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Research Article

Implementation of Hospital Management Information Systems: Obstacles and Challenges (Case Study at Santo Antonio Baturaja Hospital)

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ABSTRACT

The Hospital Information System (HIS) handles and integrates the entire flow of hospital services. This study aimed to identify factors that affect the effectiveness and efficiency of HIS implementation and select strategies that can be used to overcome the inhibiting factors. In-depth interviews were used in this study with a qualitative and case-study strategy. The respondents were 26 officers selected by non-random purposive sampling. Data analysis used triangulation of in-depth interviews, document observations, and observations of HIS implementation. Data were transcribed verbatim and analyzed thematically. The results showed that the positive behavior of officers, leadership support, and officer abilities supported the implementation of HIS. However, there are still obstacles due to the attitude of officers and management policies. From document observations, it was found that officers had incorrect input, doubled input, and forgotten input. Due to a lack of Standard Operating Procedures (SOPs) and guidelines for implementing HIS, observations on its deployment revealed inconsistent data input. The strategy suggested to deal with the barriers included designing monitoring programs, creating SOPs, conducting extensive socializing programs, and conducting training programs to enhance officers' soft skills. It is clear that Human Resources play a crucial role for the effectiveness of HIS implementation.

INTRODUCTION

In this decade, the implementation of the Hospital Information System (HIS) has become a necessity in health services. The government officially announced this in 2013 by issuing the Ministry of Health Regulation Number 82 of 2013 concerning hospital management information systems. Every hospital is required to organize HIS. This regulation is strengthened by Minister of Health Regulation Number 24 of 2022, whereby in 2023 all hospitals are required to provide electronic medical record services. With the enactment of the Minister of Health's regulations, all organizations engaged in the health service sector cannot avoid implementing HIS (Kemenkes, 2022; Kemenkes RI, 2013).

The application of HIS aims to increase accessibility, efficiency, effectiveness, clinical quality, management, and decision-making within the organization (Balaraman and Kosalram, 2013; Saharuddin, 2017). It is hoped that with the implementation of HIS, all service activities in the hospital, along with the obstacles encountered, can be resolved and handled quickly, precisely, and accurately (Adian and Budiarto, 2020; Kristanti and Ain, 2021; Widiyanto and Widayati, 2021). The application of HIS offers increased service quality, reduces the number of medical errors, and provides access to real-time information (Setyawan D., 2016). The application of HIS provides correct, relevant, updated, and easily accessible

information for users from different places to support patient care and administration (Malika, 2020; Meirianti *et al.*, 2018; Setyawan D., 2016). The expected impact is that hospitals can carry out service activities in a more productive, open, orderly, fast, easy, accurate, integrated, safe, and efficient manner (Hatta *et al.*, 2017; Putra and Vadriasmi, 2020; Saputra, 2016; Susilo and Mustofa, 2019).

The implementation of HIS requires extensive support, both financially as well as from management and adequate users. As a developing country, hospitals in Indonesia have not fully implemented HIS because the cost of implementing HIS itself is expensive and requires adequate staff readiness. Many hospitals start HIS from certain sections, such as the registration section or the pharmacy section, and then other modules are developed at different times (Asyary *et al.*, 2019; Handayani *et al.*, 2017); this also happens in the hospital studied. The application of HIS started in the pharmacy division (logistics and pharmaceutical installation), then gradually developed the registration module, polyclinic, emergency room, and treatment room, and is currently in the stage of developing e-prescribing and e-medical records.

In previous studies, there were still obstacles to implementing HIS, both in terms of facility readiness and user readiness (Asyary *et al.*, 2019; Christasani *et al.*, 2021; Handayani *et al.*, 2017; Odelia *et al.*, 2018; Suyanto *et al.*, 2015). The obstacles that most influence HIS failure are user behaviors such as attitudes, knowledge, and beliefs (Christasani *et al.*, 2021; Odelia *et al.*, 2018; Suyanto *et al.*, 2015; Widiyanto and Widayati, 2021). This study aims to describe the implementation of HIS, identify inhibiting and supporting factors, and choose strategies that can be used to improve inhibiting factors using case studies in Santo Antonio hospital.

