

PIECES Method for Evaluating the Management Information System in the Pharmacy Installation of Hospital X

Dinar Famora Arum^{1*}, Jason Merari Peranginangin², Ika Purwidyaningrum³
Master of Pharmacy, Universitas Setia Budi, Indonesia

Corresponding Author: Dinar Famora Arum dinarfamorafamora@gmail.com

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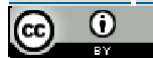
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ABSTRACT

One part of the information system in the hospital is the pharmacy sector in the pharmacy installation, which is responsible for medications in the hospital. The research conducted is qualitative using Nvivo software. Data collection was carried out through observation and direct interviews with informants in the pharmacy installation who have been using the information system for at least 1 year. The method used involved pre-test, development, and post-test with the informants. The interview guidelines use the PIECES Framework method. The variables in this method are Performance, Information and Data, Economics, Control, Efficiency, and Service. The evaluation results of the use of MIS in the pharmacy installation have several obstacles, including response time, system menus that are not yet fully functional, inaccurate drug stock data, and the absence of a report menu to assist in pharmaceutical work. The results of the evaluation after development showed significant differences between the pre-test and post-test in each variable of the PIECES method. This is because the development has addressed several issues that were problematic in the pharmacy installation. The evaluation of the management information system can be conducted periodically so that issues experienced by system users can be identified more quickly. Thus, continuous improvements can be made in the future, and the management information system used will be able to assist in the medication service process at the hospital pharmacy installation.

INTRODUCTION

The advancement of the times has created developments in the field of technology, with all systems being expected to be easily accessible and stored, and to be used more easily according to the desired needs. According to Permenkes No. 82 of 2013 regarding the hospital management information system, it is defined as a communication information technology system that functions to process and integrate all service processes in hospitals in the form of a network of coordination, reporting, and administrative procedures to facilitate the accurate and precise acquisition of information. The implementation of the Hospital Management Information System has begun to be adopted by several hospitals, as hospitals are required to improve services to the community due to the increase in hospital accreditation (Fahmi et al., 2022). The pharmacy installation is responsible for the management of medications, direct patient services, and the control of health supplies in the hospital, both for outpatient and inpatient care (Murnita et al., 2016). The management of medication in hospitals is a very important aspect of management that must be handled effectively and efficiently in order to improve the quality of healthcare services (Rumangkang et al., 2023). The use of information technology in the health sector so far has been able to help in the patient service process better related to data processing which starts from input, then process, and output in the form of information for decision-making in order to achieve a goal (Nirwana & Rachmawati, 2020). A systematic review of information systems in hospitals produces a summary of evidence from studies on health information system that have been implemented to improve patient flow in both inpatient and outpatient settings. Health information system interventions can influence patient flow and facilitate the search for patient data, documentation management, order entry, patient registration, bed management, decision support, discharge management, prescription management, and patient reporting flow (Nguyen et al., 2022). This shows that the pharmacy installation is one of the important parts of the management information system in hospitals.

This research aims to determine the evaluation results of MIS (Management Information System) usage in the pharmacy installation at Hospital X, to conduct development based on the evaluation results that have been carried out, and to determine the evaluation results after the development conducted on the MIS used in the pharmacy installation. Previous research related to the evaluation of management information systems has been conducted in several hospitals, but there are various key aspects that will be evaluated concerning the management information system used. In this study, an evaluation was conducted in the pharmacy installation because no evaluation had been carried out since the implementation of the management information system. Previous research that has been conducted using the same method includes: Evaluation of the registration information system at Kasih Ibu Hospital Surakarta (Arif et al., 2019), Analysis of the Hospital Management Information System at RSU Dr. H. Koesnadi Bondowoso (Dinata & Deharja, 2020), Evaluation of the hospital management information system in the research unit (Alfiansyah et al., 2022), Evaluation of user satisfaction with the performance of the Hospital

Management Information System (SIMRS) at HL Manambai Abdulkadir (Fahmi et al., 2022), Evaluation of user satisfaction with the hospital management information system at Wates General Hospital (Ferdiana & Pramono, 2024).

