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Impact of Using Health Information Systems (HIS) among Healthcare Professionals during Pandemic COVID-19

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Abstract

The emergence of updated and accurate big health data through information systems becomes crucial for fast decision and strategizing planning in fighting the pandemic war. A qualitative survey was conducted among healthcare professionals using the Hospital Information System during the pandemic to explore the insight of HIS experience among users and identify scope and categories available for further detailed study. Specifically, this study explores the current practice of HIS, observing the policies and guidelines and to identify the challenges and its limitations. Six areas have been identified; system implementation, policy and guidelines, challenges, system advantages and disadvantages, and system characteristics.

Keywords: Hospital Information System (HIS), Healthcare Professionals, Covid 19, Big Data

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1.0 Introduction

The rapid development of information technology (IT) has dramatically impacted the global economy and lifestyle. The healthcare sector is expanding so quickly that it needs to incorporate new, cutting-edge technologies to enhance outcomes and lower costs (Nik Azliza et al., 2021). Most manual works have undergone an automated transformation, more simplified and moving faster with the introduction of information systems (IS) in every industry. This includes healthcare sectors with numerous technologies being developed, from artificial intelligence devices to information systems used in daily operations. As such, the hospital Information System (HIS) is one of the most popular technologies discussed within the healthcare system, especially in developing countries. This is due to the advantages HIS can contribute to improving quality healthcare delivery services. Effective use of HIS, according to M. Izwan, Rosni, and Nasriah (2020), became the catalyst for a favorable impact on system quality, records quality, service quality, and knowledge quality in promoting clinician performance.

Malaysia is among other developing countries that also take the challenge of transforming its healthcare sectors into technology-oriented. It started the HIS implementation in Ministry of Health (MOH) hospitals in 1998. However, despite the advantages of HIS being well-known worldwide, the adoption of HIS in MOH public hospitals is still low. This is very clear when as of April 2021, the total number of MOH hospitals using HIS is only 19 (13.0%) from the total of 146 MOH hospitals. Other 19 hospitals are using *Sistem Pengurusan Pesakit (SPP)* and *Sistem Pendaftaran Pesakit Dalam (SPPD)* while another 108 hospitals are using a fully manual system (MOH, 2021). This shows the adoption of HIS among MOH public hospitals is still low.

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The emergence of COVID-19 in March 2020 opened the eyes of many parties, especially in the health sector, regarding the importance and urgency of using information systems in managing thousands of health data and records, including the implementation of HIS in all hospitals. However, the implementation of HIS in all MOH hospitals seems very slow. This is mainly due to the government budget constraint. In addition, there is almost a lack of studies evaluating each type of HIS implemented in MOH hospitals. This is because the existing HIS in MOH hospitals is not operating in one standard system but consists of several types of HIS in several hospitals (MOH, 2021). Thus, there is a need to have such an evaluation study to identify existing system efficiency and also any input that can improve the existing system in achieving a better healthcare delivery system in Malaysia.

2.0 Literature Review

2.1 Information System

Information System (IS) is software and hardware systems that support data-intensive applications (Shasha & Vossen, 2011). Also known as an integrated set of components for collecting, storing, processing, and communicating information. Its main components are computer hardware and software, databases, telecommunications systems, human resources, and procedures (Brittanica, 2010). During a pandemic, more than in any other public health situation, information systems (IS) play a critical role in managing data and other information at the speed the situation requires. IS provides essential evidence for taking action, making the most informed decisions, and adjusting policies to allow for better intelligence on actions to improve health (IRIS, PAHO, 2021). IS also provides immediate, expeditious, and coordinated data access and sharing, and they facilitate the prioritization of care, access, and response, especially for people in conditions of vulnerability. With appropriately disaggregated health data, it is possible to plan actions that reduce potential health inequities at all levels of care and facilitate the implementation of strategies to address such inequities (IRIS, PAHO, 2021).