METHODS

This study is a descriptive-analytical research with a qualitative strategy using in-depth interviews. This study used a case study strategy at Santo Antonio Baturaja Hospital. The variables in this study are the implementation of HIS at Santo Antonio Baturaja Hospital and the factors that influence HIS implementation, which are explored using the Precede-Proceed theory model approach. The instrument in this study was an in-depth interview guide that was compiled according to the Precede-Proceed theory model, namely predisposing, reinforcing, enabling, and inhibiting. The validity of the in-depth interview guideline was tested with professional judgment by three experts who were relevant to the problem being studied. Collecting data using in-depth interviews, direct observations of HIS implementation in the field, and observations of documents in the form of constraint reports in the HIS *WhatsApp* Group. Sampling was done by means of non-random purposive sampling, with the aim of obtaining detailed information according to the experience and knowledge gained in implementing HIS. Respondents' willingness to participate in this study was expressed by their willingness to sign an informed consent form. The place and time of the in-depth interview were determined according to the agreement between the researcher and the respondent. Before the in-depth interview, respondents were given information about the purpose of this study. In-depth interviews were conducted in person and recorded based on their consent.

The process of verifying the contents of the in-depth interviews was done by replaying the results of the in-depth interviews and the minutes of the in-depth interviews to the respondents after the in-depth interview process was completed. This was done so that the respondent can provide confirmation about the contents of the in-depth interview regarding agreement and objection to the content. The results of the in-depth interviews were transcribed or described word for word as they were (verbatim) and set forth in written form. The transcript results were double-checked by different people to ensure data accuracy. The results of the transcripts were analyzed using thematic analysis techniques that refer to the problem formulation and study objectives. Thematic analysis is used to analyze classification and present themes (patterns) related to the data. This thematic analysis describes various subjects in great detail and discusses them through interpretation. Factors influencing HIS implementation are explored using a precedent-process theory model approach. This study protocol was approved by the Institutional Ethics Committee with Ethical Approval No. 0651/KEPK/Adm2/IX/2022 on September 26, 2022. A study permit was obtained from the director of Santo Antonio Hospital with number 348/RSSA/DirIXII2022 on November 8, 2022.

Study Instruments

The instrument in this study was an in-depth interview guideline that was compiled according to the Precedence-barrier theory

model, which consists of four constructs: predisposing, reinforcing, enabling, and barrier. Each construct guides several questions that focus on implementing HIS. The predisposing construct guides four questions regarding the user's knowledge, attitudes, beliefs, and values. The reinforcing construct guides questions about coordination between users and leadership policies in supporting the implementation of HIS. The enabling construct answers questions about the availability and maintenance of the facility. The barrier construct guides one question to explore constraints and challenges during the implementation process. The validity of the in-depth interview guide was tested in a professional judgment by three experts who were relevant to the problems studied but were not involved as respondents in this study.

Data Collection Techniques, Samples, and Sampling Techniques

Implementation of data collection at the Santo Antonio Baturaja Hospital in South Sumatra. Data were collected using the in-depth interview method, direct observation of HIS implementation in the field, and documented observation in the form of constraint reports in the HIS *WhatsApp* Group. Sampling was done by non-random, purposive sampling. Respondents taken were specialist doctors, pharmacists, nurses, midwives, pharmaceutical technical personnel, laboratory analysts, radiographers, administrative officers, financial officers, medical recorders, registration officers, and IT. The selection of respondents is intended to obtain detailed information according to their experience and knowledge of implementing HIS. Respondents' willingness to participate in this study was expressed by their willingness to sign the Informed Consent. In-depth interviews were conducted in the office and lasted between 45 and 60 minutes for each respondent. Prior to the in-depth interview, the respondents were given information about the purpose of this study. In-depth interviews with respondents were conducted directly and recorded based on their consent. The questions were asked according to the interview guide, which had been validated by three experts. After the in-depth interview process was completed, the in-depth interview content verification process was done by replaying the in-depth interview results and minutes for the respondents. This was done so that respondents can provide confirmation about the content of the in-depth interview regarding approval and objections to the content.

Data Processing and Data Analysis

The recorded in-depth interview results were transcribed, described word for word, or verbatim. The transcripts were double-checked by two different assistants to make sure they were accurate. The results of the transcripts were analyzed through thematic analysis. First, deductive coding of verbatim transcripts based on the constructs in the in-depth interview guide was carried out independently by the researcher and two assistants. Next, we discussed this initial code to reach agreement on a formal code. Then, important themes are discovered through the inductive synthesis of these formal codes. A self-coding process, a formal code agreement between the researcher and two assistants, and a verbatim review ensured the quality of the study data. Finally, critical themes were discussed by the researcher and two research assistants (Korstjens and Moser, 2018). Processing of data from direct observations in the field was done by making a recap of the observation checklist in 18 rooms that apply HIS in a results table. The results of observations on the implementation of HIS implementation documents, namely daily reports on the constraints of HIS implementation, were processed using the Excel program and visualized in the form of a graphic figure.

