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Designing Integrated Patient Safety Incident Reporting with Hospital Information System

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A B S T R A C T

Incident reporting systems are designed to obtain patient safety information that is used for organizational and individual learning. Currently, the recording of patient safety incident reports has been facilitated by the ministry of health through the implementation of the quality of health facilities, especially for incidents with unexpected events (KTD) or sentinels. Incident recording in hospitals is still very weak, so incident data cannot be analyzed properly and correctly to improve the quality of hospital services. This study aims to design an Integrated Patient Safety Incident Reporting Information System (SIPIKAT). The design of SIPIKAT uses the Systems Development Life Cycle (SDLC) method with the Framework for the Application of System Techniques (FAST). In-depth interviews and Focus Group Discussions (FGD) were conducted to obtain the necessary data. This web-based SIPIKAT is designed using PHP 5.6 and Javas-script, MySQL database, and Apache web server. SIPIKAT integration with Hospital Information System (SIMRS) via web service to retrieve patient identity data including name; date of birth and medical record number. The output is in the form of incident report information and risk grading to be followed up. Conclusion SIPIKAT Research is easy to use and generates information on risk aggregation required for follow-up.

Kata kunci:

Sistem Informasi Pelaporan
Keselamatan insiden
Sistem informasi rumah sakit

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A B S T R A K

Sistem Pelaporan Insiden Keselamatan Pasien dirancang untuk memperoleh informasi tentang keselamatan pasien yang digunakan untuk pembelajaran organisasi dan individu. Saat ini, pencatatan laporan insiden keselamatan pasien telah difasilitasi oleh kementerian kesehatan melalui penerapan mutu fasilitas kesehatan, terutama untuk insiden dengan kejadian tak terduga (KTD) atau sentinel. Pencatatan insiden di rumah sakit masih sangat lemah, sehingga data insiden tidak dapat dianalisis dengan baik dan benar untuk meningkatkan kualitas pelayanan rumah sakit. Penelitian ini bertujuan untuk merancang Sistem Informasi Pelaporan Insiden Keselamatan Pasien Terpadu (SIPIKAT). Perancangan SIPIKAT menggunakan metode Systems Development Life Cycle (SDLC) dengan Framework for the Application of System Techniques (FAST). Wawancara mendalam dan Focus Group Discussion (FGD) dilakukan untuk mendapatkan data yang diperlukan. SIPIKAT berbasis web ini dirancang dengan menggunakan PHP 5.6 dan Javas-cript, database MySQL, dan web server Apache. Integrasi SIPIKAT dengan Sistem Informasi Rumah Sakit (SIMRS) melalui web service untuk mengambil data identitas pasien termasuk nama; tanggal lahir dan nomor rekam medis. Outputnya berupa informasi laporan insiden dan risk grading untuk ditindaklanjuti. Kesimpulan Penelitian SIPIKAT mudah digunakan dan menghasilkan informasi tentang agregasi risiko yang diperlukan untuk tindak lanjut.

INTRODUCTION

World Health Organization (WHO) estimates that 1 in 10 hospital patients experience an injury from hospital services. Every year 15% of hospital expenses are wasted on dealing with unexpected events. More than one million patients die each year from surgical complications. Inaccurate or delayed diagnosis affects care and endangers a number of patients.(Oyebode, 2013)

In 2019, the Indonesian Ministry of Health recorded a total of 7,310 Patient Safety Incidents (IKP) which were divided as follows: KNC (Near Injury Events) with 2,421 incidents, KTC (Non Injury Events) with 2,463 incidents and Unexpected Events (KTD) or sentinels as many as 2,463 2,426 events. From the results of the report, as many as 5,405 did not result in injuries, 167 minor injuries, 421 moderate injuries, and 85 serious injuries and 233 died or were sentinel (Kemenkes, 2019). There were 7,465 cases in 2019, consisting of 171 deaths, 80 serious injuries, 372 moderate injuries, 1183 minor injuries, and 5,659 no injuries.(Daud, 2020)