2.2 Hospital Information System

HIS is a massive, integrated system that supports the comprehensive information requirements of hospitals, including patient, clinical, ancillary, and financial management (Acharyulu, 2012). While according to Biomedical Ltd. (2006), Hospital Information System (HIS) refers to a computer system designed to manage all the hospital's medical and administrative information. Meanwhile, another definition defines a Hospital Information System (HIS) as a system focusing on the integration of clinical applications collectively with financial and administrative applications to enhance service efficiency (Hyung et al., 2004).

According to Biomedical Informatic Ltd, (2006), HIS consists of two or more of these components, such as a Clinical Information System (CIS), Financial Information System (FIS), Laboratory Information System (LIS), Nursing Information Systems (NIS), Pharmacy Information System (PIS), Picture Archiving Communication System (PACS) and Radiology Information System (RIS).

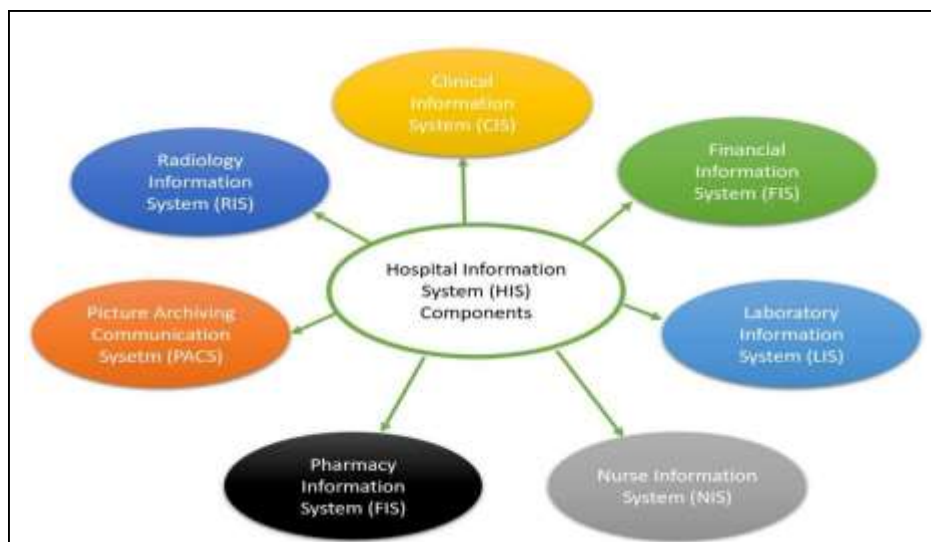


Figure 1: Components in Hospital Information System (HIS) (Biomedical Informatics Ltd., 2006)

In medical informatics, hospital information systems aim to achieve the best possible support for patient care and administration through electronic data processing. (Aniza, et al. 2010). In the present world, hospital information systems (HIS) are a vital point of patient care. HIS provides the best information to the right people and in the right place (Schreiweis & Heilbronn, 2010).

The world has a shortage of technical support in medical care. However, hospital information systems (HIS) are the solution to patient care and help make proper decisions (Andre & Vimla, 2004). The computer has become essential to the health care system, driven partly by the stimulated growth of digital applications and communication technologies over the last two decades. That is why the HIS system is the new health care system development.

2.3 COVID-19 virus

The novel coronavirus disease 2019 (COVID-19), which causes severe respiratory disease in high-risk groups, was first identified in Wuhan in China and has subsequently progressed to a global pandemic causing over 100 million infections and almost 2.3 million deaths as of February 2021 (Malden et al., 2021). Despite

unprecedented measures to control the spread of the virus, prevalence remains high, and health services have been under considerable strain as a result (Malden et al., 2021).

The coronavirus disease 19 (COVID-19) is a highly transmittable and pathogenic viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which caused a global pandemic that led to a dramatic loss of human life worldwide (Zhu et al., 2020).

