VIVA MEDIKA
Jurnal Kesehatan, Kebidanan, dan Keperawatan

Homepage: http://ejournal.uhb.ac.id/index.php/vm
P-ISSN: 1979-2026 E-ISSN: 2656-1034
DOI: 10.35960/vm.v17i1.1329

Implementation of Hospital Management Information System for Optimizing Healthcare Service Operations at A Hospital

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ABSTRACT

Computer-based Hospital Information Systems (HIS) are increasingly crucial, yet realizing them requires more effort than merely developing the system. Government regulations mandate the implementation of HIS in every hospital. With HIS, data processing becomes easier, yielding rapid, precise, accurate, and up-to-date information tailored to user needs. This study aims to investigate the implementation of HIS to optimize healthcare service operations at the Dr. Sukirman Military Hospital in Pekanbaru. It employs a qualitative descriptive research design with a case study approach using interviews. The study took place at Dr. Sukirman Military Hospital from November to December 2023, focusing on HIS implementation. Data collection techniques included in-depth interviews, participatory observation, and document review supported by a checklist related to HIS implementation. Data were collected through in-depth interviews with six informants, direct involvement in informant activities through observation, and document review with a checklist. Data analysis employed fishbone analysis, and data validity was tested using the triangulation method. Findings revealed that human resources lacked skills, experience, motivation, responsiveness, needed socialization, supervision, and that socialization and supervision methods in HIS implementation were lacking. Moreover, the material, machine, and environment aspects were still ineffective in-service quality and operational aspects. Therefore, there is a need to enhance human resource competencies through training and supervision to improve the quality of HIS implementation, and there is a need to develop systems for HIS implementation to optimize hospital operations.

Keywords: Hospital Information System, implementation, operational optimization

1. INTRODUCTION

Technological breakthroughs in healthcare, such as hospital information systems, can make hospital data management and governance processes clearer, more secure, centralized, and flexible (Sudiarti et al., 2019). The presence of technology in HIS, particularly computers, greatly supports and facilitates the management of devices and resources within the hospital (Fadilla & Setyonugroho, 2021). HIS enables easier data processing and yields rapid, precise, accurate, and up-to-date information tailored to user needs. Furthermore, the development of responsive and user-friendly applications strongly supports HIS (Rusman & Suwardoyo, 2022). Technological advancements have transformed the lives of communities, nations, and countries. The public's demand for healthcare services is increasing and requires excellent service (Molly & taar,

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2021). In this context, hospital services need to be supported by a hospital data and information management unit capable of making various modifications to facilitate reporting, speed, accuracy, integration, service improvement, efficiency, and speed in implementing healthcare service operations.

Hospital Information Management System (HIS) is an information and communication technology system that processes and integrates the entire flow of hospital services through a network of coordination, reporting, and administrative procedures, and is part of the Health Information System. HIS aims to improve efficiency, effectiveness, professionalism, performance, as well as access and services provided by each hospital (Kristanti & Ain, 2021). Therefore, every hospital is required to implement HIS and must manage and develop the system (Pane et al., 2023). The implementation of HIS management and development is intended to improve and support the process of hospital healthcare services, including speed, accuracy, integration, service improvement, efficiency improvement, ease of reporting in operational implementation, speed of decision making, accuracy and speed of problem identification and ease in developing strategies for managerial implementation, work culture, transparency, inter-unit coordination, system understanding and reduction of administrative costs in organizational implementation (RI, 2013).

According to Alotaibi and Federico (2021), the impact of not using technology in hospital data management systems can result in data inaccuracies, delayed access to information, limited data analysis, vulnerability to data security, and lack of integration between systems. This can disrupt operational efficiency, increase the risk of errors, and threaten the security and privacy of patient information, potentially negatively affecting the quality of care provided and the patient experience.

In Indonesia, 78% of hospitals had implemented HIS by 2022, according to data released by the Ministry of Health (MoH) of the Republic of Indonesia. Despite the seemingly significant number of hospitals implementing HIS, the current implementation is still not optimal and comprehensive. The data shows that the remaining 22% of hospitals have not yet used this technology. The number of hospitals without HIS is just one of the many problems facing Indonesia's healthcare sector. Moreover, the use of HIS in hospitals that already have the system is still not optimal. According to the Regulation of the Minister of Health (PMK) of the Republic of Indonesia Number 82 of 2013, the HIS application architecture must at least include communication and cooperation, main service activities (front office), and administrative activities (back office). However, most hospitals have not implemented HIS according to the MoH standards. It was recorded that 629 (24%) hospitals only implemented HIS in the front office, and 1,662 (64%) in the back office (Aviat, 2023). This data can be supported by a study conducted at the Dr. Hardjono Regional Hospital in Ponorogo Regency, which has implemented HIS to improve hospital performance since 2011, especially in terms of data provision and management. The cooperation contract with a third party for the development of the hospital information system ended at the end of 2016. The system was updated monthly through collaboration. When it comes to the implementation process, users often complain about the output data of the information system not meeting their needs (S. M. Puspitasari & Istiono, 2017).

