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Incident Reporting Development: PaSIR (Patient Safety Incident Reporting) System for Better Patient Safety

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A B S T R A C T

Patient safety is a global issue in the health sector, including the issue of COVID-19 transmission in hospitals. Patient safety indicators can be analyzed through incident reports. Incident reports as a primary data source, are important as a basis for quality improvement and patient safety. The electronic-based reporting system is seen as more effective to provide convenience in reporting incidents. This study aims to develop an electronic-based incident reporting system by involving users. The electronic-based incident reporting system is named PaSIR (Patient Safety Incident Reporting). The PaSIR system has functions for reporting, analysis, feedback, and presentation of incident report profiles. In addition, the PaSIR system provides facilities for monitoring incident reports in real time.

Kata kunci:

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Sistem Rekomendasi
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A B S T R A K

Keselamatan pasien menjadi isu global di bidang kesehatan, termasuk isu penularan COVID-19 di rumah sakit. Indikator keselamatan pasien dapat dianalisis melalui laporan insiden. Laporan insiden sebagai sumber data primer, penting sebagai dasar peningkatan mutu dan keselamatan pasien. Sistem pelaporan berbasis elektronik dipandang lebih efektif untuk memberikan kemudahan dalam pelaporan insiden. Penelitian ini bertujuan untuk mengembangkan sistem pelaporan insiden berbasis elektronik dengan melibatkan pengguna. Sistem pelaporan insiden berbasis elektronik ini diberi nama PaSIR (Patient Safety Incident Reporting). Sistem PaSIR memiliki fungsi untuk pelaporan, analisis, umpan balik, dan penyajian profil laporan insiden. Selain itu, sistem PaSIR menyediakan fasilitas untuk memantau laporan insiden terkini.

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INTRODUCTION

National government regulations in Indonesia (Minister of Health Regulation No. 11 of 2017 concerning Patient Safety) require all hospitals to make incident reports and monitor remedial efforts. Monitoring of documented improvement efforts in the incident reporting system. Reporting incidents voluntarily as evidence of the implementation of patient safety efforts in hospitals. Patient safety is an effort to provide safe care to patients (Zwart, 2011). Reports are the main pillar of incident disclosure and prevention of second incidents (Youngberg, 2010). Reports are the main pillar of incident disclosure and prevention of second incidents (Youngberg, 2010). For this reason, managers need support in implementing a non-punitive reporting culture, this is the key to the success of the incident reporting process.

Incident report management is used to study events that demonstrate poor patient safety practices, such as incidents caused by infection or adverse drug reactions, as a way to explore patient safety in hospitals (Lindfield, Knight, & Bwonya, 2015). To improve the culture of reporting incidents, it is necessary to develop an electronic incident reporting system that is in accordance with user needs (Budi, Hapsara, Tetra, & Lazuardi, 2021).

Based on the study of incident report documentation in a regional hospital in Yogyakarta, Indonesia, there were several groups of reported incidents, namely identification errors, officer communication, drug services, surgical services, risk of infection, risk of falls, and facility management. The current condition, the number of reported figures has decreased since the start of the reporting culture (in 2016), as shown in Figure 1.