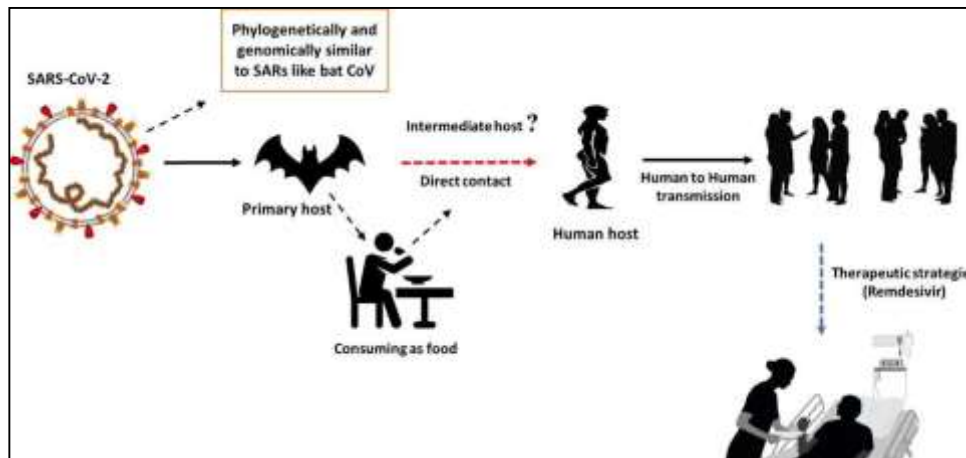


Figure 2: How the COVID-19 virus transmitted

The operational response to the COVID-19 pandemic required rapid adaptation and leveraging of the capabilities of the existing HIS to collect, transmit and analyze health data in real time. This allows users and top management to understand the epidemiological situation and craft appropriate control measure (Negro-Calduch et al. 2021).

The origin of the COVID-19 outbreak in Malaysia can be traced back to the first case arriving on Malaysian shores on January 25, 2020, when a passenger from China (en route via Singapore) tested positive for the virus (41). Since then, a new historical chapter has unfolded, shaking the pillars of the national public health system and ultimately testing the nation's perseverance as a whole (Jamal et al., 2021).

The MOH then spearheads the national outbreak management of this global pandemic as declared by WHO. MOH has come up with a comprehensive preparedness plan. This plan encompassed several key components including enhanced screening and inter-agency collaborations at entry points (airports, seaports, etc.); bolster sampling at health clinics and hospitals; designation of hospitals and laboratories nationwide as "treating" and "sampling" centers, respectively, empowering the public health surveillance system through active case detection and robust contact tracing; and the adequate stockpiling of personal protective equipment (PPE) and medications needed. (Jamal et al., 2021).

Despite serious damage to the economy and population health, COVID-19 has stimulated innovative ideas and the use of modern information technologies in many countries (Liu, 2021). HIS capabilities in many countries were overwhelmed by information demands and the challenges encountered due to the unprecedented nature of the pandemic in severity and scale. Initial challenges ranged from new demands on key contributors at each health system level, who were already overburdened by the pandemic, to the urgency in determining how to effectively document seamless, continuous COVID-19 processes in electronic health record (EHR) embedded databases (Negro-Calduch et al., 2021).

2.4 Healthcare Professionals

According to WHO, a health professional can be described as a person who is purposely trained to work in a health or health-related field. In addition, these health professionals play a central and critical role in improving access and quality health care for the population. Among the roles to be performed by healthcare professionals such as providing essential services that promote health in the community, prevent diseases and deliver health care services to individuals, families, and communities based on the primary health care approach (WHO, 2013).

As defined by the International Standard Classification of Occupations (ISCO) (ILO 2008; WHO 2010), the health professionals list includes Medical Doctors (both Generalist and Specialist Practitioners) Public Health Doctors, Nursing Professionals, including Public Health Nurses, Midwifery Professionals, Dentists and also Pharmacists.