Similarly, Dr. Sukirman Air Force Hospital in Pekanbaru, in the era of national health insurance (JKN), has begun to provide healthcare services supported by the implementation of HIS. However, an initial observation conducted in November 2023 found that the implementation of HIS for-healthcare service operations needs optimization. This includes the not yet productive operation of existing HIS devices such as the LAN network and online queuing system, personnel in each unit with HIS devices not yet fully understanding and still reluctant to operate

the existing HIS devices, and a lack of management commitment in the implementation of HIS at Dr. Sukirman Air Force Hospital Pekanbaru, which will be an obstacle in facing future hospital challenges. The purpose of this study is to describe the implementation of HIS for optimizing the operational healthcare services at Dr. Sukirman Air Force Hospital Pekanbaru.

2. RESEARCH METHOD

This study employed a qualitative descriptive research design with a case study approach using interviews. The study took place at Dr. Sukirman Air Force Hospital Pekanbaru from November to December 2023, focusing on HIS implementation. Data collection techniques included in-depth interviews, participatory observation, and document review supported by a checklist related to HIS implementation at Dr. Sukirman Air Force Hospital Pekanbaru. Data were collected through in-depth interviews with six informants consisting of two main informants (socialization coordinator and operator), two supporting informants (management staff), and two key informants (informatics technicians and medical record staff). Observations were conducted by the researcher through direct involvement in informant activities in HIS implementation at Dr. Sukirman Air Force Hospital Pekanbaru. Data analysis employed fishbone analysis, and data validity was tested using the triangulation method, which involves using multiple data collection methods: in-depth [individual]{.mark} interviews with an interview guide and probing informants by repeating questions and answers to obtain clear and specific explanations, participatory observation conducted by the researcher through direct involvement, and document review supported by a checklist carried out by the researcher examining administrative documentation related to HIS implementation (Ade Heryana, 2022).

3. RESULTS

Man

Based on participatory observation (see Table 1), there is already a socialization team appointed to support HIS implementation, a person in charge of HIS to ensure smooth operation, and designated medical record staff and operators in each service unit. However, in practice, there is no supervision team for HIS implementation at Dr. Sukirman Air Force Hospital Pekanbaru to optimize healthcare service operations.

Table 1. Observation results related to man in HIS implementation for optimizing healthcare service operations at Dr. Sukirman Air Force Hospital Pekanbaru in 2023

Object of Observation	Present	Not Present	Notes
HIS implementation socialization team	√		In the decree, there are 2 people, but they have not yet developed a program/schedule and have not carried out HIS socialization.
HIS implementation supervision team		√	
Person in charge of HIS device operations	√		1 electromedical technician, 1 informatics technician, not yet responsive/slow in handling when there are disturbances/damage to devices

Based on a review of documents at the Secretariat of Dr. Sukirman Air Force Hospital Pekanbaru (see Table 2), there is already a Decree for the HIS socialization team tasked with helping users understand how to operate HIS. However, there is no basic Decree for the team that will supervise the implementation of HIS for optimal operation.

Table 2. Results of document review on HIS implementation for optimizing healthcare service operations at Dr. Sukirman Air Force Hospital Pekanbaru in 2023

Reviewed Document	Present	Not Present	Not
Decree of HIS Socialization	√		Backed up with a WhatsApp group but the group is passive.
Decree of HIS Implementation Supervision Team		√	

Based on in-depth interviews with all informants, information was obtained that there are still limited skilled human resources in using the HIS application, there are still human resources who have no experience using HIS, low desire of human resources to operate HIS / reluctance of human resources to input data in real-time during healthcare services, lack of response from informatics technicians in overcoming disturbances/obstacles in HIS, and human resources requiring training and supervision in HIS implementation. The following are excerpts from in-depth interviews with all informants:

"...we usually input directly, but if there are many patients, we input after the service. ...if there are disturbances, we report to the IT staff, Ma'am, but that's how it is, sometimes it's not fixed immediately." (main informant)

"...there should be someone who specifically teaches until we can do it, then there is one person in each room who can teach it again. Because the contents of the application are not like in the hospital... the form is easier, and I also input to the computer there." (main informant)

