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The Use of FMEA to Analyze Electronic Medical Records to Reduce the Risk of Failure at Rizani Hospital

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ABSTRACT

This study aims to identify the potential risk of failure (failure mode), causes, and impact of failure in the implementation of RME at Rizani Paiton Hospital, assess the level of risk priority using the Risk Priority Number (RPN), and formulate recommendations for preventive measures and improvement plans based on the Failure Mode and Effect Analysis (FMEA) method. This study uses a qualitative descriptive approach with a case study design, conducted at Rizani Paiton Hospital in July–November 2025 with purposively selected participants from management elements, SIMRS/IT teams, medical records, nurses, and doctors who are directly involved in the implementation of RME. Data was collected through semi-structured interviews, RME workflow observations, and FMEA form filling, then analyzed through failure mode identification, severity, occurrence, and detection score assessment, and RPN calculation to determine risk priority. The results of the study show that there are several groups of potential major failure risks, including system and network disruptions that hinder access and storage of data, input errors and incompleteness of RME filling by users, limitations of system features and integration, and the risk of data loss and unavailability when needed in clinical services. A number of failure modes have high RPN values so they are categorized as priority risks, especially those that have an impact on service delays, potential clinical errors, and disruptions in the continuity of patient information. The resulting recommendations include strengthening infrastructure and system backup, improving RME features and integration according to service flows, improving user training and assistance, strengthening control and monitoring of documentation completeness, as well as drafting more comprehensive SOPs and RME risk management governance.

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1. INTRODUCTION

Hospitals are a health service industry that aims to improve the degree of public health through inpatient, outpatient, and emergency services (Alfatiyah and Bastuti, 2022). Improving the quality of service requires an effective work system, including efficient management of medical documents. Electronic Medical Records (RME) is a technology-based solution to improve documentation efficiency, accelerate communication among health workers, facilitate access to patient information, and support service continuity (Ariani, 2023).

Electronic Medical Records (RME) is an integrated information system that contains medical history, examination results, medical procedures, and patient financing administration (Hatton et al., in Rubiyanti, 2023). In Indonesia, the implementation of RME is strengthened through the Minister of Health Regulation Number 24 of 2022 which requires all health service facilities to record medical records electronically as part of the transformation of the national health information system, with a target of full implementation by December 2023.

Rizani Hospital as a type C private hospital in Probolinggo Regency has started implementing RME gradually since 2023 and is committed to implementing it comprehensively by 2025. Management support can be seen from system development, facility improvement, and human resource training. The use of RME increases service efficiency as long as there is no network disruption, which shows that there is internal strength in supporting the digital transformation of healthcare services.

The implementation of RME still faces obstacles in the form of training limitations, uneven user adaptation, suboptimal system features, and network disruptions and supporting facilities, including risks in the data migration process. On the other hand, opportunities are supported by government regulations, health technology developments, and training forums and professional communities. Threats that need to be anticipated include power outages, system failures, user resistance, potential data loss, and patient information security risks.

These problems show the need for systematic mapping of the risk of failure in the implementation of RME so that the quality of service is maintained. Failure *Mode and Effect Analysis* (FMEA) can be used to identify potential failures, assess risk levels, and design system improvement actions. This approach is expected to be able to minimize implementation obstacles and increase the success of the implementation of RME at Risani Hospital.

2. METHODS

This study uses a qualitative descriptive approach with case studies to analyze the implementation of Electronic Medical Records (RME) and identify potential risk of failure through the Failure Mode and Effect Analysis (FMEA) method. FMEA functions as a risk assessment tool to systematically identify process vulnerabilities, failure modes, causes, *and impacts*, resulting in risk ratings based on the level of impact and chance of failure and the basis for the formulation of corrective actions.

The research participants included the Head of Medical Records, the Head of SIMRS, the IT support department, doctors, nurses, and elements of hospital management. Data collection instruments are in the form of semi-structured interview guidelines and *FMEA* forms used for recording and risk assessment. Data was obtained through in-depth interviews and observation of the RME implementation process with participants who were directly involved in the use of the system.

Data analysis was carried out qualitatively using *the Failure Mode Effect Analysis* (FMEA) method through the stage of identifying potential failure modes for the implementation of RME. The data is then identified as the cause and impact of failure to determine the level of risk using the parameters on the *FMEA form*. The results of the assessment are used as the basis for determining risk priorities and recommendations for system improvement so that the implementation of RME runs more optimally and sustainably.