Based on The World Health Report 2006: Working Together for Health highlighted a worldwide shortage of almost 4.3 million doctors, midwives, nurses, and support workers. As the COVID-19 outbreak keeps growing, many healthcare professionals have been mobilized to other existing and also new healthcare facilities such as PKRC to manage COVID-19 patients.

3.0 Research Methodology

This qualitative study used a semi-structured interview mechanism to collect data. Respondents selection of this study is using the purposively sampling technique, which can provide in-depth and detailed information regarding this study. A structured questionnaire was developed to enable systematic data input from interviewees. The interview questionnaire includes three main scopes: general knowledge of HIS, specific knowledge of HIS, and research objective-related questions. This includes the current practice of the medical officers, their view on the HIS policy and guidelines, the challenges and experiences using the implemented HIS in the hospital, and their view on each HIS characteristic. For current HIS practices, the questionnaires are based on the inpatient process in MOH hospitals (MOH, 2022) while for HIS user satisfaction, the extended end-user computing satisfaction (EUCS) of HIS by Aggelidis and Chatzoglou (2012) was referred

The interview session involved healthcare professionals, which involve two (2) respondents, medical officers who work in MOH hospital, working more than two (2) years (not a houseman-officer) and had experience using both HIS and manual system implemented at the hospital. Besides notes made throughout the interview, a video recorder was used to record the interview session to enable better and more accurate input during the transcribing process. Later the input from the video recording was then transcribed and analyzed using Atlas. ti. software. Six categories were developed after the analysis process; current practices, policy and guidelines, challenges, system advantages, system disadvantages and system characteristics.

All respondents were aware and agreed that every piece of information given throughout the interview will only be used for this study and sensitive personal details will not be disclosed to any other parties.

4.0 Results and Discussion

The data collection process for this study was done through interview sessions. The interview was completed with 25 questions for each respondent (medical officers), which can be divided into five (5) main sections based on the scope to be explored in the study. The section is respondent demographic data, general knowledge of HIS, specific knowledge of HIS, QTC usage, and objectives study-related questions. The interview session was done using video recording at the hospital. The sociodemographic for the respondents as per Table 1 below.

Table 1: Sociodemographic of the respondents

Categories	Count	%
Gender		
Male	1	50
Female	1	50
Age (years)		
30	1	50
33	1	50
Working Experience (years)		
4	1	50
5	1	50
Highest Education		
Bachelor Degrees (M.B.B.S)	2	100

