Development of Risk Management Information System (SIMRISK) for Prevention and Monitoring of Work Safety in Hospital

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Abstract

Risk management in hospitals must be implemented to minimize risks that threaten the occupational safety and health of hospital human resources, patients, patient companions and hospital visitors, Hospital management has difficulty in collecting information, delays in reporting, inaccurate and incomplete data, difficulty storing data, difficulty in accessing data and manual reporting and recording are some of the problems in the current risk management information system. The research objective is to develop a risk management information system to assist in reporting and recording risk management, work accidents, hazardous and toxic material inventory and occupational disease. The research method is qualitative with a research and development design, the information system development method uses the waterfall method with the stage needs analysis, system design, implementation system and verification system. the results of this study found that there are problems in collecting, tracking, analyzing and following up on decision making. Needs analysis to development of risk management information system with features that facilitate data input, speed up the report process start with the flow of occupational health safety responsible officer to making reports and verified by doctors and occupational health and safety committees, producing output risk management reports, work accident reports, hazardous and materials inventory reports and occupational illness reports. The conclusion of this study is that risk management information system has a positive impact on data processing related to safety and health so that the data is available to be used as a basis for decision making and determining OHS priorities in hospitals

Keyword: Accident, Illness, Hazardous, Hospital, Toxic material

INTRODUCTION

The importance of occupational safety in hospitals is to ensure the safety and health of hospital workers, patients, patients' families and visitors. Hospitals are health care facilities that have a high risk of threatening the safety of many people. Hospitals implement physical, biological, chemical, ergonomic and psychological risk management. Risk control solutions aim to mitigate risks so that they are acceptable and do not result in accidents that harm the hospital such as cost losses, obstruction of services and other losses (Hayat et al., 2023).

Occupational accidents have a material adverse impact on hospitals because they hamper productivity, performance of hospital workers, provide negative perceptions, loss of patient confidence and other losses. The potential incidence of occupational accidents in hospitals are needle sticks, mild to severe injuries, contracting diseases, exposure to blood, back pain, scratches, burns, ergonomic disorders and other incidents. Preventive efforts are needed to control risks and prevent the occurrence of accidents or similar accidents.

Management steps in preventing accidents through the implementation of risk management stages with the contribution of various parties starting from the stages of communication and consultation, context setting, hazard identification, risk analysis, risk evaluation, risk control monitoring and review (Anjaswarni et al., 2022; Istih et al., 2017). The stages of risk management can be maximized with the development of a risk management information system that helps communication, monitoring and evaluation of assessments.

Risk management requires the contribution of various parties in supporting the creation of a safe, healthy hospital and the realization of zero incidents. obstacles found when implementing risk management are the lack of involvement of hospital workers, communication difficulties in reporting incidents, the absence of data that supports risk management, difficulty monitoring follow-up, difficulty in coordination between work units. The development of a risk management information system is a forum to assist the communication and consultation process, the risk management information system is used to enter risk identification data, assist risk analysis and conclude risk evaluation, and can be utilized as an incident monitoring tool, control follow-up results and review data related to the effectiveness of risk management control measures. (Bando et al., 2020; Maria et al., 2015)

The use of information technology can assist in recording and reporting (occupational health and safety) OHS, one of the efforts to maximize the role of information technology is through the development of reporting, recording, and decision support information systems. development of risk management information systems to support work safety in hospitals by assisting data input, processing and output, facilitating data search, maintaining data security and assisting decision making (Adibi et al., 2012; Hastuti., 2020; Firmansyah et al., 2022).

Problems with the OHS information system in hospitals based on several studies state that the OHS information system in hospitals is paper-based which is done manually with a complex reporting flow and takes a long time, difficulty in storing report archives, errors in filling out forms, incomplete forms, and various other technical errors in reporting and recording (Hastuti et al., 2020).

Based on a literature search, it is known that the development of OHS information systems in hospitals has so far only focused on reporting and recording after incidents occur, so there is no data support in efforts to prevent and monitor OHS incidents (Hikmah et al., 2021; Adna., 2022; Sutejo., 2021). It takes the development of a risk management information system for incident prevention through risk mitigation, the risk mitigation stages begin with risk identification, risk assessment and risk control so that the data is available for management to use in decision making (Kemenkes, 2016; Najihah et al., 2023).