In Indonesia there are 1,227 accredited hospitals, but only 668 incidents were reported in 2016 nationally. Based on the results of Daud's report (2020) in 2019 only 12% of 2,877 hospitals in Indonesia reported patient safety incidents, with a total of 7,465 patient safety incident reports. This number consists of 38% near death, 31% non-injury, and 31% unexpected events.(Daud, 2020)

Barriers that often occur in reporting patient safety incidents include: lack of knowledge of how to report incidents(Dhamanti, Leggat, & Barraclough, 2020); reporting system is too complicated and lacks functionality because it is not anonymous (Soydemir, Seren Intepeler, & Mert, 2016); limited time to report due to many patients and high workload of nurses(Ridelberg, Roback, & Nilsen, 2014); and staff do not understand how incident reporting works in practice (Sujan, 2015).

Conventional recording and reporting through patient safety incident report sheets is suspected as a factor causing the data conditions as above. For this reason, it is necessary to design an information system that helps in recording and reporting patient safety incidents electronically.(Palojoki, Pajunen, Saranto, & Lehtonen, 2016) The existence of an information system that is user-friendly and as needed can assist in the collection, processing and analysis of patient safety incident data as well as making real-time reports that will stimulate the use of information in patient safety incident management.(Saleem, Paulus, Vassiliou, & Parsons, 2015) This study aims to design an Integrated Patient Safety Incident Reporting and Analysis Information System (SIPIKAT) which is integrated with the Hospital Information System to facilitate reporting.

METHOD

The research was conducted at Panti Wilasa Citarum Hospital Semarang in July-August 2021. As the unit of analysis and the end user of SIPIKAT is the Hospital Patient Safety Team (T-KPRS). The design of SIPIKAT uses qualitative research with a framework for system analysis, design and implementation activities, namely SDLC (Systems Development Life Cycle) with the FAST (Framework for the Application of System Techniques) framework. The FAST method consists of 8 stages, namely 1) Preliminary Study; 2) Problem Analysis; 3) Needs Analysis; 4) Decision Analysis; 5) Design; 6) Build a new system; 7) Implementation; and 8) Operation and support.(Whitten, 2001) Data collection methods were carried out through in-depth interviews and Focus Group Discussions (FGD). In-depth interviews with 7 selected respondents related to integrated patient safety incident reporting, namely: 1) Supervisory Board; 2) Hospital Director; 3) Hospital Quality Committee; 4) Hospital Patient Safety Team; 5) Head of Inpatient Care Room; 6) Head of Polyclinic; and 7) Head of Pharmacy Installation. Analysis of data from interviews and FGDs using content analysis.(Landauer, 1988)

RESULTS AND DISCUSSION

The design of the system aims to provide a general overview to the user in making a new system design to facilitate the processing of patient safety incident data, so it is hoped that the application made is better than before.

The research results will be described in accordance with the SDLC stages with the FAST Framework, namely:

1) Preliminary Study; 2) Problem Analysis; 3) Needs Analysis; 4) Decision Analysis; 5) Design; 6) Build a New system; 7) Implementation; and 8) Operation and support.

Currently, the recording of patient safety incident reporting at Panti Wilasa Hospital Semarang is done manually (paper-based) which causes: reporting redundancy, data is often inconsistent; reports that should be 2x24 hours late; analysis and ratings of late incidents make interventions late and difficult to carry out; data updates are not real time; processing and data analysis is still less accurate. The results of the study related to the completeness of recording and reporting patient safety incidents at Panti Wilasa Citarum Hospital Semarang, the data for patient safety incident reports in 2020 were 457 reports, where in this study 409 (89.50%) data were used. Of the 409 report data analyzed, the completeness of the data includes names (initials); medical record number; date of birth; and age group, obtained 4 (0.98%) without a medical record number listed; and 409 (100%) had no date of birth and 249 (60.88%) late for reporting.