*N=2

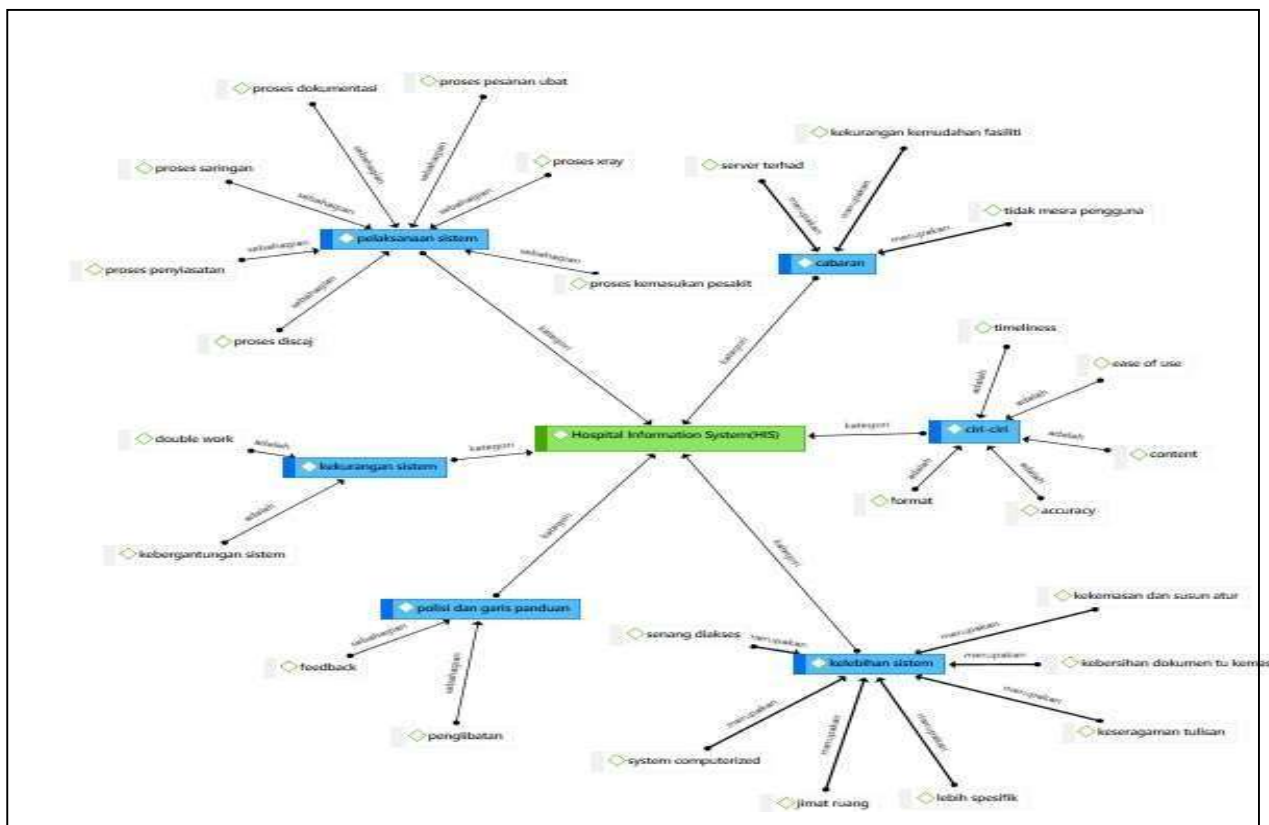


Figure 3: ATLAS.ti diagram of HIS implementation in the hospital

With the use of the ATLAS ti version 8.4.3 analysis program, the information from the interview session was processed. It isa computer program mostly, though not solely, utilized in qualitative research or the processing of qualitative data. This software is a qualitative research tool that may be used for data visualization, constructing literature reviews, coding, and analysis of field notes and transcripts.

According to Rambaree, (2007) and Friese, (2011), ATLAS.ti increase data rigor through variety of ways: by facilitating; data triangulation (primary with secondary data), coding reliability, reflexivity process, and improving credibility, conformability and dependability.

Based on the respondents' answer, six (6) main categories were developed after completing the video analysis using ATLAS.ti version 8.3. The categories are system implementation, policy and guidelines, challenges, advantages, disadvantages, and characteristics. The diagram of categories developed by Atlas.ti as Figure 3 while the summary of the six (6) categories developed from data analysis done is in Table 1 below.

Table 2: Categories and sub-categories generated from ATLAS.ti

Bil	Categories	Sub-categories
1	Current Practice	<ul style="list-style-type: none"> i. Triaging ii. Admission Clerking iii. Investigation (x-ray and lab order) iv. Medicament prescription v. Documentation vi. Discharge
2	Policy and Guidelines	<ul style="list-style-type: none"> i. Feedback ii. Involvement
3	Challenges	<ul style="list-style-type: none"> i. Server/internet limitation ii. Facility (hardware) shortage iii. Not user-friendly
4	System Advantages	<ul style="list-style-type: none"> i. Easy to access ii. Computerized system iii. Save space iv. More specific v. Standard writing vi. Documentation cleanliness vii. And tidiness and layout
5	System Disadvantages	<ul style="list-style-type: none"> i. System dependent ii. Double work
6	System Characteristic	<ul style="list-style-type: none"> i. Format ii. Accuracy iii. Content iv. Timeliness v. Ease of use

4.1 System Implementation

HIS usage enables the patient treatment process to be conducted faster and more accurately than the manual system (documentation on physical medical records). Processes such as triaging, admission clerking, radiology and lab investigation, medicament prescription, documentation, and discharge information are documented fully into the system, enabling other medical professionals to view and plan other treatment regimens concurrently for the patient as the information keeps on updated.