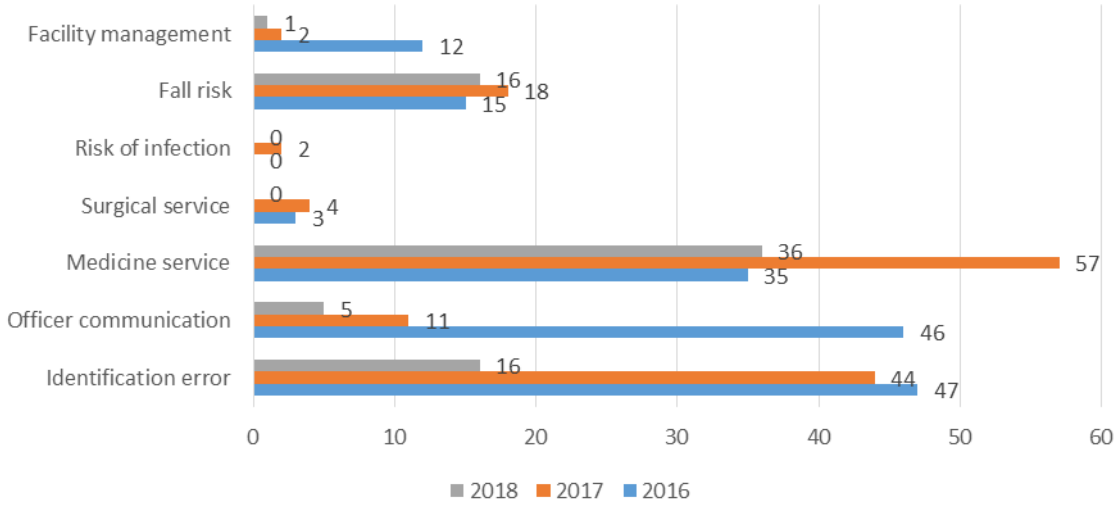

Figure 1. Trends in Number of Incident Reports

Figure 1. reported incidents related to misidentification, respectively, from 2016-2018 are 47, 44, and 16 cases. This reporting rate has decreased due to several factors, namely: [1] difficulty for staff to find forms to report incidents; [2] feedback system that does not reach the staff concerned; [3] monitoring the flow of complex report management; and [4] the existence of the incident report analysis team is not in one room, making it difficult to coordinate.

These causal factors are considered the importance of developing an electronic-based incident reporting system. In another study, to improve the reporting culture, reporting can be done by telephone, mail, or online and allows it to be made anonymously, and the quality manager team is always ready to carry out analysis of incoming reports through an agreed method (Youngberg, 2010). Information technology facilitates incident reporting systems. This electronic system replaces the paper-based reporting system to improve incident reporting and improve patient safety. Contributions of electronic incident reporting systems include increasing the number of reported incidents, immediate reporting time (less than 48 hours), ease of reporting, and notification of incidents (Elliott, Martin, & Neville, 2014).

One of the regional hospitals in DIY, Indonesia, has developed an electronic-based incident reporting system by involving staff to get input on the system concept according to user needs. This article aims to develop an electronic incident reporting system based on user needs in hospitals.

METHOD

Research design

This type of qualitative research with the Research and Development (R&D) method is the most appropriate method to conduct this research. The research was carried out in stages, starting from the identification of user needs, system design, and implementation of system development.

Informants

The research subjects were the patient safety team, ward nurses, hospital information technology staff, and ward chief. Informants needed for interview data collection were 1 head of the ward and 10 nurses in the ward, 1 nurse in charge of incident reports, and 3 patient safety team members. The subjects of the FGD were 15 nurses, 1 Information Technology (IT) officer, 2 ward chief, 2 hospital training teams, 3 patient safety teams, and 2 board of directors.

Data collection and data validity

Methods of data collection using interviews, documentation studies, observation, and Focus Group Discussion (FGD). The research instruments were an interview guide, observation spectrum, documentation study checklist, and direct FGD.

Data analysis

Researchers conducted qualitative data analysis starting from data reduction, data presentation, leveraging and drawing conclusions (Miles, 1994). The process of analyzing qualitative data uses the Atlas.TI 8 application. This study uses a triangulation method to ensure the validity of the research data. Triangulation as one of the strategies used in qualitative research to test the validity of the data through the convergence of information from various sources (Carter et al,).

This study protocol was approved by the Local Medical and Health Research Ethics Committee (Ref: KE/FK/1182/EC/2018).

RESULTS AND DISCUSSION

Identification of User Needs of Electronic Incident Reporting System

System development is carried out by involving users in each stage which aims to get a match with user needs (Jawahar, n.d.). The development of an incident reporting system takes into account the characteristics of user behavior, tasks to be done, organization, and system environment (Holden & Karsh, 2014). Users of the electronic incident reporting system are all staff in the hospital, even patients or families are expected to participate in reporting incidents encountered (Vincent, 2007).

The development of an electronic incident reporting system is a necessity to increase the effectiveness of incident report management. Electronic incident reporting involving staff is a solution for improving patient safety in hospitals (Ferroli et al., 2012). Staff is involved in the need identification process for consideration in the system development process. Identification of the need for an electronic-based incident reporting system is carried out through Focus Group Discussion (FGD) activities. Based on the results of the FGD analysis, the following is the identification of user needs for the system to be designed.