The problem with the input component is that patient safety incident reporting is still conventional with the incident report form, but there are 2 types and it has not been integrated with other existing applications such as SISMADAK, SIMRS, etc. Fill in the incident report form which must be complete with the following data: name (initials) of the patient; patient's medical record number; age (year, month, day); and the determination of age groups, so that perceptions can be different, as stated by the following respondents:

> "...the incident reporting has been running even though sometimes the staff's perception is still different, ..." (Respondent 4)

> "...the application has not been integrated with SISMADAK, ..." (Respondent 4)

The process of collecting patient safety incident data starting from the service unit/work unit to the KPRS Team is still done manually with the help of available applications such as spreadsheets and word, as revealed in the following in-depth interview:

"... if the report is done manually with an application that has word/excel and the date of the report can be set but it will be a hassle too..." (Respondent 1)

The problem with the output is that Patient Safety Incident reports are routinely made, but are often too late. The Risk Rating is still manually calculated so it is often inaccurate and only comes down to incident reports and simple investigations. Innovation has not been carried out in optimizing existing data, for example by monitoring and reviewing so that it will accelerate the next intervention, as stated by the following sources of information:

"... expected realtime data, but only until simple reports and investigations." (Respondent 4)

The result of collecting data about the required system requirements is a system that is easy to use, fast, accurate, complete as needed and integrated. This is revealed from the following interview results:

"... the service must run and the tasks of many mosoks must be disturbed by making reports continuously... if indeed a SIM can be made, especially if it has been integrated with the service process, it will be easier for the authorities to see, that's to be expected...". (Respondent 1)

The goal to be achieved in the development of SIPIKAT is the availability of a database and the processing of these basic data automatically so as to produce incident information in hospitals with only one entry. This patient safety incident report information can be used for: learning and planning for faster and more accurate incident handling; intervention to manage patient safety incidents more quickly; generate risk ratings quickly and precisely; produce patient safety incident reports to parties outside the hospital (board of supervisors and ministry of health) in a timely manner; Simultaneous and real-time data updates into all patient safety incident reports.

At the stage of determining the requirements, information is obtained that the reporting of patient safety incidents includes: 2 x 24 hour internal reporting; incident reporting should be analyzed to rank incidents with low (blue), moderate (green), high (yellow) and extreme (red) ratings; The results of the incident ranking must be followed up by the hospital as follows: low rating (blue) with a simple investigation and must be completed by the unit concerned within 1 week, medium rating (green) with a simple investigation and must be completed by the unit concerned within 2 weeks weeks, high (yellow) and extreme (red) ratings must be completed by further investigation and Root Cause Analysis (RCA) within 45 days; reporting to the Ministry of Health through the National Committee for Patient Safety 2x24 hours online for incidents with the category of unexpected or sentinel events. Information on patient safety incidents in the design of SIPIKAT in hospitals according to the guidelines for reporting patient safety incidents, namely: 1) determining the type/category of incidents including Unexpected Events (KTD) including Sentinels, Potential Injury Events (KPC), Near Injury Events (KNC) and Incidents Not Injured (KTC); 2) determination of probability of occurrence (Probability); 3) determination of impact value (consequences); and 4) Determination of Risk Rating (Risk Grading).

The system needed is one that can be integrated with existing hospital applications and can be used by related units in integrated incident reporting either through an available local network (LAN) or online via the internet network and can process data automatically and in real time so as to produce output as expected.

The use case diagram is a description of all the actors and interactions of the Patient Safety Incident Reporting Information System. Figure 1 shows that the system consists of 3 user categories, namely admin, user and director. Admin and user are active actors while director is passive actor. The admin role as the main manager of the system can assign access rights for each user, and all modules in the system including deleting data. Users consist of the head of the unit and/or the KPRS Team, whose role is to manage incident data including inputting patient safety incident data (IKP) every time there is an incident, printing incident report data, grading and re-grading incidents, and following up on incidents in the form of simple investigations and investigations. carry on. The director has access rights to view patient safety incident data and determine the follow-up plan.