4.2 Policy and Guidelines

The awareness of policy and guidelines in HIS usage is very little among users. Thus, ensuring patient data safety is crucial to be delivered to the user. There is a need for user involvement during policy and guidelines developed to ensure parallel direction and mission among health systems and information technology. Feedback from users plays an important role in effective and efficient policies and guidelines that have been developed.

4.3 Challenges

As patient clinical documentation is entirely in the system, a stable internet connection is crucial in HIS implementation to ensure a continuous treatment process for the patient. Besides, the shortage of hardware in hospitals will weaken the treatment process due to high volume usage, especially in referral and specialist hospitals. Furthermore, although the latest technology and interface are built into the system to enhance its efficacy, senior users find the system not user-friendly. They need some time to understand and get used to the system.

4.4 System Advantages

HIS enables patient records easy to access by many medical practitioners everywhere and anytime using several allowed devices. All clinical information and documentation are well organized in the computerized system. As all patient information is captured inside the system, physical medical records can be reduced, saving hospital storage space. Pre-formatted input ensures more specific details in clinical documentation and standard writing in every form and module. Physical

medical records in the patient area enable the spreading of viruses, especially contagious, such as COVID-19. Thus, HIS allows cleanliness and more safety. Computerized documentation makes the clinical information tidy and easy to read compared to handwriting in physical notes. The layout of reports and forms generated from the system is also more structured and easy to understand.

4.5 System Disadvantages

Internet dependency on HIS becomes a risk to hospitals, and a contingency plan should always be ready to ensure a continuous health delivery system. In some cases, double work in documentation needs to be executed, especially during the downtime of the server or internet.

4.6 System Characteristics

HIS usage fulfills the good information criteria in health information through a more structured and formatted as compared to physical records. Accuracy of the information is also guaranteed as it only can be accessed by authorized users with a certain level of access. The content is reliable and can help in decision-making during treatment and planning. Clinical information that is constantly updated ensures the timeliness of each piece of information. Besides, the HIS interface is usually built-in in a very simplified and easy-to-use format.

5.0 Conclusion and Recommendation

HIS implementation in MOH hospitals is critical, particularly in the management of infectious diseases such as COVID-19 patients. The HIS module that is currently being used in the hospital is adequate because it is in line with current patient treatment practices by healthcare professionals. The hospital's hardware and internet connectivity limitations, on the other hand, hindered the system's efficiency and hampered the treatment process. Every hospital reopening requires better planning and management, including the selection of a system for managing clinical and health information. Any HIS policies and guidelines should be provided to users to ensure patient data security is constantly maintained. To maintain the system's dependability and compatibility, it is necessary to examine the existing HIS system regularly.

The results of this study are crucial for providing top management with a solid foundation and proof of the value of the information system (HIS) evaluation procedure being used in public hospitals. This is because there was a dearth of prior research on the evaluation of HIS in public hospitals. Findings from the review process will assist MOH senior management in updating and refining the current system to ensure that the government is worth every dollar invested and that the system is capable of playing its proper part in enhancing the healthcare delivery system. While investigating the user's point of view and experience would provide another crucial element for enhancing technical specification preparation for any HIS development by MOH.

Further study on this should be extended to another group of users such as nurses, medical lab technologist, radiographers, and paramedic team for more cohesive findings on HIS efficiency as this study only focus on one group of users which is medical officers only. In addition, this study only involves one of several types of HIS implemented in MOH. Thus, an efficiency study across HIS systems used in MOH also can be developed for better coverage.

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