RESULTS AND DISCUSSION

Description of the Implementation of HIS in Santo Antonio Hospital

Twenty-six inclusion respondents were interviewed. Respondents have experience using HIS ranging from 1 month to 4 years. Respondents who have 1 month of experience using HIS were still selected regarding the implementation of e-prescribing, which was only implemented in early April 2023. The list of units, respondents, and applications used can be seen in Table 1.

From direct observation of the implementation of HIS in 18 work units, most of them already have sufficient staff. Among the officers, they have established coordination by implementing a culture of exchanging information both verbally and in writing, carrying out the results of mutual agreements, and carrying out handovers during shift changes. This really supports the smooth implementation of HIS (Septiyani and Sulistiadi, 2022). Adequate facilities and infrastructure, such as computers, uninterruptible power supply (UPS), and printers, are supported by conformity modules except for medical record units and ease of

opening modules. Modules that suit user needs and are easy to operate encourage users to get used to and enjoy using HIS (Pakpahan *et al*., 2021; Puspitasari and Nugroho, 2018). The medical record module is currently in the development stage. The development of the e-prescribing module, which was just released in early April 2023, has now started to be implemented in the inpatient unit and will be followed by other service units such as the polyclinic, emergency room, operating room, and Theresia unit.

Studies show that the level of understanding and skill of officers in implementing HIS is influenced by the period of time they use HIS (Widiyanto and Widayati, 2021). Respondents who have used HIS longer have better understanding and skills, such as the following statement:

"Basically yes. Because I use it in my work, I know what to select or click for a certain purpose……"(Respondent02).

This result was reinforced by a previous study, which stated that the longer someone uses HIS, the more they understand and become skilled in operating it (Puspitasari and Nugroho, 2018; Widiyanto and Widayati, 2021). The level of understanding of applications, modules, and skills in using HIS is an important part that users must have in order to be able to operate HIS properly (Christasani *et al*., 2021; Fauziah and Mulyanti, 2023; Igiany, 2019; Jober and Harjoko, 2018; Mudiono *et al*., 2018).

Supporting and Inhibiting Factors for the Implementation of HIS Knowledge

The results of the data analysis in the first step resulted in a summary of user perceptions and experiences that were extracted deductively based on the precede-proceed constructs, as shown in Table 2. Knowledge is a predisposing factor that motivates officers to use HIS. Most officers think that the flow of the module's operation is easy to understand and use, so they do not experience difficulties in implementing it (Igiany, 2019; Puspitasari and Nugroho, 2018). This was stated by one respondent:

"It's easy because it's structured; when inputting in the operating room, which one should be done first starts from the top, and the last row finishes saving…."(Respondent 05).

Table 1. List of units and types of applications used

Unit/room name	Health workers	Respondents (n=26)	Application used
Registration	Officer Registration	2	*e-Report MR, Front Office*, HR, *Receptionist*
Inpatient Room	Nurse Midwife Surgery Specialist	6 1 1	*e-Prescribing, e-Report MR, Billing system*, Care Nursing, HR, Accreditation
Polyclinic	Nurse Midwife	1 1	*e-Prescribing, e-Report MR, Billing system*, HR, Accreditation
Installation bad Emergency	Nurse	1	*e-Prescribing, e-Report MR, Billing system*, HR, Accreditation
Operating Room	Nurse	1	*e-Prescribing, e-Report MR, Billing system*, HR, Accreditation
Cashier	Officer Cashier	1	*Billing system*, HR
Installation Pharmacy	Pharmacist TTK	2 1	*e-Prescribing, e-Report MR, Billing system*, HR, Accreditation
Logistics Pharmacy	TTK Admin	1 1	*e-Report MR, Inventory system*, HR, Accreditation
Medical records	Medical recorder	1	*e-Report MR, Billing system*, SDM, PMKP, V-Claim
Laboratory	ATLM Admin	1 1	*e-Report MR,* HR, Accreditation
IT (Information Technology)	IT people	1	IT Support All Modules, HR
Radiology	Radiographer	2	*e-Report MR,* HR, Accreditation