"...yesterday E... had reported, and I have requested to immediately find a UPS and router so that in the future the service will not be disrupted again, and next week everything will be resolved, I am still waiting for further info from E...." (supporting informant)

"...on the server, it should be backed up at least once a month so that if there are disturbances, the data is not lost. .....if there is a power outage, the server is off and immediately on when the electricity is back, but the application does not automatically turn on, it still has to be turned on. ....so we actually have to always check and back up so that the data is not lost..." (key informant)

Material

Based on participatory observation (see Table 3), there are already servers, hardware, and HIS supporting facilities such as routers, LAN cables, stabilizers, UPS, online queuing machines, and televisions, but there are still units that are not equipped with hardware, and there are supporting facilities that are not equipped with UPS, so routers are often damaged due to unstable voltage and LAN cables are cut due to friction from unidentified objects.

Table 3. Observation results on HIS implementation for optimizing healthcare service operations at Dr. Sukirman Air Force Hospital Pekanbaru in 2023

Object of Observation	Present	Not Present	Notes
Server	√		Limited capacity
P*hardware*	√		There are still units that do not have hardware
HIS supporting facilities	√		Not adequate, there are still units that do not have supporting facilities and are damaged.

Based on in-depth interviews with all informants, information was obtained that there are already computers and HIS supporting facilities, but they still need to be completed.

The following are excerpts from in-depth interviews with all informants:

"...last year there were several computer procurements, also servers and supporting facilities such as online queuing machines and some other equipment. However, we still need to continue completing what is lacking in other units..." (supporting informant)

"...the computers prepared this year have been adjusted to the needs. But for supporting equipment, we continue to propose, because it is indeed needed for RME bridging ....for voltage, it can sometimes be an obstacle, all equipment should indeed use UPS and stabilizers to minimize damage due to unstable voltage. Because within a year, several have been damaged due to unstable voltage.." (key informant)

"...not all of these computers use UPS, including the routers, so they have been damaged several times and the damage is due to voltage. We have proposed repairs and replacements for these damaged computers and routers. Maybe the quality of this equipment also affects the durability of the equipment, adjusted to the procurement budget, Ma'am..." (main informant)

Machine

Based on participatory observation, there is already a server with the HIS application using Kanza, which is operated by computers with Core i5 and Core i7 processors. However, there are still several computers with processors that need to be upgraded so that the application is more responsive when used.

Based on in-depth interviews with all informants, information was obtained that there was router damage and internet connection disturbances due to LAN cable damage, and ID-passwords were not fully functional. The following are excerpts from in-depth interviews with all informants:

"...the hospital's voltage sometimes fluctuates. Routers have been damaged several times due to voltage. ...And not all are backed up by UPS or stabilizers." (core informant)

"...there was a damaged LAN cable, I don't know what friction it was hit by...or maybe also because the cable is old and was disrupted during the previous corridor repair, and the position of the damaged cable is outside the room. It was once checked and it was suggested to replace it from the central..." (main informant).

"...we will try to procure according to the priority scale...if it is indeed very urgent, we will try..." (supporting informant).

Method

Based on participatory observation of the methods used in HIS implementation, it was found that after installation, 1 training session was carried out in each unit immediately after the hardware in that unit completed the Kanza application installation. However, in the implementation of HIS, there was no follow-up socialization, so the ID-passwords that had been created for each user in the service unit were not actively used until the observation was carried out, and several IDs and passwords needed repairs. It was found that in some units, only 1 (one) ID-password was actively used, whereas each officer in operating HIS should use their respective ID-password. Furthermore, there are no Standard Operating Procedures (SOPs) for HIS implementation and no socialization has been carried out.

Based on in-depth interviews with all informants, information was obtained that reinforced the results of participatory observation that there are no SOPs for HIS implementation and no socialization has been carried out after the post-installation training. The following are excerpts from in-depth interviews with all informants:

"...we were indeed trained, Ma'am, after the Kanza application was installed, but it was just a brief introduction, then we were given a YouTube tutorial link, so we were told to learn from that link....until now there has been no more socialization." (main informant)

"...after installation, it was immediately followed by training in each unit, miss. Then we created a group for all users, if anyone understands, they can ask in the group. But

until now, no one has asked. So we think everyone already understands..." (key informant)

"...as far as we know, there are no SOPs yet." (supporting informant)

Environment

Based on participatory observation, the placement of the server is less representative because it is located inside the ICU room which is too narrow, and some users who already have ID-passwords are less proactive in being able to operate and implement HIS in carrying out their duties and responsibilities.