3. FINDINGS AND DISCUSSION

Results

Rizani Hospital is one of the hospitals in the Probolinggo Regency area that provides complete individual health services through outpatient, inpatient and emergency services. In the implementation of health services, Rizani Hospital is supported with medical and non-medical support services and is equipped with both medical and non-medical facilities and infrastructure.

The flow of the RME process at Rizani Hospital starts from patient registration, followed by the clinical service process (nurses–doctors–supporters), then the closure of services and data management by medical records, *casemix*, and IT/SIMRS as support. This process runs for two main pathways: outpatient and inpatient, with a similar pattern but different intensity of monitoring and documentation.

Hierarchy Chart

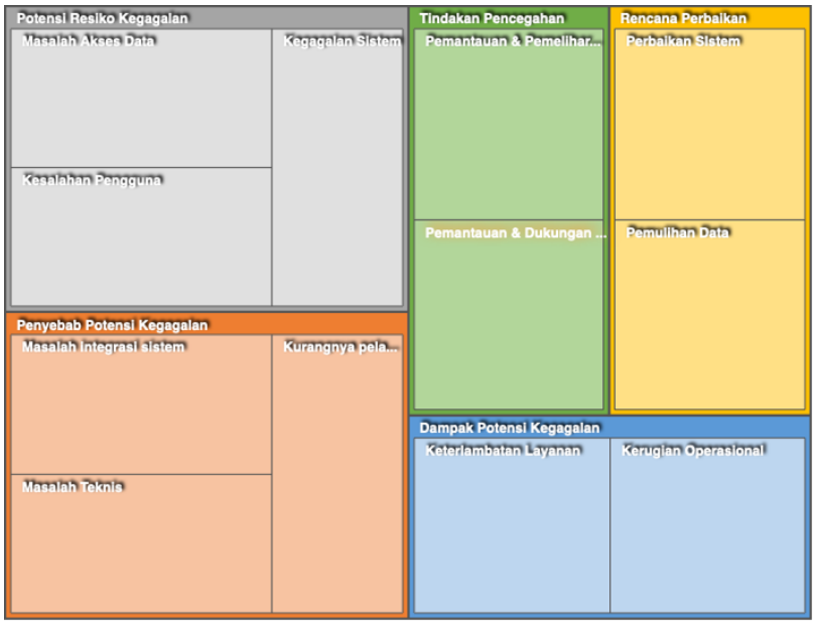

Figure 1. *Hierarchy Chart*

Figure IV 1 is divided into five main categories, namely: Potential Failure Risk, Potential Failure Cause, Potential Failure Impact, Preventive Measures, and Improvement Plan.

Word Cloud

Figure 2. *Word Cloud*

Figure 2 is a *word cloud* that displays words relevant to the topic of the application of Electronic Medical Records (RME) in hospitals. Words like "doctor," "officer," "patient," "nurse," and "electronic system" look larger, signifying the importance of these elements in this context. Several other words that appear indicate challenges or risks, such as "constraints," "problems," and "disruptions," which indicate the existence of potential obstacles in the implementation of the RME system in hospitals. Words like "training," "*upgrade*," and "repair" indicate the effort required to improve the system and reduce the risk of failure.

Potential Failure Risk

a. Potential Risk of System Failure

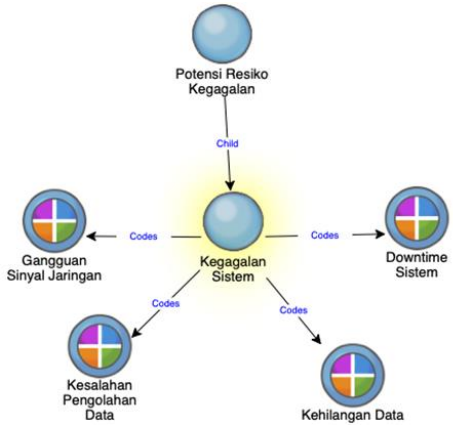

Figure 3. Potential risk of system failure

This diagram shows that system failures are affected by several key factors, namely network signal interference, system *downtime*, data processing errors, and potential data loss. Network disruption is the most frequent risk and has a direct impact on the service process and patient data storage. In addition, system *downtime* causes the input data to not be integrated with other systems, while data loss has the potential to occur when patients move between treatment rooms.