Table 2. Perception and experience respondent in implementation of HIS

Construct	Question	Summary of perceptions and experiences using HIS
Predisposing	Knowledge	All respondents acknowledge that HIS supports enhanced performance and interaction between units to be more effective and efficient. All respondents found the channel operation module easy to understand. Most respondents possess adequate skills in HIS usage; however, respondents emphasize attitude, discipline, and thoroughness.
	Attitude	Most respondents have a disciplined and thorough attitude toward using HIS. Most respondents care about HIS maintenance. Most respondents did not use standard operating procedures in the implementation of HIS.
	Belief	Most respondents believe HIS improves coordination and communication between units, supports work becoming effective and efficient, and supports easy, fast, and accurate service.
	Values	All respondents agreed. The HIS helped increase honesty and responsibility at work.
Reinforcing	Coordination between power health	The existence of integrated data in all units makes coordination between power and health more efficient and easier.
	Policy leader	Leaders are very supportive in providing facilities and solving problems, but lacking in monitoring and evaluation.
Enabling	Availability facility	The current facilities have all been fulfilled.
	Maintenance facility	Facility maintenance is carried out by IT.
Barrier	Obstacles and challenges implementation	All respondents agreed that the most dominant obstacles are behavior officers, management, and technology. behavior of the user in HIS operation, such as: less careful, wrong input, double input, forgetting to input, no discipline, less communication, perception of more manual labor, etc. Management such as: not yet there is monitoring and evaluation from the leader; not yet Standard Operating Procedures and HIS usage guides are available; not yet there is socialization in a thorough manner; not yet there is training in a special manner. Technology such as blackout current electricity, failure devices, and generated Akshi information has not fulfilled the user's needs.
Continues Improvements	Commitment increase Skills	All respondents considered the importance of self-improvement and a willingness to develop for the smooth implementation of HIS.

This result is reinforced by previous study, which revealed that the ease of flow encourages officers to get used to using it so that it supports their success (Igiany, 2019; Jober and Harjoko, 2018; Mudiono *et al*., 2018).

Good understanding and skills encourage officers to be open to a systemic work culture. Most of the respondents stated that HIS reduced manual work time, simplified and accelerated the service process, and lightened the workload. Most of the respondents felt that the integrated data for all HIS attendance units supported interaction between units to be more effective and efficient (accurate, easy, and fast). However, there are still obstacles to its application, such as late input and late sending of data, as expressed by one of the following respondents:

"HIS supports... we work faster, it's simpler, the problem is sometimes it's slow sending... (Respondent 03).

Previous studies stated that HIS increases service effectiveness and efficiency (Fauziah and Mulyanti, 2023; Jober and Harjoko, 2018; Lehmann *et al*., 2016; Roaini and Rohmadi, 2022; Sari *et al*., 2016) and improves performance (Bayu and Izzati, 2013; Jober and Harjoko, 2018; Rahmani, 2019).

Attitude

Discipline and conscientiousness greatly influence the success of HIS implementation. Most officers are disciplined in data entry but are not accompanied by a thorough attitude, so input errors and double inputs are still common. This happened because there were no instructions for

using HIS, such as standard operating procedures (SOPs) or manuals for use.

"I myself am disciplined; when I am not disciplined, I hinder others" (Respondent 01).

Previous studies stated that being undisciplined and not scrutinized would hinder further processes (Igiany, 2019). Accuracy will reduce many errors so that accurate and reliable data are obtained (Igiany, 2019; Sari *et al*., 2016).

Belief

The results of the study revealed that most officers believed that HIS would improve coordination and communication between health workers, support work to be effective and efficient, and support easy, fast, and accurate services (Fadilla *et al*., 2021; Pujihastuti *et al*., 2021). This belief was reflected in one of the responses expressed by an interviewed officer:

"Yes, because everything is recorded and inputted on the computer, the data are valid. It can effectively coordinate between rooms and is efficient because it saves time and energy" (Respondent 02).

In line with previous studies, HIS was implemented as a strategy to improve coordination between units (Septiyani and Sulistiadi, 2022).