Risk management reporting and recording in hospitals can assist in efforts to prevent workplace accidents through identifying sources of danger, conducting risk assessments so as to prioritize hazards and risks that must be mitigated immediately, determining appropriate control measures based on the risk control hierarchy. The obstacles experienced include difficulties in inputting hazard types, difficulties in determining the risk assessment matrix, difficulties in calculating risk assessments and difficulties in determining appropriate risk control suggestions. The development of risk management information also can be use to report and record work accident, hazardous inventory, occupational illness (Yulisman et al., 2022). The risk management information system developed is not only limited to digitizing reporting and recording but can be used as a decision support system (Mustofa., 2023; Pascarella et al., 2021).

Based on the above background, this study aims to develop a risk management information system to assist in risk management reporting, work accidents, hazardous and materials inventory and occupational illness as a digitization effort and as a decision support system.

METHODS

This study uses a research and development design with qualitative methods used to identify needs in developing risk management information systems. Research location at Diponegoro National Hospital, Semarang City, Indonesia. The time of this reaserach start from september 2023 - january 2024. The research instrument used interview guidelines to find out problems, identify needs, reporting constraints, determine the type of data, research subjects with the main informant was the secretary of the OHS committee and hazardous and toxic material staff and the triangulation informant was the head of the OHS committee. The information system development method uses the waterfall method with the following stages (Saherman et al., 2023).

Requirements analysis is a stage to identify user needs and software specifications for the benefit of developing information systems so that they are in accordance with the information needs of system users. At this stage the data is obtained through interviews, discussions and document observations. Design is the stage of designing information systems by determining information system requirements, context diagrams, databases, entity relationship diagrams and data flow diagrams.

Implementation is the stage of developing an information system based on needs analysis data and then translating it into programming language or coding. At this stage the programming language used is Mysql database and PHP. Verification is a stage to review the

suitability of input, process, output and functional of the information system that has been developed. At this stage using the blackbox testing method.

RESULTS

Results and discussion of research on the development of a risk management information system (SIMRISK). Starting from the stages of analysis, design, implementation and verification as follows :

Needs analysis

System requirements analysis is carried out to collect information about the application of risk management and other OHS applications, input, process and output requirements of the information system, The results of the interview are as follows:

Analysis of the problem based on the results of the interview found that risk management reporting was prepared only as administration in hospital accreditation assessments using SIMRISK reporting and monitoring can be done every day. Then the delay in reporting work accidents is overcome by using SIMRISK, reporting is carried out within 1x24 hours from the time the incident occurs. Meanwhile, the occupational illness report form has been provided but the reporting has not been done so far, using SIMRISK can stimulate occupational illness reporting activities and facilitate the OHS committee in conducting early detection. hazardous inventory reporting has not been carried out routinely because the amount of data is considered an additional burden for the OHS PIC, by using SIMRISK reporting and monitoring can be done every day.

Input components of reporting and recording of risk management, work accidents, hazardous and materials inventory and occupational illness at Diponegoro National Hospital so far, the information needed in risk management is input hazard identification data, then input calculation of risk assessment scores and categories, difficulty in inputting control determination. Work accident input errors so that they are corrected again by the OHS committee, delays in inputting work accident information more then one week from the incident and some even exceed it. for manual input of hazardous and materials inventory reporting has not been routinely carried out by each work unit, complex hazardous and materials inventory data input has resulted in the work unit not being independent and even reporting is carried out by the OHS committee, reporting has not been running regularly so that the OHS person in charge has difficulty in inputting these reports and so far all OHS reporting and recording is paper-based and still manual, making the data incomplete and inaccurate.