The system is designed to provide a fast reporting function by filling in 5 important data related to incidents that can be accessed via android communication tools and can be reported without limits of place and time. The five data are time, location, group of events, units, and actions taken to resolve incidents. WHO developed a tiered reporting system consisting of a minimal information model, an intermediate information model, and a complete information model (Department Health Republic of South Africa, 2017). Reporting with a minimal information model is used to capture incident data, without losing the opportunity to report (Armitage et al., 2018). The ease of reporting incidents quickly is facilitated by accessing reports through the internet network, but access through this network is not integrated with patient data in hospitals. This is done for reasons of patient data security.

The system is designed to provide integrated facilities with the hospital's health information system to search for patient data affected by incidents, this facility is accessed by the hospital's local network (intranet). System technical specifications are prepared to integrate incident reporting systems with existing electronic systems (Elkin, Johnson, Callahan, & Classen, 2016). The advantage of electronic systems is integration with other systems so that the work system becomes more effective.

To complete data entry in the incident report (up to a simple investigation sheet), staff must use the local network (intranet) in the hospital. The system is designed so that staff who have submitted reports cannot save or read any more incident reports. This is done to ensure data security, considering that incident reports are confidential and sensitive. Electronic reporting systems have a better confidentiality system than manual reporting (the report lies on the table and allows who I accidentally read the report) (Elliott et al., 2014).

The system is designed to provide editing facilities to complete reports that have been submitted by staff so that the reports submitted are clearer. This function is owned by the person in charge of the report and the patient safety team. For the patient safety team, facilities are provided to edit incident reports at the hospital level. The system is designed to provide an incident report validation function by chief of the ward. This validation process can be delegated to the person in charge of the report, after coordinating with chief of the ward. The dual examination process requires expertise to be able to explore the chronology of incidents (Hewitt, Chreim, & Forster, 2016). Middle-level managers are the most appropriate people to carry out a double-check process that can prevent a second incident from occurring.

The system is designed to provide an incident report analysis function according to its level, for the person in charge of the report and chief of the ward in each room, while the analyst team and the board of directors can perform analysis of hospital incident reports, including the root cause analysis process. The results of the root cause analysis process carried out by experienced experts as a form of feedback to staff who have reported incidents (Benn et al., 2009).

The system is designed to be able to carry out the analysis process with the facility of downloading incident reports, displaying tables and graphs of incident reports, and for the analyst team to download hospital incident reports in excel format. The system is designed to provide facilities for report feedback, conveying assignments from the board of directors to the head of the room. The system is designed to provide a facility to report back on improvement efforts that have been made by the head of the room. This facility is expected to a form of effective incident report monitoring. The system has an administrator function that can view the system from all access rights. This is to anticipate the occurrence of errors in the system.

The system is designed with the hospital identity display at the top of the reporting system, storing incident case data that has been previously reported, adding incident case data, and risk grading matrix assessment is carried out automatically by entering impact and probability incident data.

The identification of user needs in the electronic incident reporting system can briefly be seen in Table 1. The results of the identification of user needs are the basis for the design of the electronic incident reporting system.

Incident Reporting System Flow Analysis

Based on the results of observations in the room, the incident reporting process starts from the discovery of cases by staff. Based on hospital policy, staff can report incidents anonymously to ensure a sense of security from punishment. based on studies, anonymous incident reporting is an alternative to increase the number of incident reports (Jang, Choi, & Kim, 2017).

The staff writes a report to be submitted to the person in charge of the report in the room. The person in charge of the report in the room is in charge of confirming and completing the incident report so that the report can reflect the conditions of the incident in detail. Based on other studies, the detailed contents of the incident report include the identity of the reporter, the identity of the patient, a description of the incident, the results of the analysis of the report, and recommendations for preventive measures (Kanda, 2011).

Next, the head of the room with the person in charge of the report validates the report. The person in charge of incident reports monitors incident reports at the room level, while the patient safety team and director monitor incident reports at the hospital level. The results of other studies prove that the incident report monitoring system has proven to be effective in improving patient safety (Elkin et al., 2016). Middle-level managers in this case the head of the room have a very important role in the process of monitoring incident reports.