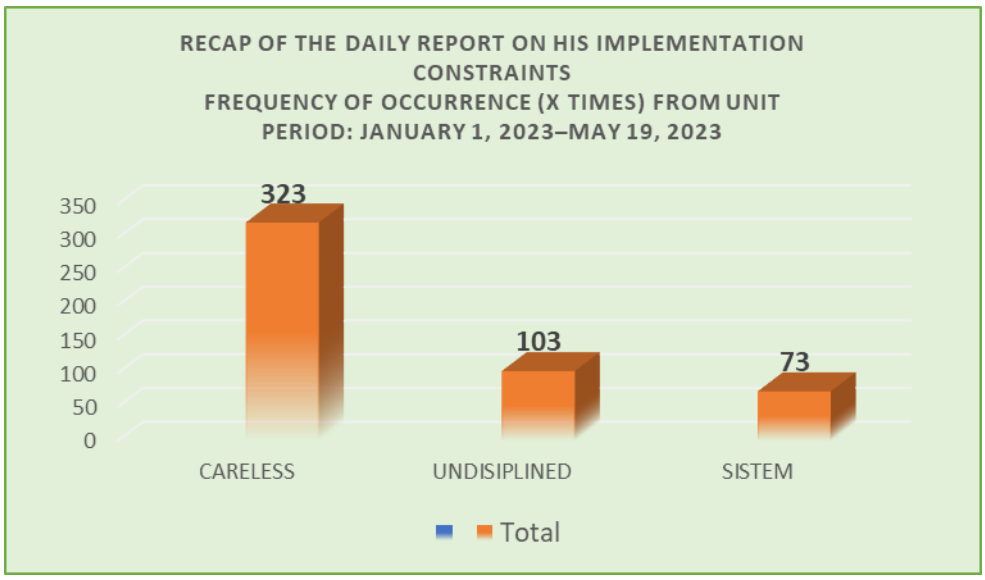


Figure 1. Constraints to implementing HIS from all units

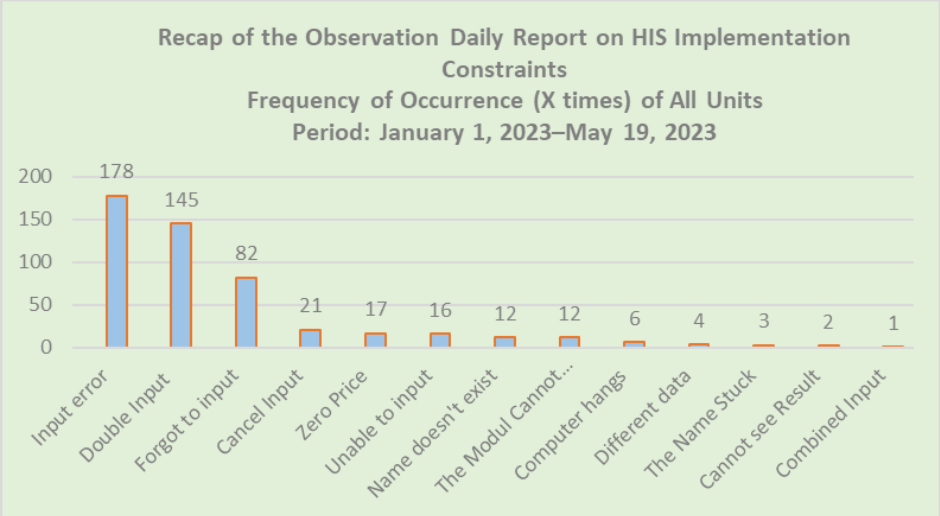


Figure 2. Constraints to the implementation of HIS from all units based on the type of constraints.

Table 3. Obstacles, factors causing obstacles, references, proposed strategies, and action plans

