). Barriers for Implementation and Use of Health Information Systems from the Physicians' Perspectives. Studies in Health Technology and Informatics, 251, 269–272. https://doi.org/10.3233/978-1-61499-880-8-269

Mehdipour, Y., & Zerehkafi, H. (2013). Hospital Information System (HIS): At a Glance. Asian Journal of Computer and Information Systems, 1(2), 2321–5658. https://www.ajouronline.com/index.php/AJCIS/article/view/334

Ministry of Health Malaysia. (2009). Annual Report 2009. file:///C:/Users/dell/AppData/Local/Mendeley Ltd./Mendeley Desktop/Downloaded/Unknown - Unknown - Issn 1511-1512.pdf

Mosa, M., Yoo, I., & Sheets, L. (2012). A systematic review of healthcare applications for smartphones. BMC Med.Inf. Decision Making. BMC Medical Informatics and Decision Making, 12(67), 1–31. http://www.biomedcentral.com/1472-6947/12/67

Nguyen, L., Bellucci, E., & Nguyen, L. T. (2014). Electronic health records implementation: An evaluation of information system impact and contingency factors. International Journal of Medical Informatics, 83(11), 779–796. https://doi.org/10.1016/j.ijmedinf.2014.06.011

Ohio University. (2020). Health Information Systems: Importance & Examples. https://onlinemasters.ohio.edu/blog/health-information-systems/

Osman, M. S., Azizan, A., Hassan, K. N., Ghani, H. A., Hassan, N. H., Yakub, F., Daud, S. M., & Latiff, L. A. (2021). BLE-based Real-time Location System Integration with Hospital Information System to Reduce Patient Waiting Time. 3rd International Conference on Electrical, Communication and Computer Engineering, ICECCE 2021, June, 12–13. https://doi.org/10.1109/ICECCE52056.2021.9514248

Ozdalga, E., Ozdalga, A., & Ahuja, N. (2012). The smartphone in medicine: A review of current and potential use among physicians and students. Journal of Medical Internet Research, 14(5), 1–14. https://doi.org/10.2196/jmir.1994

Salleh, M. I. M., Abdullah, R., & Zakaria, N. (2021). Evaluating the effects of electronic health records system adoption on the performance of Malaysian health care providers. BMC Medical Informatics and Decision Making, 21(1), 1–13. https://doi.org/10.1186/s12911-021-01447-4

Stamatian, F., Baba, C. O., & Timofe, M. P. (2013). Barriers in the implementation of health information systems: a scoping review. Transylvanian Review of Administrative Sciences, S156–S156.

Tsai, C. H., Eghdam, A., Davoody, N., Wright, G., Flowerday, S., & Koch, S. (2020). Effects of electronic health record implementation and barriers to adoption and use: A scoping review and qualitative analysis of the content. Life, 10(12), 1–27. https://doi.org/10.3390/life10120327

Wai, S. Y., Waishiang, C., Khairuddin, M. A. Bin, & Jaini, A. (2022). Sustainability Analysis of Bintulu Hospital Information System Through e3value and i* Modeling. International Journal on Informatics Visualization, 6(2), 390–396. https://doi.org/10.30630/joiv.6.2.993

Wallace, S., Clark, M., & White, J. (2012). "It's on my iPhone": Attitudes to the use of mobile computing devices in medical education, a mixed-methods study. BMJ Open, 2(4), 1–7. https://doi.org/10.1136/bmjopen-2012-001099