b. Potential Risk of User Error Failure

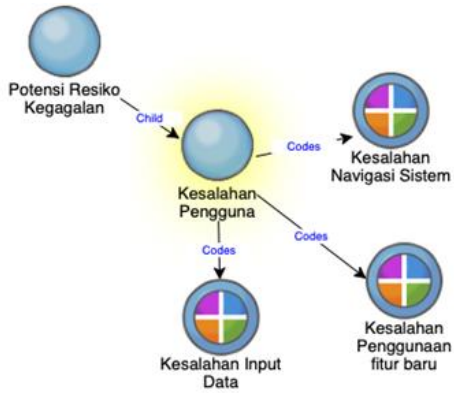

Figure 4. Potential risk of user error failure

This diagram shows that user errors are affected by data input errors, use of new features, and system navigation due to workflow changes from manual logging to RME. There is still incomplete data filling, especially in the narrative of patient records, so that it has an impact on the quality of care. In addition, non-compliance with filling, non-conformity of digital forms with field needs, lack of training and socialization, manual work habits, limited typing skills, and high staff turnover also slow down adaptation to the new system.

c. Data Access Issues

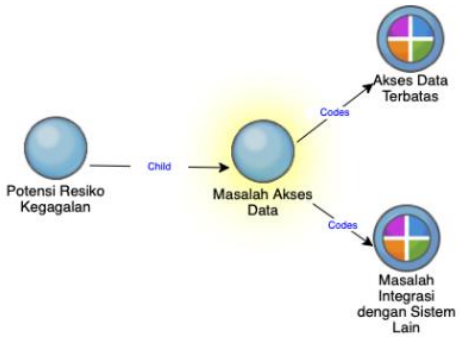

Figure 5. Potential risk of failure of data access issues

This diagram shows that data access problems are caused by limited access and integration constraints between systems. In some cases, patient data from other units does not appear or disappears after transfer, such as patient assessment data from the emergency room that does not appear in the inpatient room, requiring a search by the IT team to recover it.

In terms of management and IT, the integration between SIMRS, RME, BPJS, and the Ministry of Health has not been fully optimal. Although the integration of SIMRS and RME is already underway, there are still technical obstacles to the integration with BPJS and the Ministry of Health, which are in the process of being completed and are targeted to be completed by the end of the year. This condition has the potential to cause obstacles in data collection and processing so that it can disrupt the smooth operation of RME.

Potential Causes of Failure

a. Technical Issues

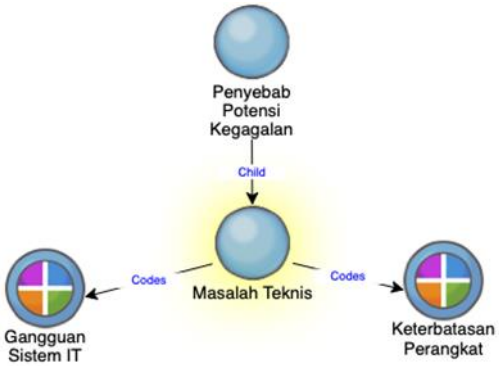

Figure 6. Potential risk causes of technical problems failure

This diagram identifies two main factors that cause technical problems, namely IT system glitches and device limitations. Computer limitations in some polyclinics have led to queues of data inputs and patient complaints, while inadequate use of tablets has been replaced by trolley laptops. About 40% of available devices still need updates. Even if the network is relatively stable, physical disturbances such as detached LAN cables or *hub/switch damage* still occur. Network security also needs to be improved through the addition of firewalls and public IPs, as well as *penetration testing* due to cost constraints. IT system disruptions and device limitations have an impact on operational performance and optimization of system usage.