Factor	Obstacles	Factors Causing obstacles	References	Proposed Strategies	Action plans
Behavior User	1. Inaccurate, wrong input, double input	▪ Haste ▪ Lack of concentration ▪ Play HP ▪ Working on other tasks at the same time. ▪ Unclear information ▪ Input is done by a different person from the one who performs the action. ▪ Do not understand the flow. ▪ No cross-checking or viewing of V-transactions before input	(Embrey, 2012; Holland *et al.*, 2012; Jadhav *et al.*, 2014; Mathieson *et al.*, 2018; Menon, 2019; Shah, 2005)	▪ Educative: Conduct training and skill improvement for officers. ▪ Managerial: Re-socialize employee performance appraisals. ▪ Regulation: Establish SOPs and manuals for using HIS.	Design and include HIS introduction and training programs in new employee orientation materials. Re-socializing the point of accuracy and discipline in evaluating employee performance evaluations in monthly unit evaluations Immediately complete the SPO and manual for using HIS in all units that use HIS.
	2. Lack of discipline: forgetting to input, not inputting, sending data slowly	▪ Discipline attitude ▪ With many patients and many service actions, doctors in charge of patient visits simultaneously sometimes cause officers to forget to input data. ▪ Lack of concern ▪ Belittling, ▪ Delay ▪ Not implemented reward culture	(Ahuja and Khamba, 2008; Mathieson *et al.*, 2018; Rane *et al.*, 2016)	▪ Educative: Change your mindset and attitude. Conduct training and skill improvement for officers. Implementing a reward culture ▪ Managerial: The mutual support and commitment of each unit are mandatory for data input to HIS. Re-socialize the employee performance appraisal program. Reinforcing positive behavior	Design and include HIS introduction and training programs in new employee orientation materials. Develop outstanding employee programs for implementing HIS.
	3. There is a perception that the manual system is faster.	▪ Lack of user knowledge ▪ HIS has not run as a whole.	(Mathieson *et al.*, 2018; Rane *et al.*, 2016)	▪ Educative: Change your mindset and attitude. Designing programs to increase knowledge about HIS through in-house and external training ▪ Managerial: Aligning common goals, vision, and mission for implementing HIS Cultural transformation, willingness to adopt work culture from manual recording to system culture, high level of concern, teamwork culture	Design and include HIS introduction and training programs in new employee orientation materials.
	4. Lack of communication	▪ Submission of information that is less clear ▪ Unused information facilities such as bulletin boards and handover books	(Menon, 2019; Smith, 2013; Vigfússon *et al.*, 2021)	▪ Educative: Communication is transparent, clear, and uses Indonesian. Effective communication training	Conduct effective communication training for each new employee. Providing and utilizing existing communication facilities in units such as handover books,

Factor	Obstacles	Factors Causing obstacles	References	Proposed Strategies	Action plans
					bulletin boards, and WA groups
	5. The perception of HIS increases the workload.	▪ Lack of user knowledge ▪ HIS has not run as a whole.	(Ahuja and Khamba, 2008; Mathieson *et al.*, 2018; Rane *et al.*, 2016)	▪ Educative: Change your mindset and attitude. Increase officers' knowledge of the benefits of HIS. ▪ Managerial: cultural transformation, willingness to adopt a systemic work culture, high level of concern, teamwork culture.	Include the HIS introduction program in the general orientation material for new employees.
	6. The number of officers is less.	▪ Doctors practice at the same hours. Even though the schedule at the Health Facilities Information System (H.F.I.S.) is different, it is not according to the practice schedule, so there is a buildup of patients at certain hours.	(Menon, 2019; Shah, 2005)	▪ Managerial: Change management: educating flexible HR attitudes Optimizing existing human resources	Setting service schedules to minimize crowding at certain hours
	7. E-prescribing has not been implemented in the polyclinic unit, Theresia unit. Emergency Room and Elisabeth 2 unit	▪ Polyclinic has not been able to because of a shortage of staff. ▪ The Emergency Room and Theresia's unit are still developing a follow-up e-prescription module.	(Rane *et al.*, 2016)	▪ Managerial: Determine the implementation of e-prescribing in all service units. Accelerating the process of implementing e-prescribing in the four units Monitoring the process of implementing e-prescribing by the leadership	Monitor the process of implementing e-prescribing by the leadership.
Organization/Management	1. There is no HIS monitoring by the leadership	▪ There are no policies, guidelines, or regulatory leaders monitoring HIS. ▪ There is no clear task or function for monitoring the implementation of HIS.	(Mathieson *et al.*, 2018; Shah, 2005)	▪ Managerial: Management and leadership commitment to engaging and supporting HIS implementation. Establish a monitoring policy for HIS implementation. Clarity of the main tasks and functions governing the monitoring of HIS implementation	Develop HIS implementation policies. Monitoring the implementation of HIS according to the main duties and functions
	2. Lack of evaluation of hospital information system operation	▪ There is no policy, guideline, or duty that regulates that leaders must evaluate the implementation of HIS.	(Mathieson *et al.*, 2018; Vigfússon *et al.*, 2021)	▪ Managerial: full support and commitment from the leadership by being involved and fully responsible for the HIS implementation process.	Develop his implementation policies. Conduct periodic evaluations of HIS implementation.
	3. Standard Operating Procedures	▪ SPO is still in the revision stage regarding the e-	(Ahuja and Khamba, 2008;	▪ Regulation: Establish standard operating	Monitoring the process of preparing the