The process of reporting and recording risk management, work accidents, hazardous waste inventory and occupational illness at Sakinah Nasional Diponegoro Hospital so far the

risk management recording process has been carried out for the internal data needs of the OHS committee, the reporting process starts from the OHS committee preparing a report form and will be filled in by the work unit but it has not been running well so that the OHS committee fills out the form, when a work accident occurs the OHS person in charge contacts the OHS committee and the victim will be taken to the emergency room for further treatment, for the flow of the reporting process by OHS person in charge filling out the work accident form then verified by the emergency room/ doctor where the victim is treated and will be given recommendations, then verified by the OHS committee by providing recommendations and conclusions, for the occupational illness reporting process has not been carried out but a form has been prepared for reporting, for the flow of the hazardous waste inventory reporting process in the work unit is reported monthly by the OHS person in charge to the OHS committee but the OHS person in charge often does not report so the hazardous waste inventory reporting form is filled in by the OHS committee.

The output of reporting and recording risk management, work accidents, hazardous waste inventory and occupational illness at Diponegoro National Hospital so far, what is expected is a system that helps facilitate input and print reports on risk management, work accidents, hazardous waste inventory and occupational illness, the information system is expected to provide an overview of the amount of hazardous waste inventory in each work unit, the information system is also expected to help overcome reporting delays which are usually 1-3 weeks to be reported every day, Information systems can also make it easier to monitor hazardous and materials inventory in each work unit, OHS reporting using information systems can help reduce the use of paper, for the output of risk management reports is expected to be an excel file and export based on the specified month, the output of work accident and occupatiobal illness reports is expected to be a pdf file that matches the format of the work accident form, the output of the hazardous and materials inventory report is expected to be a pdf file that matches the format of the hazardous and matrials inventory report table and is equipped with a symbol description.

Design

The SIMRISK design has a main menu of risk management, work accidents, hazardous waste inventory and occupational diseases. With context diagram, data flow diagram and entity relationship diagram as follows:
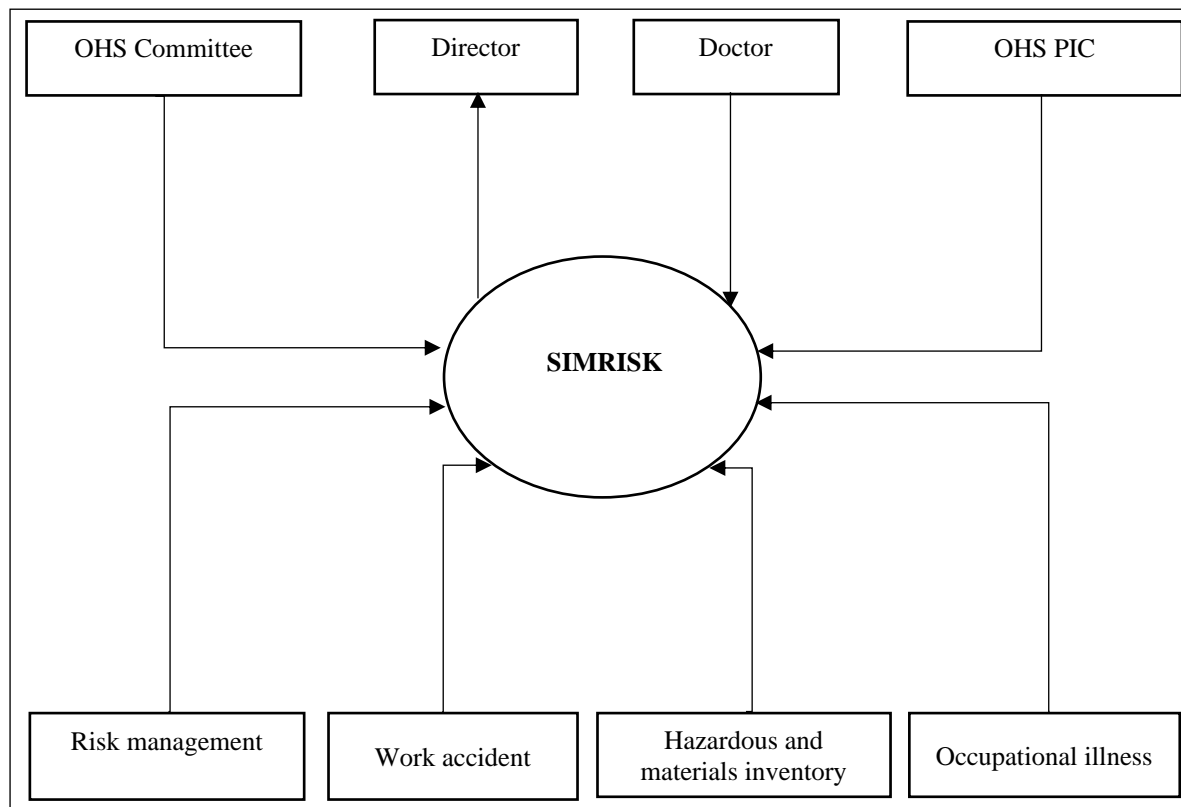