LITERATURE REVIEW

Evaluation within a system is used as an effort to understand the actual condition in the use of information systems, so that it can be identified and further actions can be taken to improve performance and facilitate its implementation (Putra et al., 2020). Evaluation of MIS (Management Information System) can be conducted using the PIECES Framework method. The important aspects that will be analyzed using this method are Performance, Information and Data, Economics, Control, Efficiency, and Service. The reason for using this method is that it can conduct a complete and thorough evaluation, allowing for the identification of the strengths and weaknesses of the information system used (Romahdoni dan Winardi, 2021). Another advantage of using this method is that it is widely used in research within companies or organizations, as it is easy to understand and does not require a large amount of data (Baiti et al., 2023). PIECES is a method that uses a framework to measure the value of whether a variable applied to a system and related to information systems in service quality is good or not (Aditya & Jaya, 2022).

METHODOLOGY

The research conducted is a qualitative descriptive observational study. This research was conducted based on ethical approval issued by the Health Research Ethics Committee of the Faculty of Medicine, University of Muhammadiyah Malang with No. E.5.a/053/KEPK-UMM/III/2024. Data collection was conducted through direct observation and field interviews using the PIECES Framework. The subjects of this study are pharmacists, pharmaceutical technical staff, and pharmacy staff working in the Pharmacy Installation. The sampling conducted in this study used the purposive sampling technique, which involves qualifying the samples used in the research. The sample used consists of pharmacy staff who have been involved in the operation of the management information system for at least one year, totaling 20 people. The variables used in this study are 6 in accordance with the method employed. The variables are Performance, Information and Data, Economy, Control, Efficiency, and Service. Data collection was carried out through direct observation and interviews with all qualified staff. The method used began with a pre-test evaluation based on variables, development based on the results of the pre-test evaluation, and a post-test evaluation to determine the impact felt after the development was carried out on the system in the pharmacy installation. The validity of the data was ensured using triangulation techniques. This technique involves checking data from various sources using different methods and at different times. The triangulation technique consists of 3 types, namely source triangulation which is used to test data credibility by checking data obtained from several sources (Hernawati, 2017). In our research, we conducted interviews with all staff in various job positions. Technique triangulation is used to test data credibility by checking data from the same source but using different techniques;

in the research, observation, interviews, and documentation techniques were employed. Time triangulation is used to test data credibility by checking data through interviews, observations, or other techniques but at different times or situations. In the research, data collection was conducted at different times, in the morning, afternoon, and evening. The data processing carried out includes data reduction, presentation, and conclusion drawing. Data reduction is the activity of summarizing, selecting key points, focusing on important matters, and noting them carefully and in detail (Hernawati, 2017). Data reduction carried out in this study includes data transcription and data coding. Transcription is the activity of transferring data from recordings into written form completely without altering, reducing, or adding any information contained in the recordings. The transcription process uses Ms. Word and data coding is done with Nvivo 14. The coding was done using nodes in Nvivo 14, where the codes were adjusted according to the themes or codes in the PIECES method. The presentation of data is based on the results of reduction presented in the form of narratives, charts, tables, and coverage values obtained from the Nvivo software output. The conclusion is drawn after the data presentation activities.

RESEARCH RESULT AND DISCUSSION

Overview of the Management Information System in the Pharmacy Installation

The management used was created by a vendor and has been in use since 2019. Management information system is used to carry out all processes in the pharmacy unit, both for drug management and patient services. All staff in the pharmacy unit have a username and password to access the MIS, but there are access restrictions for each user. This management information system will be connected to other units, making it easier to provide services to patients. The staff in the pharmacy unit who participated in this study numbered 20 people who met the criteria for the research.

Results of the Management Information System Evaluation

Based on the evaluation results conducted on the management information system in the pharmacy installation, results were obtained for each variable. The results of direct observations and interviews conducted with all pharmacy staff using the management information system in the pharmacy installation will be displayed in the table below, showing the conclusions presented by the 20 individuals involved in the research.

Table 1. Evaluation Summary Results

Variable	Indicator	MIS (Management Information System) in Pharmacy Installation
Performance	Throughput	MIS in the pharmacy installation is known to provide accurate results, but several issues have been found, such as hardware problems that prevent printing, and sometimes the number of labels printed does not match the number inputted.
	Respon Time	The MIS at the pharmacy installation has issues with the system software and hardware. Disruptions in response time can be caused by the server