Factor	Obstacles	Factors Causing obstacles	References	Proposed Strategies	Action plans
	(SPO) and manuals for using HIS in the room are not available.	▪ medical record module, which is still in the development process. ▪ The manual is still 60% available; the rest will be generated after RME is running.	Embrey, 2012)	procedures (SPO) Establish his implementation policies and his implementation decrees.	ongoing SPO and guidebook
	4. Lack of socialization as a whole from vendors or IT when there is a new module	▪ There is no overall socialization program as outlined in the HIS implementation policy.	(Ahuja and Khamba, 2008)	■ Regulation: Compile and develop HIS implementation policies.	Arrange and develop socialization programs in the HIS Implementation Policy. Socialization and training are available to all officers, not just the head of the room and certain officers.
	5. There is no special training for new employees from the IT team.	▪ There are no regulations or policies governing this as a HIS training program. ▪ There is no division of job descriptions for IT officers between IT support systems and IT support hardware and networks.	(Ahuja en Khamba, 2008; Mathieson *et al.*, 2018; Menon, 2019)	■ Regulation: The training program is defined in the HIS Implementation Policy. ■ Managerial: Division of IT roles according to job descriptions	Arrange and develop training programs in the HIS Implementation Policy Designing clear job descriptions for IT as IT support systems and IT hardware and network support
	1. The final information generated does not meet user needs (for daily censuses).	▪ Differences in perceptions with report users and immature consolidation	(Shah, 2005)	▪ Managerial: Commitment and common understanding between management, users, and vendors Improve the quality of information	Periodic evaluation of the HIS implementation process
	2. Not all modules meet the needs of users; some are still done manually, so the work is doubled.	▪ Electronic Medical Record (EMR) is being compiled in accordance with the Minister of Health as a whole in all units, as well as the use of HIS results reports that are not optimal and the equalization of perceptions about output that has not gone well.	(Rane *et al.*, 2016)	▪ Managerial: Development of the e-medical record module	EMR module completion. Upgrade the EMR module at HIS in early June 2023.
	3. There is a computer that takes a long time to load and looks blurry.	▪ Minimum requirements that have not been met, as well as many computers that have not been turned off for days (overheating).	(Embrey, 2012)	▪ Managerial: Planning for the procurement of facilities that meet specifications	Submit a procurement request for a unit with inadequate computers.
	4. Lost data sometimes occurs with different names.	▪ External Factors: Power Outages Are Very Dominant ▪ The communication system is broken between the client computer and the server due to device failure (network, computer, electricity).	(Gackowiec, 2019)	▪ Managerial: Maintenance of UPS facilities on a regular basis Evaluation of the cooperation agreement with the State Power Plant	Uninterruptible Power Supply (UPS) maintenance program for all HIS units. Designing a periodical evaluation program of cooperation agreements with state power plants.
	5. The patient's name is stuck	▪ Human error is related to services that are not	(Ahuja and Khamba,	▪ Regulation: Increased adherence	Immediately complete the SPO draft and