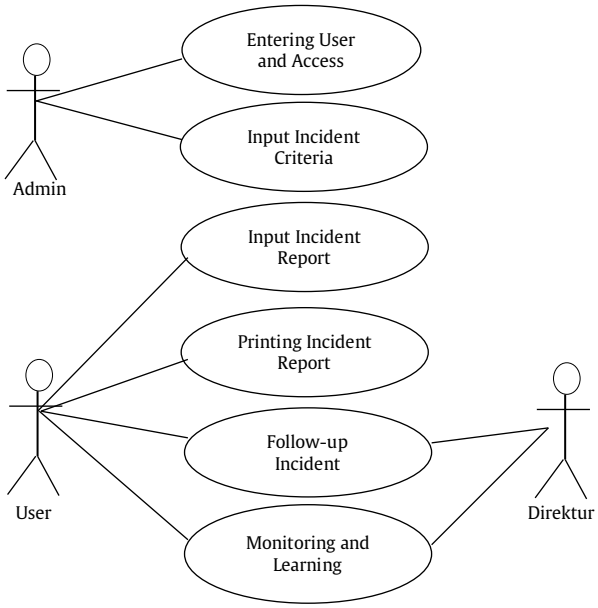

Figure 1. Use Case Diagram

Figure 2 shows an Activity Diagram that describes the workflow of each sector. This picture describes all the activities performed by the user on the Patient Safety Incident Reporting System. The Activity Diagram describes the activities carried out by the Admin on the system. Users are required to enter a username and password before being able to access the data. The system will check whether the username has been registered and the password has been entered correctly. If it is not correct then the user is required to repeat to enter the username and password.

SIPIKAT which will be developed is web-based for the back end system and Android-based for the front end system. To make it easy to use and solve existing problems, SIPAKAT will be integrated with the SIMRS application with a web service connection. SIPIKAT will optimize the use of patient safety incident information in the form of individual or aggregate information. Incident information can be used for learning and monitoring incident risk factors early on, while aggregate information can be used to support decision makers in determining more precise and targeted planning related to patient safety incident risk control.

The context diagram shows the flow of data flowing from the source entity to the process entity and the destination

entity. Activities start from patient data entities that are already available at SIMRS include the patient's name, date of birth, medical record number, then the data obtained is processed in SIPIKAT to produce age (years-months-days) and age groups stored in the SIPIKAT database. Next, the user completes the form related to patient safety incidents which will be reported to T-KPRS as monitoring and evaluation material for patient safety incidents.