	Audability	The MIS in the pharmacy installation has already provided the appropriate data, such as medication history and drug stock, but a new menu is still needed to improve further.
	Communication Prevalence	MIS in the pharmacy installation provides a different menu display due to differences in tasks and responsibilities.
	Completeness	The MIS in the pharmacy installation can be used well by the users and all functions can be utilized.
	Fault Tolerance	The MIS in the pharmacy installation can be easily used if there is an error in input and data editing is performed.
Information and Data	Data Accuracy	MIS in the pharmacy installation for data accuracy often has inaccuracies in stock quantity
	Information Relevance	MIS in the pharmacy installation for data accuracy is often inaccurate regarding stock quantity. MIS in the pharmacy installation can generate data that can be used to assist in tasks such as inputting medication in the online BPJS pharmacy
	Information Presentation	MIS in the pharmacy installation can help provide information that can be used in medication services.
	Data Flexibility	The MIS in the pharmacy installation can have stock added if the data does not match, so that posting the medication can still be carried out.
Economics	Reusability	The MIS in the pharmacy installation can connect with each other so that the stored data can be used with other applications, such as for BPJS claims and online pharmacy filling.
	Resources	MIS in the pharmacy installation can help and reduce the workload in managing and providing medication services to patients
Control and Security	Integrity	MIS in the pharmacy installation can be used by users who have a username and password.
	Security	MIS users in the pharmacy installation have access restrictions, so not all users can use all menus.
Efficiency	Usability	MIS can be easily used by users.
	Maintability	The MIS in the pharmacy installation will be repaired by the hospital IT team either online or offline, depending on the level of damage to the MIS.
Service	Service Accuracy	MIS in the pharmacy installation will help users be meticulous in providing services to patients.
	Reliability	The data generated by the MIS can be trusted, but sometimes the stock may not be accurate.

Source: Primary Data, 2024

Data analysis on the variable was conducted using the Nvivo 14 application by coding with the PIECES variables. Further analysis of the PIECES framework conducted in previous research concluded that a thorough examination of the information system is key to achieving organizational goals (Asro et al., 2024). The Performance Dimension explains that the importance of a good information system is measured through key indicators such as speed, reliability, and availability. The information and data dimension shows that high-quality and availability of data are very important to support effective

decision-making in order to improve services. The Economics Dimension explains the importance of the relationship between costs and benefits in information system investments so that organizations can allocate resources effectively. The Control and Security Dimension explains the importance of managing information security risks to protect sensitive data from threats. The Efficiency Dimension explains the importance of eliminating operational barriers that can disrupt the performance of information systems. The Service Dimension explains the importance of designing information systems that are responsive and easy for users to use in order to enhance overall experience and satisfaction (Asro et al., 2024).

Performance variable plays an important role in assessing the reliability of a system in processing and managing data so that the data can produce the expected information (Indrawati et al., 2019). Based on the research results on the performance variable, it can be concluded that the MIS used can provide information well but still has some constraints on the throughput and response time indicators, so it cannot yet provide accurate and quick information for decision-making in the pharmacy installation. This is in line with previous research which states that an information system in a hospital must be able to provide ease of operation and overcome obstacles in serving patients. An information system cannot operate automatically, so supporting devices that are already embedded in the hospital's server are needed (Molly & Itaar, 2021). Information and Data is an important variable to be assessed because it involves information needed by system users (Dinata & Deharja, 2020). Based on the research results, it shows that the data generated by the system is sometimes not accurate. The data in the system should provide accurate data to help in making decisions to improve services. In previous research by Wirajaya and Nugraha 2022, it was stated that SIM is needed to obtain adequate information support and can reduce uncertainty and the risk of making incorrect decisions. Uncertainty that is well-processed will produce useful, precise, and accurate information that can be accessed by all parties involved (Suriani et al., 2023). Economy is one of the variables used to identify includes the budget costs used for system repairs and system development (Alfiansyah et al., 2022). In this variable, the management information system used has shown good results in terms of cost and benefits. A MIS that can connect with systems in other parts will facilitate service and reduce the workload of system users. Integrated SIMs will support effective and efficient healthcare services (Andriani et al., 2022). Control and Security is one of the variables used to identify integrity and security. A system should be equipped with good controls and security measures so that outsiders cannot enter and disrupt the existing system (Indrawati et al., 2019). Based on the research results, it has been found that the system is protected by the presence of passwords and usernames for each user, with limitations according to their respective duties and responsibilities. This is in line with the statement that a system with access restrictions can be based on the division of labor among officers, aiming to prevent information from being misused by irresponsible individuals (Nirwana & Rachmawati, 2020). Efficiency is one of the variables used to identify usability and maintainability. The identification of

these two variables aims to assess the ease of use of the information system. According to Hanif 2019, a system must be easy to use for both novice and experienced users (Alfiansyah et al., 2022). Based on the research results, it can be concluded that MIS can be easily used by users and there is always assistance from the information technology team to help if there are any obstacles in its use. Service is one of the variables used to identify accuracy and reliability. Identification of this variable is used to determine the level of service provided by the information system in relation to user and customer satisfaction, as well as the service produced by the system used (Dinata & Deharja, 2020). Based on the research results, it can be concluded that MIS can assist users in performing their tasks and the data generated can be trusted, but it is only occasionally inaccurate regarding stock. This is in line with the statement that the direct use of SIM can be utilized to provide services to patients, which can affect the satisfaction of patients, employees, and management (Pujihastuti et al., 2021).