Table 1
Identification of Electronic Incident Reporting System Needs

No	Component	Description
1.	Data structure	1. Hospital identity
		2. Components of an incident reporting system (JCI)
2.	Function	1. Quick reporting
		2. Complete reporting
		3. Confirm and complete the report
		4. Simple investigation
		5. Validation
		6. Verify
		7. Report analysis
		8. Analysis of the risk grading matrix
		9. Downloading analysis results report
		10. Feedback system
		11. Documentation of the root cause analysis process
		12. Assignment of remedial efforts
		13. Report back to the board of directors
		14. Monitoring of room-level and hospital-level incident reports
3.	Interoperability	Hospital medical record information system
4.	System security	1. System security
		2. Access rights
		3. Password
		4. Data backup
		5. Restriction of internet network access rights, specifically for fast reporting
	Data confidentiality	1. Whistleblowers are allowed to report in an anonymous format
		2. Whistleblower cannot read the incident report that has been submitted
		3. Staff in room can't access incident report in different room

The patient safety team receives a report that has been validated by the officer in the room. The director receives the results of the analysis of incident reports from the patient safety team for decision-making on remedial measures. Feedback is provided from the patient safety team to the ward head for process improvement. The function of feedback is as evidence of follow-up to incident reports (Kang & Gong, 2017).

The flow analysis of the incident reporting system is considered in the development of an electronic-based incident reporting system. Administrator staff can monitor the incident reporting process in the electronic system to ensure the system runs smoothly (Figure 2).

Incident Reporting System Design

Based on the results of the research that the system design stage was developed based on procedures and collected data requirements for the development of a better electronic system (Bourgeois, 2019). The purpose of this design stage is to convert all requirements into detailed specifications that cover all aspects of the system (M. Langger, 2016).

Before designing a reporting system, several things must be considered regarding the hospital's readiness to develop a new system. The results of the analysis of research data found that there are four aspects of economic feasibility as the basis for developing an electronic incident reporting system, the first is that the hospital has subscribed to the domain. The second analysis is that the hospital is already using a hospital information system (in Indonesia it is called SIMRS) for health data management. The third analysis of each room has a computer with an intranet network. The fourth analysis is that the registration system can be done online.

The development of this system takes into account the system specifications that can be synchronized with the information system in the hospital. Based on the results of the system analysis, the new system can be developed with specifications using a programming language in the form of html, css, php, or javascript. For local network connection use xampp application. The database used is mysql. Programming framework using open source with yii2 with deredency with comroser. Web browser using google chrome, opera, or firefox. The web server used uses the apache 2 application.

Use case diagrams are used to describe system functionality that describes interactions between users in an incident reporting system that will be designed based on an analysis of user needs. The electronic-based incident reporting system is designed to have functions to report incidents, view reporting guidelines, enter the incident reporting system, display analysis results, display analysis

results in the form of graphs, view the system's initial dashboard, and functions to manage the system.