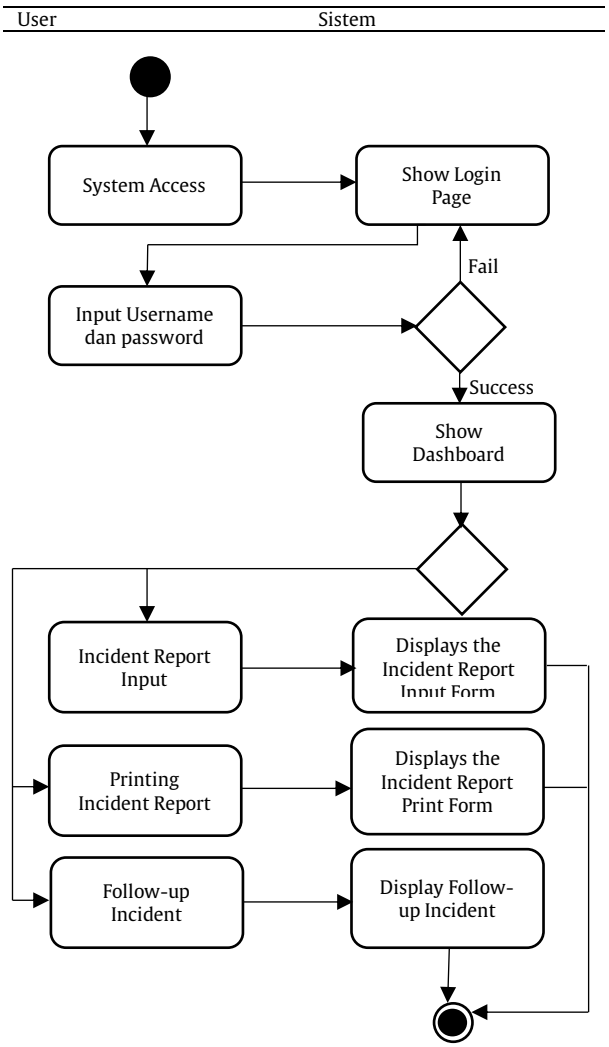

Figure 2. Activity Diagram

The data flow diagram is contained in the Work Unit, this is where incident data is recorded in the patient safety incident form. After entering the report data, the process is continued at the T-KPRS for re-grading to determine the incident rating and follow-up according to the results of the re-grading. Then the system generates incident information. If the incident is an adverse event (including sentinel), T-KPRS enters the incident report data into the Health Service Facility Quality application that has been provided by the Ministry of Health.

Database design is the process of changing the data requirements described above into the entity form described in an Enhanced Entity Relationship (EER) on the system to be built. This Patient Safety Incident Reporting Information System accommodates the need to store Patient Safety Incident Report (IKP) data. The database in the system that was built is described in Figure 3. This database is a single unit but is shown separately so that it is easy to understand the entities and attributes according to their respective uses.

The SIPIKAT design is an Information System built with PHP 5 Scripting Language and JavaScript as well as a MySQL database. This application is designed for web and android based by utilizing the Apache web server as a supporter and compiled with web2apk software to compile into an android version. The technology needed to operate SIPIKAT, namely Hardware and Software: 1) Laptop/PC: Intel Pentium Core i5; OS: Multiplatform (eg Windows, Linux); Memory 4GB; Monitor Resolution 1024 x 768; Google Chrome browser, 2) Tablet: Android Jelly Bean OS; 7" screen.

System testing is done by black box technique. Tests are carried out on each page by executing the display using test data and checking the functionality of the page.

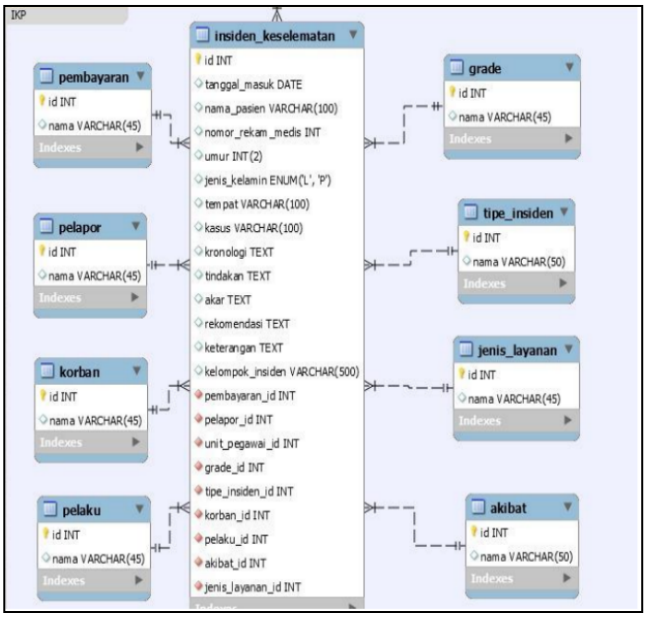

Figure 3. IKP Database Design

DISCUSSION

SIPIKAT is a web and android-based application designed to collect IKP report data, process, analyze and present IKP data, is part of a thesis research entitled Design of an Integrated Risk Management Information System to Support the Implementation of Health Service Risk Management at Yayasan X Hospital. Features -SIPIKAT features consist of: Login; Patient Safety Incident Report Data Form; IKP Report Data Input Form; Search Patient data; IKP Report Regrading Form; Simple Investigation Data Form; Advanced Investigation Data Form and Root Cause Analysis (RCA) Form. Each user has been given an ID (username and password) to log into SIPIKAT.