b. System Integration Issues

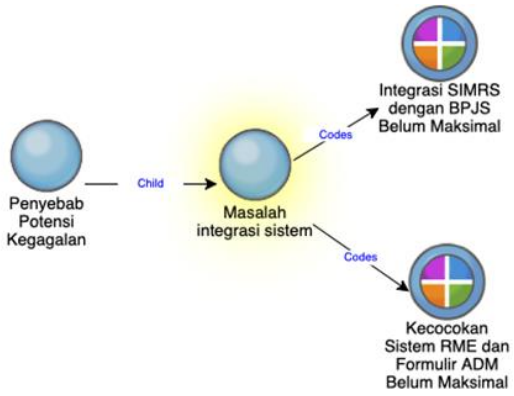

Figure 7. Potential risk causes of failure system integration issues

Figure 7 is a cause-and-effect diagram that illustrates system integration problems as a potential source of risk of RME implementation failure. The two main issues identified are the lack of optimal integration between SIMRS-BPJS and the incompatibility between the RME system and digital forms. Although the internal integration of SIMRS and RME has been underway, the *bridging process* with BPJS and the Ministry of Health is still pending due to the improvement of the RME features, including manual forms and revisions to BPJS features such as *informed consent*, laboratory critical assessment, and CPPT stamp. In addition, the use of one public IP risks being blacklisted by BPJS in the event of *switching failure*, thus hindering the integration of BPJS and Satu Sehat even though the RME continues to function internally. The solution planned for 2026 is the addition of a provider to improve connection reliability.

c. Lack of User Training

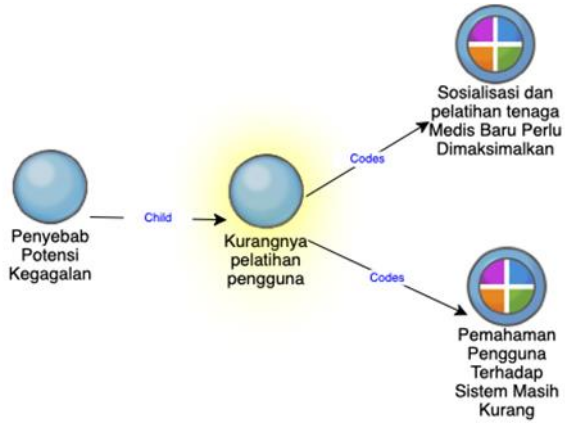

Figure 8. Potential causes of failure risk of lack of user training

This diagram identifies two main factors that cause a lack of user training, namely the socialization and training of new medical personnel that need to be maximized and the lack of user understanding of the system. Socialization and special training have been carried out, especially for doctors in charge of patients (DPJP). However, this training still needs to be held on an ongoing basis, especially when there are system updates or new features. Regular training is expected to improve the discipline and obedience of the DPJP in filling in data, reducing the burden on other staff who have to fill in the completeness of the data as a backup.

Training is mandatory for new medical personnel so that they can understand and apply RME optimally when they start their duties. Until now, the introduction of RME for new personnel is still carried out by the socialization method by the head of the unit, without any special official training (*In House Training* / IHT). Early socialization has proven to be effective in providing basic provisions, but

regular and thorough training is needed so that users have an adequate understanding. The main obstacle in the implementation of training is the incompatibility of doctors' schedules with socialization or training times, so that the delivery of information about changes or new features of the system is uneven. This condition causes imperfect form filling and difficulty adapting to changes. Despite the socialization, direct training to users is still lacking, especially for those who do not understand basic computer technology. The provision of socialization and structured training, especially for new personnel, is urgently needed so that they understand the flow and responsibilities of filling out electronic medical records well. The need for increased training is also for the IT *Support* team that handles RME, because the rapid development of information technology requires regular competency improvement in order to be able to anticipate and solve technical problems appropriately.

Overall, these findings confirm that the lack of training and socialization for medical personnel, especially new personnel and DPJP, is a major contributor to the potential failure of the RME system. Therefore, strengthening continuous training, providing supporting facilities, and structuring an integrated training schedule is very necessary.

Impact of Potential Failure

a. Service Delays

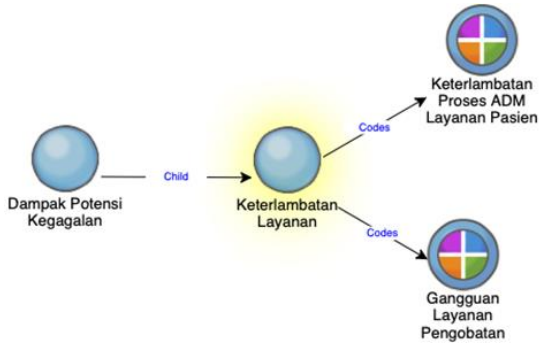

Figure 9. Impact of potential service delay failures

This diagram shows that service delays can be caused by two main factors, namely delays in the process of administering patient services and disruptions in treatment services. Service delays as a result of potential failure of the Electronic Medical Record (RME) system appear very clearly in the experiences of the speakers, especially outpatient and inpatient poly nurses. System signal interference once caused the process of storing and recording medication intake by doctors to be skipped, so that drug orders entered the system late. So that patients wait longer and eventually cause complaints and make the work of officers inefficient.