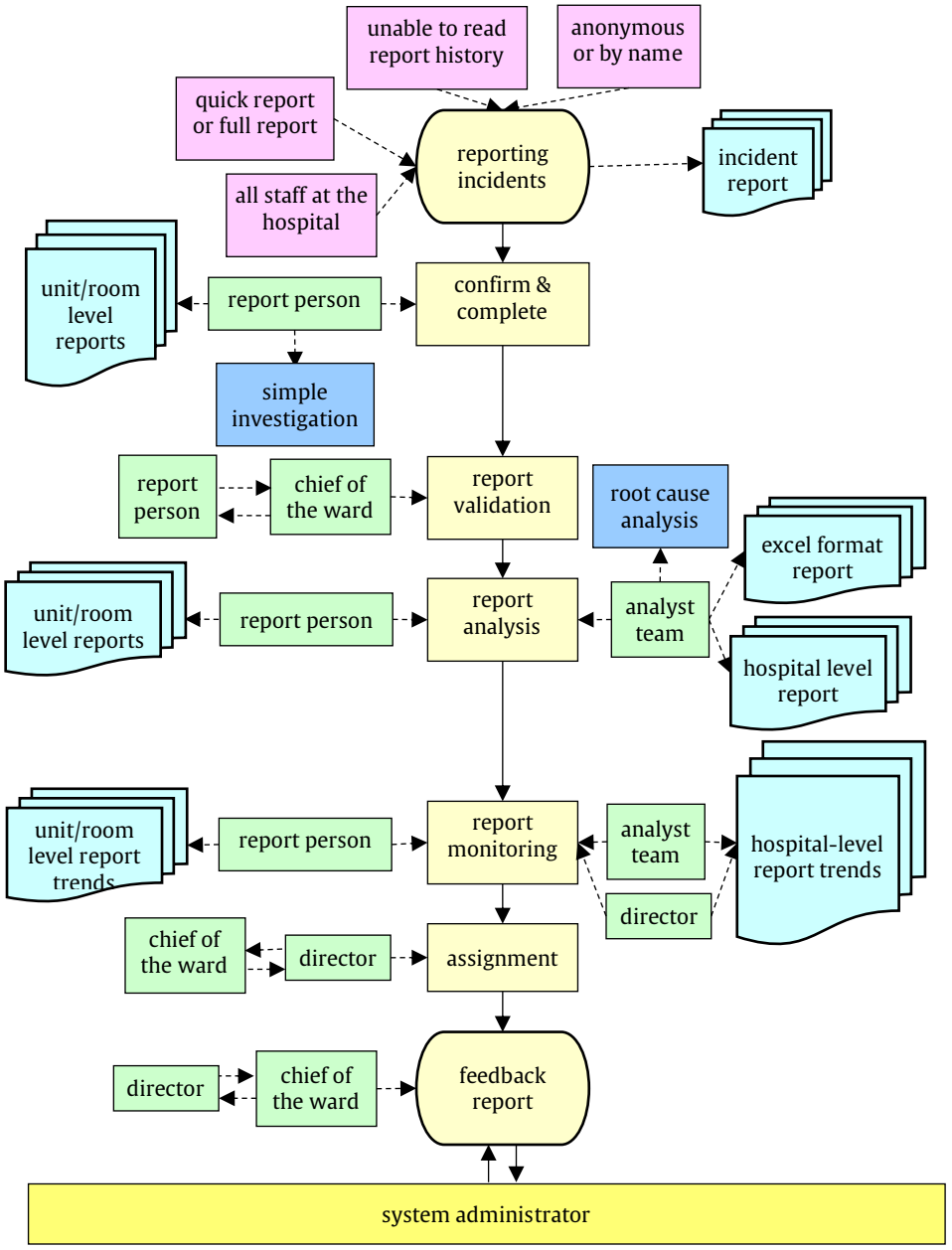

Figure 2. Incident Related to Communication

Based on the analysis of user needs, the development of an incident reporting system is designed in a database diagram. The database design with a description of the relationships between tables is presented in Figure 3. In the database table the relationships between entities are carried out through Primary Key (PK) or Foreign Key (FK). Primary key (PK) as a unique entity connecting between tables, while Foreign key (FK) as a second unique entity to connect with other tables.

Implementation System development

The system development process requires human, financial, and technological resources that can implement system development according to the planned specifications (Jawahar, n.d.) .). Computer code programming is developed according to the system specifications identified at the system design stage. The design of the user interface, database, input and output of reporting data is developed in this stage (Bourgeois, 2019).

The programming result is a database which is managed using the phpMyAdmin application which first activates the XAMPP application. The database that has been created is presented in Figure 4. This incident reporting system is named "PaSIR". The name "PaSIR" is taken from the abbreviation for Patient Safety Incident Reporting. The process of naming is also through discussion with users. An acronym that is easy to remember and reflects an incident reporting system, which is expected to simplify the socialization process to all users, thus simplifying the implementation process.