Login

The user enters the username and password that has been owned then clicks on the Login button.

Patient Safety Incident Input

Through the Patient Safety Incident Report module, this system facilitates the user to enter incident report data,

including the patient's identity by entering the medical record number on tab 1 then pressing the search button to the right of the column. This step will display data on the patient's name, RM number, date of birth, age and age group taken from patient data at SIMRS.

Pada tab 2 merupakan rincian kejadian sesuai pedoman pelaporan insiden keselamatan pasien. User harus mengisi data secara lengkap termasuk memilik skor dampak dan skor probabilitas. Setelah data disimpan maka otomatis insiden telah dilakukan grading. User dengan hak akses Tim KPRS harus melakukan Regrading untuk memastikan apa yang harus ditindaklanjuti baik dengan investigasi sederhana atau investigasi lanjut.

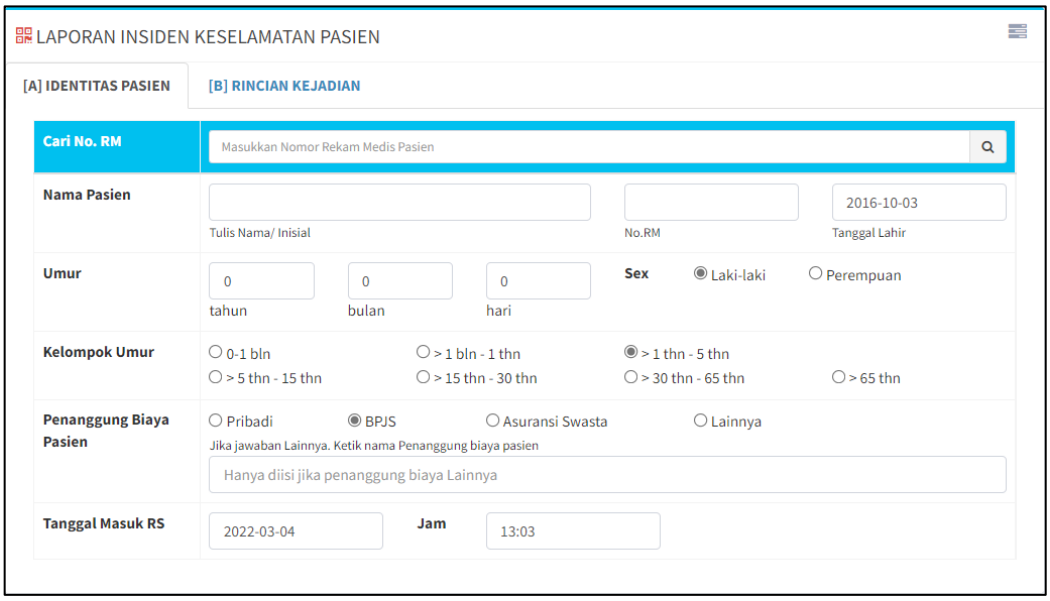

Figure 4. IKP Report Data Display

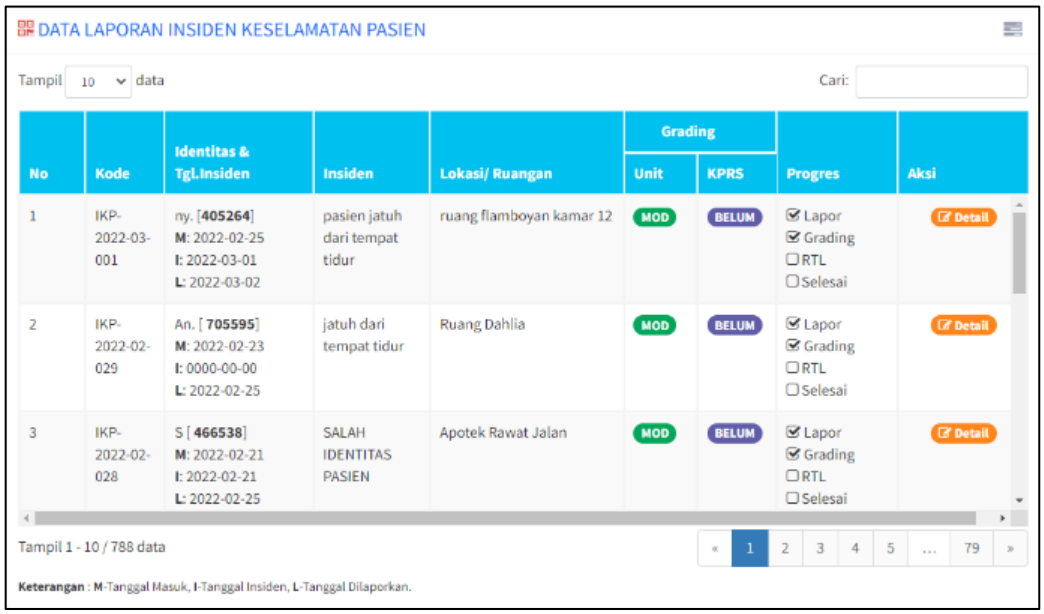

Figure 5. IKP Report Data Display

Investigation

The Investigations module is divided into two (2) namely simple investigations for green and blue grading, advanced investigations for yellow and red grading. From the regrading process, the results of the grouping of the investigative model are obtained.

Report

Once an incident report data entry, the user can automatically display or print reports, both reports in the form of a patient safety incident report form every time there is an incident or a list of incidents that have been reported in the Incident list both monthly and annually. Thus the user

does not need to manually recapitulate the data and the accuracy of the data is guaranteed.

System Test