Figure 1. Context Diagram of SIMRISK

The context diagram can be seen at figure 1. It describes the data flow of each interacting entity in the development of the risk management information system can. A risk management report flow is created by the OHS committee for internal use in prevention and safety efforts and submitted to the director. The flow of work accident reports is made by the OHS person in charge then verified by the emergency room/ examining doctor then verified by the OHS committee. The flow of hazardous waste inventory reports is made by the OHS person in charge and then reported to the OHS committee to control and supervise the use of hazardous waste. The flow of occupational disease reports is made by the OHS person in charge then verified by the examining doctor then verified by the OHS committee.
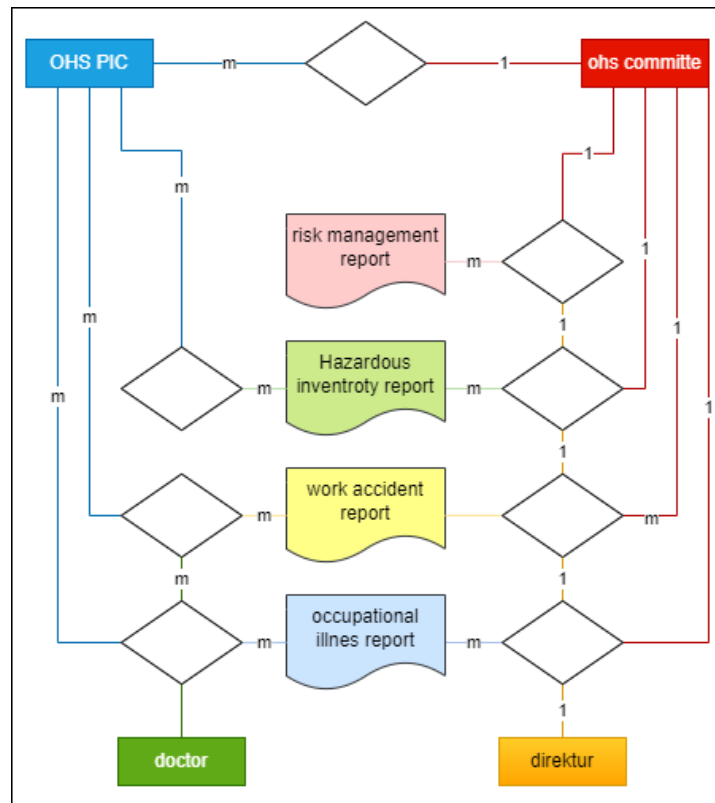
Figure 2. Entity Relationship Diagram of SIMRISK

Entity relationship diagram (ERD) is an easy-to-understand description of a database that graphically explains the relationships between entities and aims to assist in the development of information systems. ERD can be seen at figure 2.

Implementation

SIMRISK implementation is carried out with the help of programmers accompanied by researchers and the OHS committee to convert the design of the information system design into programming language. Then SIMRISK is implemented on the domain https://sim-risk.com/.

Verification

The SIMRISK verification is carried out using the blackbox testing method to review the functional input, process and output as well as the functions of the add, save, edit, copy, delete, export buttons as well as the functions of the risk management menu, accident menu, hazardous inventory menu and occupational disease menu. The results of black box testing stated that the funcional SIMRISK menu functional is as expected and declared valid.