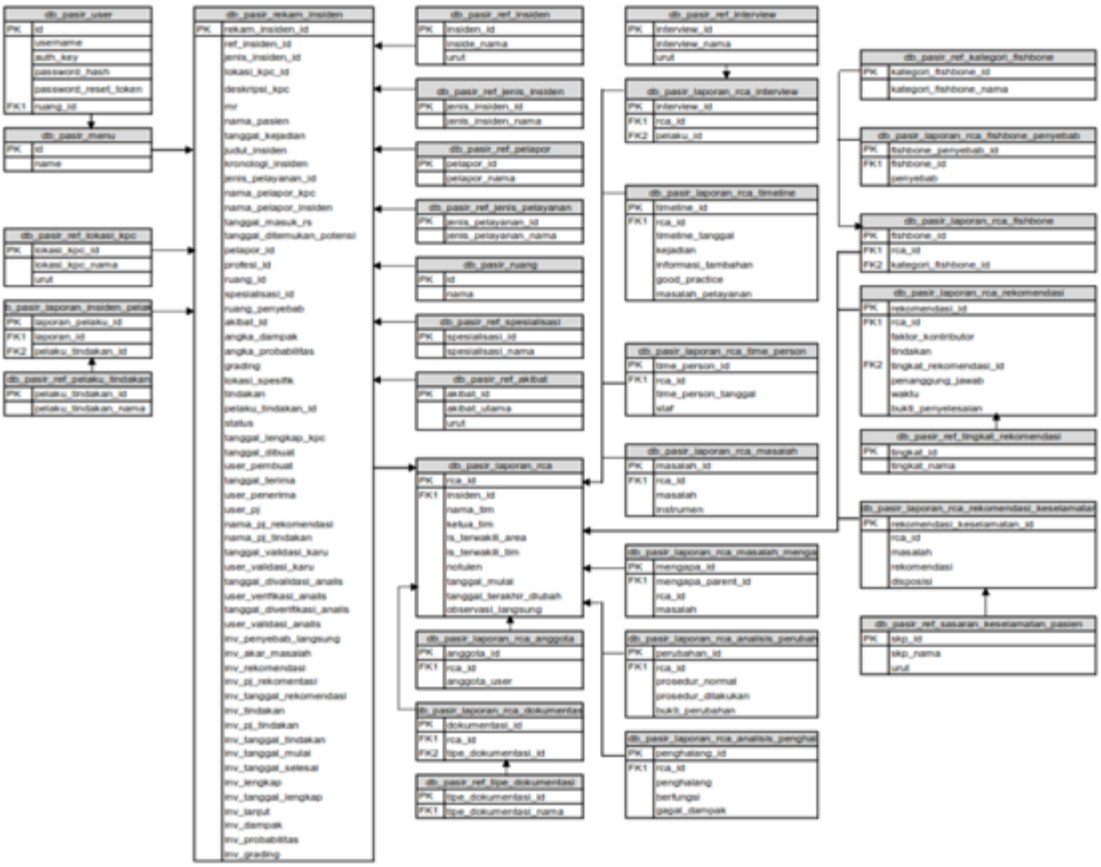

Figure 3. Relationship between tables in the PaSIR system

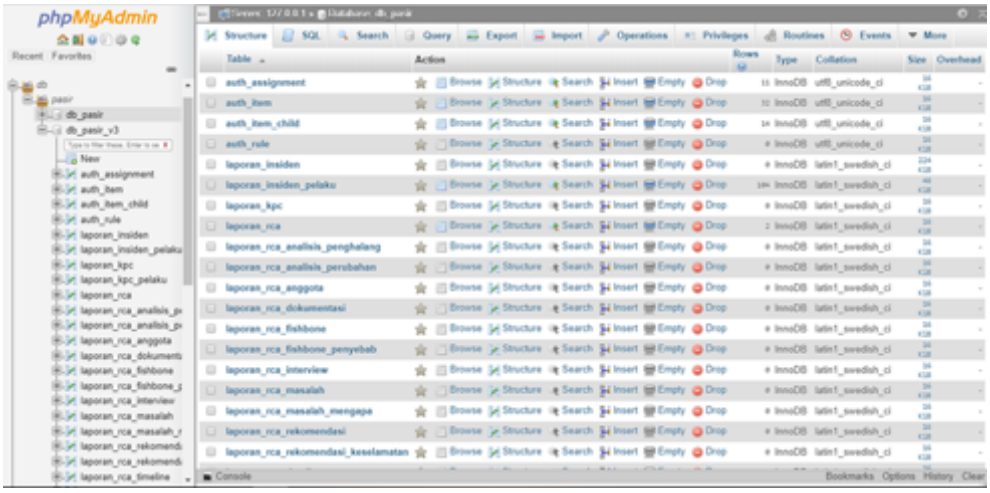

Figure 4. PaSIR Database

The relationship between the PaSIR system and SIMRS in hospitals is presented in Figure 5. The PaSIR system has five security system guarantee mechanisms. The first security system mechanism is to use a user name and password. The second security system mechanism is a fast reporting system that can be accessed by a network outside the hospital not connected to SIMRS.