Based on in-depth interviews with all informants, information was obtained that supported the results of the observation, reinforced by the results of in-depth interviews. The following are excerpts from in-depth interviews with all informants:

"...initially it was going to be put in the same room as the casemix while also being backed up using one computer stabilizer, but it didn't happen because the room was already full" (main informant)

"...at first it could be used, Ma'am, the ID-passwords, they were tested one by one at that time. But because they are never used, the file might be cropping. Later I will check one by one again, Ma'am, and activate them" (key informant)

"...initially the server room was near the secretariat, but due to the need for a room for accreditation, it was moved" (supporting informant)

From the results of in-depth interviews, participatory observation, and document review, it can be illustrated with a cause-and-effect diagram in the fishbone analysis as in Figure 1:

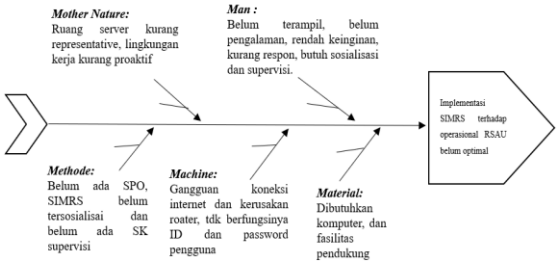

Figure 1. Fishbone diagram of HIS implementation on the operations of Dr. Sukirman Air Force Hospital

The fishbone analysis helps the researcher search for determinants that can improve implementation and service coverage. This diagram is also called a cause-and-effect diagram. This fishbone analysis provides an explanation of why it happened and the steps we can take to fix it. From Figure 1, it can be seen that the causes of HIS implementation on the operations of Dr. Sukirman Air Force Hospital are not yet optimal due to problems from the 5M factors, namely man, material, method, machine, and environment in HIS implementation.

DISCUSSION

The obstacles in HIS implementation at Dr. Sukirman Air Force Hospital Pekanbaru for optimizing healthcare service operations, as described in the study above, are not only experienced by Dr. Sukirman Air Force Hospital Pekanbaru but are also faced by several other hospitals, which can be used as a comparison in elaborating the discussion as follows:

Man

It was found that there are still limited skilled human resources in using the HIS application, human resources who have no experience using HIS, low desire of human resources to operate HIS / reluctance of human resources to input data in real-time during healthcare services, lack of response from informatics technicians in overcoming disturbances/obstacles in HIS, and human resources requiring training and supervision in HIS implementation at Dr. Sukirman Air Force Hospital Pekanbaru. A study at Praya Regional Hospital also found that from the human factor, the HIS provided was not yet of good quality,

and HIS was not yet easy to use. According to respondents' opinions, the current information system is not yet fully perceived as easy because there are still many data entries that must be done by system users, resulting in longer patient waiting times (Mada, 2019). Based on the results of research conducted at Mitra Paramedika General Hospital Yogyakarta, it was found that HIS has been implemented but cannot be implemented in all units at Mitra Paramedika General Hospital due to limited human resources and supporting equipment such as computers, in addition, the hospital does not yet have a schedule for officer training on the use of HIS, there needs to be a division of job desks so that it can support increased effectiveness and efficiency at work, resulting in a lack of discipline in human resources in inputting data, making the data in HIS incomplete (Darhayati et al., 2021). Hospitals must have an information and technology unit/installation and have staff with qualifications of system analyst staff, programmer staff, hardware staff, and network maintenance staff (E. R. Puspitasari & Nugroho, 2021).

Material

There are still hardware with technical specifications that need to be upgraded, and additional equipment is needed to support machine performance. Similar problems were found in a study at Blambangan Banyuwangi Regional Hospital, where in the material dimension, it was found that hardware was lacking in several rooms, SIM facilities were not complete in each unit, and connections were often disrupted (Mada, 2019).

Machine

Internet connection disturbances due to LAN cable damage, router damage, and ID-passwords not functioning completely were found in HIS implementation at Dr. Sukirman Air Force Hospital Pekanbaru. In a study at Blambangan Banyuwangi Regional Hospital, for the machine dimension, it was found that the server was often hot and the LAN was often jammed (Mada, 2019). The procurement of supporting goods for implementing HIS, but the existing computers often experience damage, slow loading, do not store data properly, to errors in computer equipment and application programs due to insufficient networks and computers that are not updated, whose economic life needs to be rejuvenated, so they are less effective in helping provide services in the hospital (Darhayati et al., 2021).