The data that has been input is not readable in the casemix section or must be re-inputted, the service is hampered because the officer needs to recharge before the claim and administration process can continue. In addition to the limited number of computers in the poly that must be used alternately, there are often queues for data input that led to delays in services and patient complaints related to the length of waiting for the administrative process. The form in RME is not perfect or there is system *downtime*. In these conditions, the officer must temporarily return to using the manual form, print and fill in paper files, then after the system returns to normal, all data must be input again to the RME. This dual process (manual and then electronic) is considered to be an obstacle to the workflow and has the potential to delay services. Incompleteness or delay in filling in data in the system also has an impact on delays in supporting services. If the drug order or nutritional diet is not inputted on time according to the specified time limit, the nutrition department may be late in delivering food, and the pharmaceutical installation may be late in preparing and delivering the medicine.

b. Operational Losses

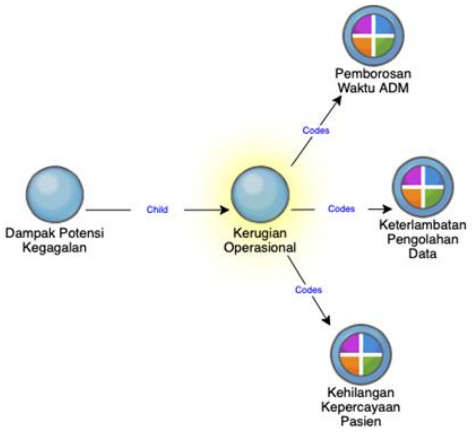

Figure 10. Impact of potential operational loss failure

This diagram shows that operational losses are caused by wasted administrative time, delays in data processing, and decreased patient trust. When the data that has been inputted is not readable, the officer must re-input it accompanied by proof of the data, thereby slowing down the flow of claims and administration and reducing patient service time. In addition, form imperfections or RME system glitches require nurses to manually fill out forms and re-input them when the system is normal, leading to a waste of time and effort.

Delays occur when the data entered in the service unit does not directly enter the resume, medical records and claim needs. Incomplete doctor data causes reports to be invalid, potentially causing differences in morbidity and mortality data, and hindering the claim process. Another operational loss is the decline in patient trust due to complaints of service delays. Signal interference that extends drug waiting times also reduces patients' perception of service quality and risks disrupting the hospital's relationship with patients.

Failure Prevention Measures

a. System Monitoring and Maintenance

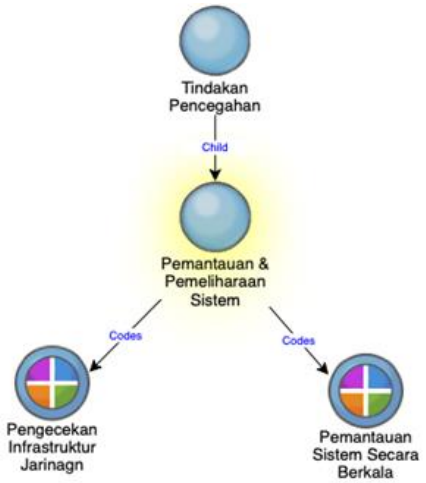

Figure 11. Prevention of system training and maintenance failures

Figure 11 shows that failure prevention is carried out through monitoring and maintenance of the system, including checking the network infrastructure and periodic monitoring. Network conditions are monitored in real-time and maintenance is carried out every three months or sooner in the event of an outage. In addition, the hospital provides two internet service providers as a backup to keep the service running when the main connection is problematic.

At the application and server level, system performance is monitored through a maximum load time limit of about ten seconds; if it exceeds this limit, the team immediately *tunes up*. Server capacity, storage, and RAM usage are evaluated periodically, and device updates are proposed when the load increases to keep the system stable. Planned maintenance is carried out about once every six months at midnight for one to two hours, with advance notice for the service unit to prepare temporary manual recording.