The use of NVivo 14 software to assist in the coding process using nodes and cases. Nodes are variables created according to needs that will facilitate coding. The number of informants who submit answers referencing the nodes along with other supporting data (source) and the number of interview excerpts quoted referencing the nodes (reference) can be displayed during the coding process using NVivo software with nodes (Pratitis et al., 2023). The sources used in the software are a storage of various data sources that will be used as references, so the sources used are interview transcripts conducted with staff in the pharmacy installation and several documentations such as drug request books, printed prescriptions and labels, stock card data, and drug request card data. From the aforementioned source, references will be obtained from the abundance of information used as a reference from excerpts of interviews with staff in the pharmacy installation, which have been categorized based on variables. Therefore, the more excerpts from one informant that point to a particular variable, the more references will be obtained.

From the results of the coding data analysis conducted at the pharmacy installation using the PIECES method with the Nvivo 14 application, percentage coverage values were obtained. The highest percentage coverage value is shown in the performance variable with a value of 20.90%, information and data with a value of 18.74%, economy with a value of 7.67%, efficiency with a value of 6.71%, control and security with a value of 4.37%, and service with a value of 2.82%. According to Aulia & Jasilah 2019 in Pratitis, 2023, the higher the percentage coverage value of a variable, the more frequently that variable is mentioned in the interview process. It can be concluded that the variable most frequently mentioned by users during the interview is performance, which is related to throughput or the results produced by the system that often experience discrepancies and issues with response time that frequently encounter disruptions at certain hours due to server system constraints. The variable of information and data ranks second because users often complain about discrepancies related to the accuracy of drug stock data, which necessitates a longer process during service to first adjust the available quantities.

Table 2. Percentage Coverage Variabel

No	Variable	Source	Reference	Percentage Coverage (%)
1.	Performance	22	178	20,90
2.	Information and Data	22	139	18,74
3.	Economy	20	102	7,67
4.	Control and Security	20	60	4,37
5.	Efficiency	20	99	6,71
6.	Service	19	47	2,82

Source: Primary Data, 2024

The next analysis conducted on the obtained data is through matrix coding query. where the analysis is conducted on nodes with nodes. The analysis aims to examine the relationship between nodes and nodes from the interview transcript. This analysis is conducted on nodes by performing an analysis to see the relationship between one variable and other variables. The results obtained are as follows:

Table 3. Matrix Coding Query (Nodes dan Nodes)

Variable	Performance	Information and Data	Economy	Control and Security	Efficiency	Service
Performance	179	27	4	3	5	1
Information and Data	27	138	3	0	2	0
Economy	4	3	102	1	1	0
Control and Security	3	0	1	60	0	0
Efficiency	5	2	1	0	99	0
Service	1	0	0	0	0	47

Source: Primary Data, 2024

The table above shows that there are statements made by the informants referring to several variables. Several variables indicate that they are interconnected with each other, for example, the performance variable refers to the information and data variable 27 times, control and security 3 times, economy 4 times, efficiency 5 times, and service 1 time. The variable information and data refer to the economy variable 3 times, efficiency 2 times, and performance 27 times. The economy variable refers to control and security, efficiency, information and data, and performance. The control and security variable refers to economy and performance. The efficiency variable refers to the economy, information and data, and performance variables. The service variable only refers to the performance variable.

System Development in the Pharmacy Installation

Based on the evaluation results that have been conducted, it shows that the MIS being used still has many obstacles, so development needs to be carried out so that the MIS used can better assist in performing tasks in the pharmacy installation. System development can have two meanings either creating a new system to completely replace the old system or improving the existing system (Wahyudin & Rahayu, 2020).