Technology

Factor	Obstacles	Factors Causing obstacles	References	Proposed Strategies	Action plans
	in one of the units.	needed or are not resolved on time.	2008; Embrey, 2012)	to standard operating procedures (SPO).	disseminate it to all units.
	6. There are still double medical record numbers.	▪ Hardware: sometimes terminated suddenly; initial patient data extraction by officers who are sometimes not detailed.	(Gackowiec, 2019; Holland *et al.*, 2012; Jadhav *et al.*, 2014)	▪ Managerial: Facility maintenance Improvement of officer skills	Monitoring the accuracy of officers in implementing HIS
	7. Less flexible, there are several features that do not give access to edit data when input is wrong.	Yes. Because ideally all systems have user restrictions (user privileges), It shouldn't be a problem.	(Ministry of Health, 2022)	▪ Regulation: Providing data access for unit heads for features: moving rooms, moving beds, selecting the Doctor in Charge of the Patient (DPJP)	Determination of access rights for the head of the room (Karu) for the feature of moving rooms, moving beds, and selecting the Doctor in Charge of the Patient (DPJP) in a Decree (SK) or entering the HIS Implementation Policy
	8. Frequent power outages from the State Power Plant (PLN)	▪ Force Majeure (*unpredictable*)	(Gackowiec, 2019; Rane *et al.*, 2016)	▪ Managerial: Maintenance of UPS facilities on a regular basis Maintenance of conducive facilities Evaluation of the cooperation agreement with state power plants.	UPS maintenance program in all HIS units. Periodic evaluation of cooperation agreements with state power plants.
	9. The results of radiology photos cannot be accessed in the treatment unit.	▪ Requires the Picture Archiving Communication System (PACS) application, not the VincentCore domain.	(Akmanligil and Palvia, 2004)	▪ Managerial: Further module development bridging with the PACS application	Compilation of Long-Term Needs Plans
	10. The Medical Record Unit has no output from RL3 (RL3.1–RL3.15).	▪ The data already exists but has not been analyzed and empowered.	(Akmanligil and Palvia, 2004)	▪ Managerial: Coordination and co-development with vendors	Coordination with vendors
	11. The Integrated Patient Development Record (CPDR) is still done manually.	▪ The Electronic Medical Record Module is currently under development.	(Akmanligil and Palvia, 2004)	▪ Managerial: Acceleration of the development of the e-medical record module.	
	12. During the data input process, there were several patients who did not appear in the queue, so they could not verify and assemble	▪ Human error at the wrong service level in carrying out data entry and processing, and sometimes due to a unilateral power outage during patient check-out.	(Gackowiec, 2019; Holland *et al.*, 2012)	▪ Managerial: Skill upgrade Facility *maintenance*	

However, from the review of documents and in-depth interviews, obstacles were still found from officers who forgot the input and reflected in this statement of one of the following respondents: *"But in reality, the patient has entered, but the system has not entered yet..."(Respondent 06).*

Values

The values of honesty and responsibility form the basis and motivation for using HIS, and this shapes the behavior of officers. The results of the study show that all officers are responsible

and will honestly report to IT staff if they make mistakes in data entry that cannot be handled alone. This is related to data access rights (Widiyanto and Widayati, 2021), as stated by one respondent:

"We're contacting IT because we can't change data entry in HIS." (Respondent 24).

The results of this study were strengthened by previous study, which stated that for the sake of system security, the user's username and password could only access the module part, except for the officer in charge of the server (Pujihastuti *et al*., 2021).

Policy Leadership

The leadership's support is felt by all officers by providing the adequate infrastructure needed and ease of access to the facilities (Erlirianto *et al*., 2015), as stated by one respondent:

"Support because even though there are some that may be expensive, until now our requests have always been complied with. Yes, for the progress of HIS as well……."(Respondent 16).

Leaders are also very supportive of increasing the ability of officers by preparing IT personnel who are always available, as one respondent said:

"Yes, it provides IT who is willing to help, including one of the leadership supports, facilitating the user if there is confusion or an error; yes, there is IT to help" (Respondent 05).

Previous studies stated that the support and involvement of leaders in the process of implementing HIS would greatly affect its success (Christasani *et al*., 2021; Igiany, 2019; Lehmann *et al*., 2016).

Barriers and strategies for overcome

Document review studies and in-depth interviews found obstacles during the implementation process from officers, management, and systems, and the most dominant were officers who were less thorough and cared less, as shown in Figures 1 and 2, and one of the respondents revealed:

"The main thing is from HR…..that was not thorough, sloppy... (Respondent 10).

In line with previous studies which stated that humans, organizations, and technology are factors that influence the success of HIS implementation, the human factor is the most dominant (Christasani *et al*., 2021; Farzandipur *et al*., 2016; Igiany, 2019; Susilo and Mustofa, 2019). The obstacles encountered are used as opportunities to improve the process of implementing HIS by seeking appropriate improvement strategies to overcome these inhibiting factors. The strategy for the successful management of HIS implementation must involve all officers, both doctors and other health professionals, and leadership support (Khalifa and Alswailem, 2015). Based on the obstacles, the causes of the obstacles, and references for improvement strategies, three improvement efforts are proposed using three strategies, namely educational, managerial, and regulatory (Embrey, 2012), as shown in Table 3.

CONCLUSIONS

Users and management are the dominant inhibiting factors in the implementation of HIS. The lack of monitoring and evaluations conducted by the leadership, the unavailability of standard operating procedures and guidelines for the use of HIS, and the absence of a reward policy have caused officers to work less thoroughly and without organized discipline; consequently, they often make mistakes in data input. Improvement strategies to overcome inhibiting factors are proposed by educational, managerial, and regulatory strategies.

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