DISCUSSION

SIMRISK is used to help prevent workplace accidents through the risk management menu. Record unsafe acts and unsafe conditions, then SIMRISK will assist in the calculation of risk assessments with accumulated probability values and impact values, help suggest risk control options based on the hazard control hierarchy. SIMRISK makes it easier for the OHS committee to monitor the correction of unsafe acts and unsafe conditions that have the potential to cause accidents, monitor work accident reports and occupational disease reports and can also monitor from the stage of PIC OHS reporting and the verification stage by doctors or IGD. OHS reports were previously done manually and need weeks and even months, with SIMRISK helping to speed up the report after the incident occurred the OHS PIC can immediately report and currently the incident report is reported in less than 24 hours because of the ease of reporting. The report document is stored in SIMRISK and can be viewed and used by the director as decision support data and determining the priority scale of work safety programs in the hospital.

The difference between the development of SIMRISK and other OHS reporting information systems is that SIMRISK prioritizes reporting as a prevention effort. risk management reporting and hazardous waste inventory reporting are forms of reports aimed at identifying possible hazards and risks to be corrected before work accidents occur that result in both material and non-material. information systems in previous studies focused on improving the reporting system and recording after accident (Hastuti et al., 2020; Herawati et al., 2022; Sutejo et al., 2021; Yulisman et al., 2022). according to a good occupational safety and health handling effort is one that seeks the realization of zero accidents, this can be supported by the use of SIMRISK.

The weakness in this study is that the current SIMRISK development is only used by internal hospitals as a safety and health effort for hospital workers. It is expected that the development of the OHS information system in the future can be used as an information system for preventing and monitoring the occupational safety of hospital workers, patients and hospital visitors. The development of the SIMRISK report menu can also be improved with reporting features for disaster prevention and mitigation, fire extinguisher and hydrant inspections and other reporting related to OHS.

Login Page

The login page contains a username and password aimed at verifying the security of information system users. The login page display can be seen in the figure 3.

Figure 3. login page

Dashboard Page

The dashboard page contains shortcuts to help users move from one menu to another. The dashboard contains menus such as risk management, work accidents, hazardous and toxic material inventory and occupational diseases. The dashboard page can be seen in figure 4.

Figure 4. Dashboard page

Risk Management Menu

The risk management menu page is used by the OHS committee as an effort to prevent work accidents through hazard identification, risk assessment and determine control (HIRADC) reporting by inputting data such as unsafe acts, unsafe conditions, probability values and impact values which automatically display the results of risk level calculations, control hierarchies and control descriptions. The display of the data risk management page is seen in the figure 4. The output of risk management menu is the report of HIRADC that can be utilized by the internal OHS committee as a preventive effort in risk management by setting

priorities and providing recommendations to the director to help make decisions on follow-up improvements to hospital facilities and infrastructure in supporting occupational safety and health. In accordance with research that states risk management is a systematic, comprehensive and sustainable effort that requires information about the source of danger and the impact of risk. the use of technology can help speed up the process of identification, risk assessment and determination of the best control of possible risks due to unsafe facilities and infrastructure. (Najihah., et al 2023; Mustofa et al., 2023)
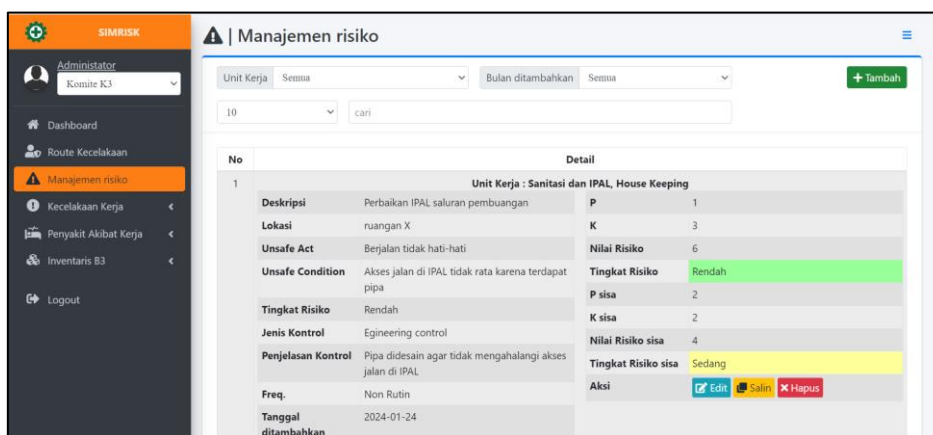