Method

The implementation of HIS at Dr. Sukirman Air Force Hospital uses the Kanza application. It was found that there are no SOPs for HIS implementation, no regular and continuous HIS socialization has been carried out even though there is already a Decree from the Head of Dr. Sukirman Air Force Hospital Pekanbaru appointing a Coordinator for the socialization of HIS implementation, and there is also no supervision team to further support the acceleration of HIS implementation for optimal operations. In a study at Blambangan Banyuwangi Regional Hospital, the method dimension found that the standard operating procedures (SOPs) for HIS were incomplete (Mada, 2019).

Mother nature

The condition and position of the server room are less representative and a proactive work culture has not been built so that the work results of related units can support each other and run smoothly. The same thing was found in a study at Blambangan Banyuwangi Regional Hospital, where the environment dimension found that the HIS room was less representative and a work culture had not been built (Mada, 2019). Research conducted at Praya Regional Hospital found that the HIS at Praya Regional Hospital was built with the principle of system development, but development has not been carried out continuously during the MoU contract period. System development is carried out based on input or needs of users so that the perceived quality of the information system does not fully meet the needs of all system user parties (Mada, 2019).

The obstacles in HIS implementation mentioned above, which are almost the same problems in previous studies, require Dr. Sukirman Air Force Hospital to make changes to optimize service operations as follows: (Rusman & Suwardoyo, 2022; Simanungkalit, 2012).

Man

HIS implementation can be influenced by the availability and quality of human resources in the hospital environment. Medical and administrative staff require good training so that they can use the system effectively. Human resources are a determining factor for the successful implementation of information systems because they are related to its operation (Pujihastuti, 2021).

Material

The hardware component of the information system is the hardware component, which consists of machines and media used to perform information system activities. Modern information systems include hardware such as computers (Central Processing Unit or CPU), input and output units, data or information storage units in the form of files, etc.), and non-computer equipment (Livinus et al., 2019).

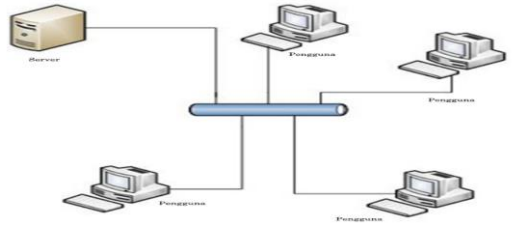

Figure 2. HIS infrastructure requirements (RI, 2013)

Figure 2 explains that the need for computer network infrastructure in the future is not only for the needs of the Hospital information system, but must also be able to be used for various things, such as IP telephone lines, CCTV, Intelligent Building, Medical Equipment and others.

Machine

In addition to hardware, software components are also important for HIS implementation. Software components are part of the information system software, which includes all operating procedures required by computer programs and operating procedures required by humans (Nugroho, 2023).

Figure 3. HIS variables that can accommodate information needs (RI, 2013)

If the Hospital is going to build its own HIS application, considering the complexity of the business processes in the Hospital, a minimum architectural overview and HIS variables that can accommodate information needs are as shown in Figure 3.

Method

A systematic process or method that hospitals can use to achieve goals efficiently, in a fixed and orderly sequence of steps. It can be implemented by creating SOPs and socializing them on an ongoing basis (Nadiya & Rijali, 2021).

Environment

Data security can be affected by environmental conditions, such as the possibility of natural disasters or crime levels around the hospital. An environment that is vulnerable to threats can increase the likelihood of leaks or illegal access to health information (Sudiarti et al., 2019).

5. CONCLUSION

The conclusions that can be conveyed from the research are that the human resources of Dr. Sukirman Air Force Hospital Pekanbaru and the methods in HIS implementation still require socialization to improve performance and change work culture. Meanwhile, for the material, machine, and environment aspects of HIS implementation at Dr. Sukirman Air Force Hospital Pekanbaru, they are not yet effective in supporting service quality and operations, requiring improvement, development, and planned budget allocation to achieve optimization of healthcare service operations.

6. RECOMMENDATION

Suggestions that can be given after conducting this research for the Management of Dr. Sukirman Air Force Hospital Pekanbaru are the need to carry out competency improvement for human resources to be skilled through guidance and supervision to improve the quality of HIS implementation through the implementation of advocacy and socialization, training, technical guidance, monitoring and evaluation, with the hope of being ready to face future healthcare service challenges for work productivity, increased motivation in HIS implementation by making changes to work culture, increased efficiency in the quality of healthcare services, making innovations in service quality and increasing patient satisfaction, as well as being more productive and competitive for increasing hospital benefits. In addition, Dr. Sukirman Air Force Hospital Pekanbaru needs to carry out system development for HIS implementation including application systems, networks, and physical security for optimizing healthcare service operations.

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