In terms of control and monitoring, the system is equipped with logs and audit trails to record user activities so that problems can be traced. The SIMRS team compiles a monthly report on the completeness of filling per unit as a compliance evaluation material. In addition, the head of the medical record unit conducts daily verification by matching system data and manual recaps so that errors are detected immediately before they have an impact on services and reporting.

b. User Training and Support

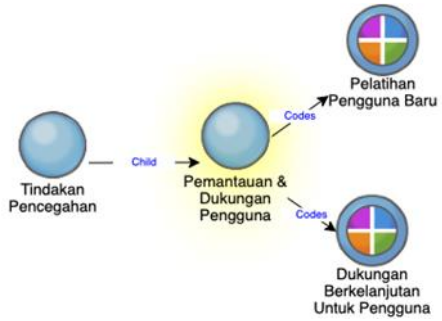

Figure 12. Training and user support failure prevention

This diagram shows that to prevent failures, there needs to be constant monitoring and support for users. Failure prevention measures in the RME system are mostly carried out through continuous training and support for users, the medical record team and SIMRS prepare a guide for filling out the RME which contains what must be filled out and how daily monitoring is carried out, then socialization is carried out directly to each room before the system is fully implemented. Socialization and special training have been carried out, especially for the doctor in charge of patients, and continuous training is still needed every time there is a system upgrade or the addition of features so that the filling of medical records remains disciplined and orderly.

Ongoing support is also facilitated through the establishment of a communication group containing the person in charge of SIMRS, the medical record team, and the person in charge of the unit so that any obstacles related to RME filling, internet disruptions, or unbridging data can be immediately reported and followed up. In addition, the head of the room and the vice chair of the room validate the medical record every morning using a special form, then report the results to be traced and corrected if there are any shortcomings, so that users feel accompanied and problems with using the system are not allowed to drag on.

At the system level, the SIMRS team also provides support by socializing every time there is a change in the form or way of using the application, inviting unit representatives to receive explanations and then distributing them to colleagues in the room. This team also compiles a monthly report on the percentage of filling completeness per unit as evaluation material, so that further training and assistance can be directed to units that still have limitations in using the system.

Recommended Improvement Plan

a. Data Recovery

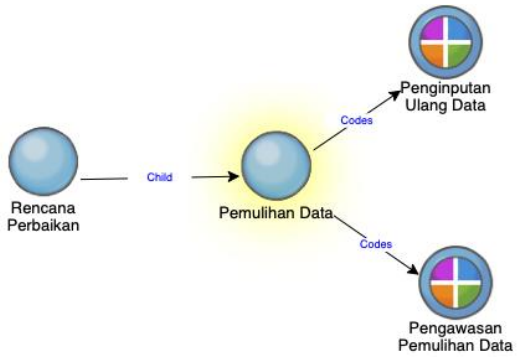

Figure 13. Recommended data recovery improvement plan

This diagram shows that to ensure effective data recovery; two important steps need to be taken: data re-input and data recovery monitoring. Data re-input is required if data is lost or corrupted, while data recovery supervision ensures that the recovery process is going well and that the data returned is accurate. One of the main forms of data recovery in an RME system is data re-input when there is a signal glitch or technical problem.

In addition to re-input, data recovery is also monitored through supervision and monitoring by both clinical units and SIMRS/IT teams. On a technical level, the inpatient nurse explained that when data is lost, the room will confirm to the SIMRS team according to patient safety procedures. The IT team then tracks the lost data and tries to return it to the unit's view. Supervision also takes place in the administrative realm and the quality of documentation. The head of the room and the head of the nursing unit carry out daily validation of the completeness of medical records, including after a disturbance or repetition of input.

b. System Repair

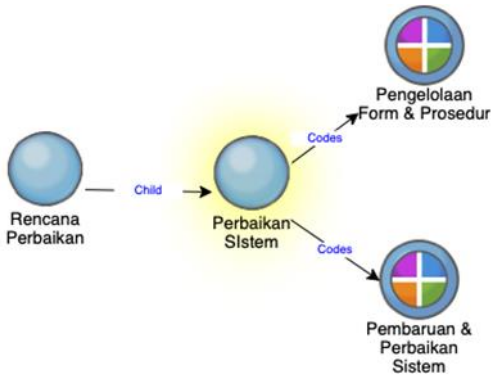

Figure 14. Recommended system improvement plan

This diagram shows that system improvements can be done through two main steps: form and procedure management, and system updates and improvements. The management of forms and procedures ensures that the standard operating procedures and forms used in the RME system are appropriate and efficient. Meanwhile, system updates and fixes aim to update software and address deficiencies in the system.