Table 4. Results of the Evaluation of Management Information System Constraints

No	Problem Indikator	Problem Explanation	Development Needed	Follow-up Recommendations
1.	Respon Time	There are issues when inputting or searching for data at certain hours.	The development with the addition of servers is expected to address the response time issue	This development is expected to address network constraints during service.
2.	Data Accuracy	The data produced is not yet accurate between the stock card and the real data.	The addition of a menu for stock consolidation is needed	This menu will help in updating the stock in real-time
3.	Information Presentation	MIS has not yet been able to provide the required reporting menu.	A menu is needed for reports on the use of narcotics and psychotropics and antibiotic A batch number and expiration date menu are needed for the procurement and service departments.	This menu will make it easier to control usage and facilitate data retrieval for reporting This menu will help with searching for items if needed.

Source: Primary Data, 2024

The development of SIM using the prototype method is a process that can be used to assist in software development by creating models for the software (Fridayanthie et al., 2021). The prototype method allows for interaction between developers and customers during the system development process (Saputra et al., 2023). This flowchart will illustrate the processes occurring within the system. The process begins with logging in using a username and password to maintain the security of the system from unauthorized parties. The next process will involve the acceptance process carried out by pharmacy staff in the warehouse, followed by the distribution process to the appropriate units. After the drugs are distributed, the drug dispensing process will occur according to the request data and prescription data. The next process is the creation of reports related to drug usage. The report on drug usage is written and made in detail. The report will assist users in providing information related to the medications used. The drug usage report will be used as planning data for drug procurement, and the process will end with a log out.

The development carried out involves adding a consolidation menu. Using this menu is quite easy, just click on the menu, then select either outpatient or inpatient, and then click on stock consolidation. The process will continue until it reaches one hundred percent, and the stock data will be adjusted. The new menu added in the development is the report. The report created is a report on the use of drugs for psychotropic narcotics and antibiotics. This report will facilitate drug control in the pharmacy installation because it can be easily read with classification according to its pharmacology. The report results that can be accessed automatically from the system can be downloaded, making it easier to

read and can be easily printed out if needed. Based on the evaluation results, not all the reported issues can be addressed. This happened due to several considerations from the hospital's side. The aspects that cannot be developed are the response time issues caused by network constraints and server disruptions, as well as the presentation of information related to batch numbers and drug expiration dates, which also cannot be developed yet because it requires changing the existing system setup in the pharmacy installation.