The results of system testing carried out by black box techniques determine whether the expected results are in accordance with the output of the system. If when testing the system that has been made and designed there is a discrepancy, maintenance will be carried out. The following are the results of the system that has been designed, namely: (1) login page, (2) entry page for incident reports and integration of patient data with the SIMRS application in the hospital, (3) risk re-grading page, (4) page a simple investigation, (5) a further investigation page, (6) a printed page of the incident report form in the form of a printout that can be seen by the user and the KPRS Team, (7) an incident report page in the form of a printout that can be seen by the user and the KPRS Team, and (8) page to display a patient safety incident grading analysis chart.

The test was carried out in the Panti Wilasa Citarum Hospital environment involving 4 categories of actors namely the Admin user, Unit Head, KPRS Team and Director with results in line with expectations and making it easier to report and analyze patient safety incidents.

The results of the feedback by 10 respondents who did the test were 85% satisfied with the development of the Patient Safety Incident Reporting Information System at Panti Wilasa Citarum Hospital Semarang.

CONCLUSIONS AND SUGGESTION

This study developed a Patient Safety Incident Reporting Information System at Panti Wilasa Citarum Hospital to answer the problems faced by the hospital. SIPIKAT provides convenience in reporting Patient Safety Incident data and ease in finding Patient Safety Incident data. This system also displays monthly patient safety incident report data in the form of printouts that can be seen by the user and the KPRS team. In addition to the features above, other features such as simple investigations and further investigations make it easier for users to follow up on the results of incident grading.

User feedback from the SIPIKAT test, from 10 respondents spread over 3 user categories, 85% were satisfied with the system development.

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Conflict of Interest Statement

The authors declared that no potential conflicts of interest with respect to the authorship and publication of this article

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