One of the main focuses of improving the RME system at Rizani Hospital is the improvement of operational forms and procedures to better comply with accreditation standards and clinical practices in the field. The improvement of the RME system is also focused on updating features and strengthening the technical capabilities of devices and networks. In terms of features, there are still some components of RME that are not perfect so they must be refined with vendors. On the technical

side, the system improvement plan also includes device adjustments and network strengthening. The RME system improvement plan is also directed at achieving full integration and *bridging* targets with external systems.

Table 1. Potential Failure

No	Potential Failure
1	Signal/network interference
2	RME server/database down or hang
3	RME data is not integrated with SIMRS
4	Slow system access/loading speed
5	Server/storage capacity is almost full
6	Limited number of computer/laptop devices
7	Electronic devices are damaged or unresponsive (slow)
8	Printer fails/error when printing documents
9	Incomplete CPPT filling
10	The RME form is not in accordance with the accreditation standards/BPJS
11	Patient data is inconsistent between units
12	Patient assessment form is not perfect
13	There are forms that have not been integrated with RME
14	Non-SPO compliant users of RME filling
15	Variations in filling methods between officers/units
16	Undertrained officers using RME
17	Resistant to system changes
18	Turnover petugas
19	Patient billing/administration is not completed
20	Medical resume not printed before the RME is complete
22	Still using manual documents for filling completeness
23	Data loss
24	Incomplete trail audit
25	Cyber threats

The results of *the Failure Mode and Effects Analysis* (FMEA) on the application of Electronic Medical Records (RME) at Rizani Hospital identified 25 potential risks of failure. The results show that the risks with the highest RPN values are dominated by network issues, device limitations, form integration, and user competencies and practices. The highest risk is signal or network interference which describes that connectivity failures occur with high frequencies and have a significant impact on the continuity of the RME input process and data access.

Next, the limited number of computer or laptop devices and the fact that there are still forms that have not been integrated with RME indicate that the readiness of infrastructure and system design has not fully supported daily operational needs. Officers have to alternate using devices to make inputs, resulting in queues and documentation delays, while unintegrated forms force the use of paper or other applications outside of the main system. This increases the risk of data inconsistencies and increases the workload due to duplication of records.

The risk of down/hanging RME servers or databases and RME forms that are not in accordance with accreditation/BPJS standards, confirm that technical and regulatory aspects are interrelated. When the server is unstable, the service is stopped, and when the form does not meet the standard requirements, the documentation becomes not optimal for the purposes of accreditation, BPJS claims, and quality audits. Meanwhile, RME data that has not been fully integrated with SIMRS and incomplete

billing or patient administration shows that the process flow from registration to file closure is not fully connected in one complete digital ecosystem, potentially causing billing delays and data mismatches.

The other three risks that are also in the top ten are damaged or unresponsive electronic devices, variations in charging methods between officers or units, and officers who are less trained in using RME. This combination of technical and human resources factors shows that failures come not only from the system side, but also from user behavior and capacity. Variations in filling methods and training limitations have the potential to cause differences in SOP interpretation, inconsistencies in filling out CPPT and other forms, and complicate the validation and tracing process when incidents occur. As such, these ten top priority risks provide a solid foundation for hospital management to develop a targeted improvement plan, including strengthening networks and devices, improving form and system integration, and training programs and standardization of RME filling practices across units.

Discussion

Potential Risk of Failure, Potential Causes of Failure, and Impact in the Application of Electronic Medical Records (RME) at Rizani Paiton Hospital

The main failure in the implementation of Electronic Medical Records (RME) is in the quality aspects of systems and processes, especially network disruptions, device limitations, form incompatibilities, and incompleteness of clinical documentation. These findings are in line with the view that Hospital Management Information System (SIMRS/RME) is an important factor in determining service quality. Syafri, Purwadhi, and Rahim (2023) stated that the quality of SIMRS has a positive effect on the quality of hospital services, so that system disruptions have a direct impact on the speed and accuracy of patient services. In this study, signal interference, server slowness, and forms that are not up to standard reflect deviations from the characteristics of SIMRS that should support service quality, as emphasized by Syafri, et al.

In terms of devices and *hardware*, potential failures include limited number of computers/laptops, damage or unresponsiveness of devices, and printer interference. This condition is caused by limited procurement and suboptimal maintenance, causing usage queues, delays in data input, and administrative process obstacles. This finding is in line with Fitriani and Ramadhan (2021) who emphasized that the success of RME is greatly influenced by the availability of supporting facilities, not only in applications.