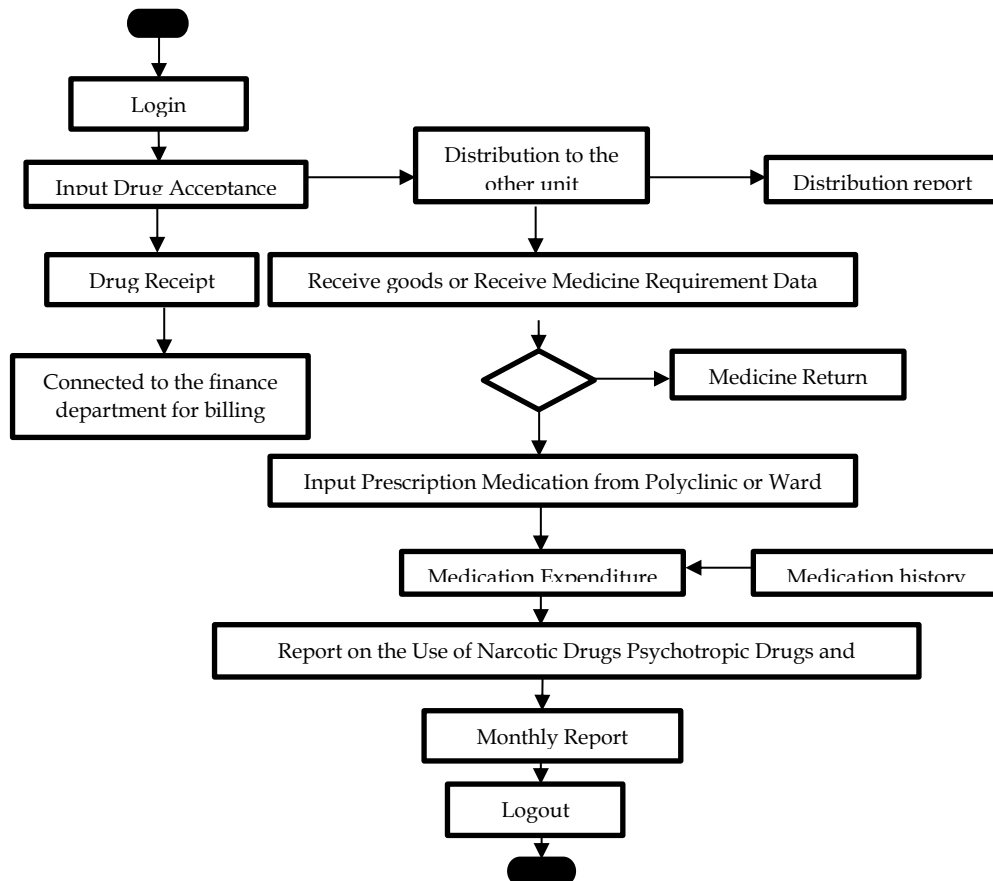


Figure 1. Flowchart Data

Evaluation of the Management Information System After Development

After the development, an evaluation was conducted using the post-test method to determine the results experienced by users after the development. The method used is the same as the previous pre-test, namely by conducting direct observation and in-depth interviews. In the post-test that was conducted, all informants were given the same questions as in the pre-test, but with additional questions related to the developments that had been made in the pharmacy installation. Based on the results of the post-test evaluation, it can be seen that the development can help users with the issues previously mentioned during the pre-test. The accuracy of the data, which was previously a frequently mentioned issue, has been improved with the development of the stock consolidation menu. All users can feel the results, but access is still limited because only the head of the installation can access it. The development of report creation can also assist

users who have tasks in report creation. The report creation selected for development in the MIS is also based on the value of the needs required in the quality indicator report, where reporting is very much needed at this time.

Table 5. Percentage Coverage Variabel After Development
 Source: Primary Data, 2024

No	Variable	Source	Reference	Percentage Coverage (%)
1.	Performance	22	312	32,01
2.	Information and Data	22	157	22,60
3.	Economy	20	123	10,82
4.	Control and Security	20	104	6,47
5.	Efficiency	20	105	7,50
6.	Service	18	50	4,04

From the results of the data analysis conducted at the pharmacy installation on pharmacy staff using the PIECES method with the Nvivo 14 application, percentage coverage data was obtained in table 5. The highest percentage coverage value is shown in the performance variable at 32.01%, which remains the most frequently mentioned variable as in the pre-test. This is because the use of management information systems in the pharmacy unit will affect the throughput or results produced by the management information system or the output generated. The results of the interviews indicate that the management information system provides usable results and assists in the process of drug management and service in the pharmacy installation after development has been carried out. The variable of information and data with a value of 22.40% becomes the second variable because the development carried out affects the accuracy of data and the presentation of information, making it better after the development. The economy variable with a value of 10.82% because the development will affect resources, making it easier for users who are responsible for creating drug usage reports. The control and security variable with a value of 6.47% experienced an increase in value from the pre-test evaluation, although the development did not affect this variable, it was mentioned quite frequently due to the limited access to the report menu, which can only be opened by pharmacy staff who are responsible here. The efficiency variable, with a value of 7.50%, also experienced an increase compared to the pre-test because the development also influenced this variable due to the initial training before using the new menu. The service variable with a value of 4.04% also experienced an increase because the development significantly influenced the medication service provided by the pharmacy installation.

CONCLUSIONS AND RECOMMENDATIONS

The evaluation results of the use of MIS in the pharmacy installation have several obstacles that affect pharmaceutical services in the pharmacy installation. The proposed development is the addition of a stock consolidation menu and reports (narcotic and psychotropic drug usage report and antibiotic usage report). The results of the evaluation after the development showed a significant difference between the pre-test and post-test in each variable of the PIECES

method. This is because the development has addressed several issues that were problematic in the pharmacy installation, such as data accuracy and the need for a medication usage report menu.

The results of the evaluation that have not yet undergone development can be used as a temporary guideline to address the issues experienced by users of the management information system in the pharmacy installation, such as response time and the addition of batch number and expiration date menus. The evaluation of the management information system can be conducted periodically so that issues experienced by system users can be identified more quickly. Thus, continuous improvements can be made in the future, and the management information system used will be able to assist in the medication service process at the hospital pharmacy installation

ADVANCED RESEARCH

The evaluation results that have been conducted cannot be fully implemented due to many considerations from the hospital regarding the development carried out. The research only employed qualitative methods, where the evaluation results were derived solely from user perspectives conveyed descriptively or in narrative statements, thus not yet able to show quantitative results regarding the use of MIS. Mixed methods, combining qualitative and quantitative approaches, can be used for future research so that the results obtained will be more comprehensive.

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