The third security system mechanism is simrs connected when the PaSIR system is accessed using the hospital intranet. The fourth security system mechanism is that the complainant only has access rights to report incidents. The fifth mechanism of the security system is limiting user access rights, according to the tasks that have been given. In another study, the incident reporting system used two security systems, namely synchronization of internet portal addresses (IP) and previously registered passwords (Reed et al., 2014).

The PaSIR system was developed with an effective and attractive interface (Figure 6-11). The socialization was carried out through the Facus Group Discussion process from

the room representatives in the hospital. The system profile is socialized in the form of a video uploaded on a YouTube link to facilitate the socialization process.

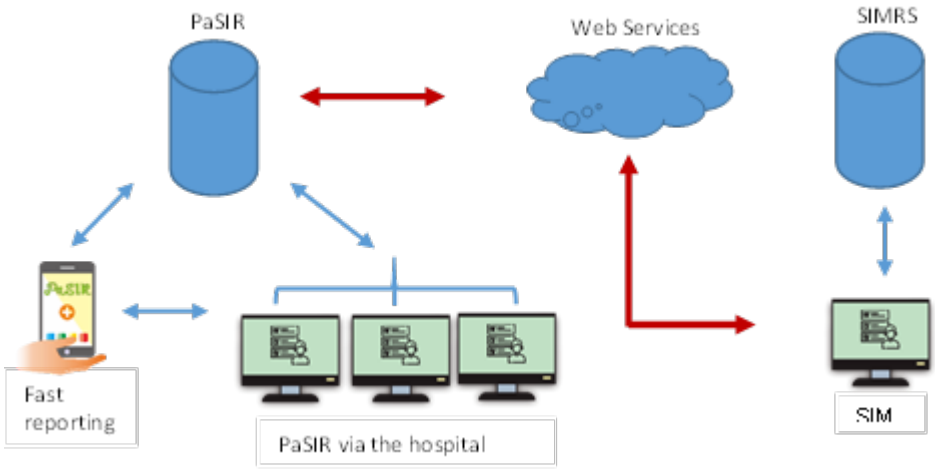

Figure 5. Relationship between PaSIR and SIMRS

Figure 6. Incident Report Menu

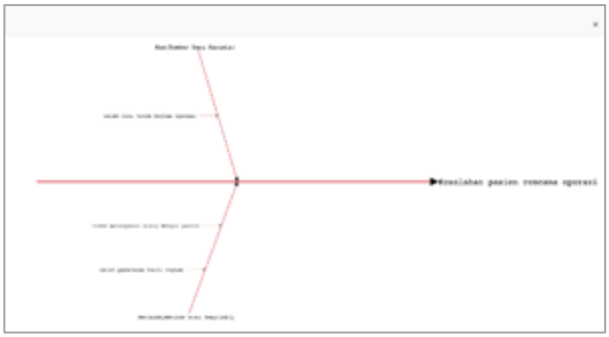

Figure 9. Display of Root Cause Analysis Results

Figure 7. Display of Incident Grading

Figure 10. Display of Incident Report Monitoring Timeline

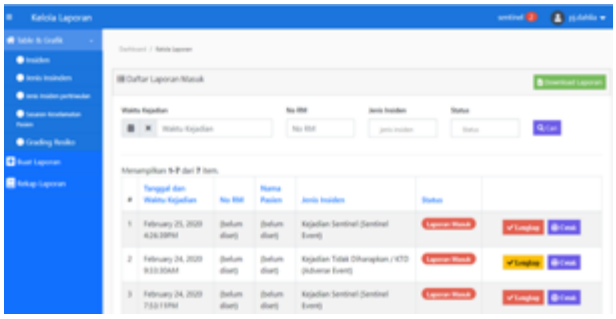

Figure 8. Display of Incident Report Register

Figure 11. Display of Incident Report Presentation

CONCLUSION

The PaSIR system was developed by involving users. The system provides facilities to facilitate the process of incident reports. The PaSIR system is an incident reporting system that can be used for incident reporting, incident report monitoring, feedback system, and root cause analysis documentation. The PaSIR system is appropriate to be applied in all hospitals for efforts to improve patient safety through the incident report process.

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