Figure 5. *Risk Management Menu*

Work Accident Menu

The work accident menu page is used by the OHS person in charge to report work accidents by inputting data such as victim identity, incident data, accident data, aid data, then verified by the emergency room / doctor and verified by the OHS committee. The display of the work accident menu page can be seen in the figure 5. The output of work accident reports can be utilized by the OHS committee to recap and provide recommendations to the director in making follow-up decisions needed for the treatment of work accident victims. in accordance with research which states that reporting and recording work accidents is an important part of the information system owned by the hospital. Work accident data is needed as a follow-up in accident insurance claims, the data is also part of the hospital's OHS assessment in hospital accreditation so that the development of a work accident information system has a positive impact on improving the orderliness of reporting, recording and storing work accident data and can assist management in evaluation and decision making to prevent the same incident from recurring. (Arifuddin., et al 2023; Herawati et al., 2022; Silpasuwan et al., 2017).

Figure 6. *Work Accident Menu*

Hazardous and Toxic Material Inventory

The hazardous inventory menu page is used by the OHS person in charge to report hazardous waste inventory by inputting data on date, work unit, person in charge, name and type of hazardous waste, characteristics of hazardous waste, unit, form, characteristics and symbol of hazardous waste, storage place, risk level of hazardous waste, initial and final stock quantities. By reporting hazardous waste inventory, it can facilitate the OHS committee in monitoring and controlling the amount of hazardous waste use. The appearance of the hazardous inventory menu page can be seen in the figure 5. The output of work accident reports can be utilized by the OHS committee to recap and provide recommendations to the director in making follow-up decisions needed for the treatment of work accident victims, the data is needed as a follow-up in accident insurance claims. (Arifuddin et al., 2023; Herawati et al., 2022; Ranjbari et al., 2022)

Figure 7. *Hazardous and Toxic Material Inventory*

Occupational Illness Menu

The occupational disease menu page is used by the OHS person in charge to report the occurrence of occupational illnesses by inputting data such as the identity of the victim, anamnesis, causal factors, direct supervisor notes, examination results then verified by the doctor with input diagnosis, program notes, suggestions and recommendations, and verified by the OHS committee input conclusions and recommendations. The display of the occupational illness page can be seen in the figure 6. The output of the occupational disease report helps the OHS committee to oversee the incidence of occupational illness and forward the data to the director for follow-up examination of victims related to the symptoms of occupational disease and guarantee the health and safety of victims and ensure that there is no transmission of occupational disease to other officers. In accordance with research that states occupational diseases have been difficult to detect due to the absence of initial examination data when officers start working at the hospital and periodic examinations, especially for officers with high risk of exposure. The development of an information system for reporting and recording occupational diseases that is carried out regularly can assist management in supervising officers and tracing incidents of occupational diseases. Occupational illness data can assist management in considering whether further or special examinations are needed for officers who have indications of Occupational illness (Bando et al., 2020; Dewi et al., 2020; Rohmani., 2023)

CONCLUSIONS

The benefits of developing SIMRISK are protecting hospital workers, preventing injuries and accidents, increasing the contribution of hospital workers to be aware of OHS and generating operational efficiency. Reporting and recording of occupational safety and health risk management in hospitals has not been running routinely and has an impact on the resolution of OHS problems and is not on target. SIMRISK can helps in reporting and recording of risk management, work accidents, hazardous and toxic material inventory and occupational diseases. SIMRISK provides the benefits of speed in reporting and recording, data accuracy, easy access to information, data storage security, ease of input, process and produce accurate and reliable report output to be used as a consideration for making the right decisions by management. These reports can be used as evaluation material and planing to prevent work accident. The documents can be use also to assessment in hospital accreditation as well as the basis for the director in making decisions and developing OHS programs.

Recommendation for other hospitals that want to implement SIMRISK or develop OHS information system. The system developed should can be use as decision support system to

help provide data for prevention and monitoring of occupational safety and health in hospitals. The OHS information system that will be developed is recommended to add utility reporting features, fire emergency response reporting and reporting.

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