On the theme of forms and documentation, failures appear in the form of forms that have not been integrated with RME, forms that have not been in accordance with accreditation/BPJS standards, incomplete CPPT, inconsistent patient data between units, and imperfect assessment forms. The reasons include the process of developing forms that do not fully refer to the 2022 KARS standards and Ministry of Health guidelines, as well as the gradual transition from manual to electronic forms, with an impact on regulatory compliance, completeness of medical records, and the quality of clinical information.

In the theme of HR and training, risks include variations in filling methods between units, lack of RME use skills, non-compliance with SPO, resistance to change, and high turnover that hinders adaptation. This condition is influenced by uneven training, manual work culture, and fast employee rotation, which causes differences in understanding SOPs. This finding is in line with Amin, et al. (2021) and Fitriani and Sari (2021) who emphasized that human factors, including knowledge, attitudes, and acceptance of change, determine the success of RME implementation and have the potential to be a source of failure if not managed systematically.

On the theme of process flow, potential failures include incomplete billing or administration, incomplete medical resumes, and the use of manual documents, which indicate that the workflow has not been fully digitized and risks causing patient delays, data mismatches, and claim barriers. Meanwhile, on the theme of security and data backup, risks include the potential for data loss, incomplete *trail audits*, and cyber threats due to security and backup mechanisms that are still in the

strengthening stage. The impact of this failure is directly related to the confidentiality, integrity, and availability of RME data as affirmed by Rubiyanti and Sari (2023) and the Ministry of Health's quality guidelines.

Nuramalia, Purwadhi, and Andriani (2023) emphasized that the implementation of SIMRS supported by a conducive organizational culture can improve the performance of hospital employees. The findings of FMEA on RME at Rizani Hospital show that some *of the failure modes* are related to user behavior and work culture, such as compliance with CPPT filling that is still short, reliance on manual documentation, and variations in the implementation of SOPs between units. This confirms that the risk of digital system failure does not only come from technical aspects, but also from behavioral and organizational factors, in line with the findings of Nuramalia, et al. (2023) that the success of SIMRS requires synergy between system quality and organizational culture. Lock-in policies for resume printing and billing when the RME is incomplete can be seen as a management intervention to bridge the gap between system design and user behavior.

The dimension of service quality is an important lens in interpreting the results of FMEA. Yassir, et al. (2023) show that service quality is related to the interest of patient revisits, so that system disruptions have the potential to reduce satisfaction and loyalty. In this study, signal interference and computer limitations triggered long queues, medication delays, and patient complaints. Wijaya and Mulyani (2024) emphasized that improving the quality of service based on community satisfaction is an important strategy for regional hospitals. Therefore, FMEA's recommendations to strengthen networks, add devices, and improve RME forms not only improve internal efficiency, but also maintain service quality and patient interest in revisits, as emphasized by Yassir, et al. (2023) and Wijaya and Mulyani (2024).

Recommendations for Risk Prevention Measures for Potential Failure in the Implementation of Electronic Medical Records (RME) at Rizani Paiton Hospital

Based on the results of the study, preventive measures are focused on controlling the cause before failure occurs. On the network theme, prevention efforts include mapping signal weak points, adding routers and access points, as well as increasing capacity and monitoring of servers regularly to prevent overload. This strategy is in line with the recommendations of Sukoco, et al. (2021) and Mulyadi, et al. (2023) which emphasize the importance of optimizing information technology infrastructure in hospital digital transformation. Meanwhile, on the theme of devices and hardware, prevention is carried out through auditing device needs per unit, procurement of additional computers/laptops at queue-prone points, and the implementation of preventive maintenance to minimize service disruptions.

On the theme of forms and documentation, preventive measures include a comprehensive review of all RME forms to be in line with the 2022 KARS Accreditation Standards, Ministry of Health guidelines, and BPJS requirements, testing forms with clinical users, and reducing the use of non-integrated manual forms. This is in line with Aritonang, et al. (2021) and Fitriani and Ramadhan (2021) who emphasized that the design of RME forms must consider clinical workflows and quality standards so that the risk of non-conformity and duplication of records can be prevented from the design stage.

On the theme of human resources and training, preventive measures are focused on continuous training for officers, routine socialization of SPO filling RME, and the implementation of coaching in units to reduce filling variations. This is in line with Amin, et al. (2021) and Fitriani and Sari (2021) who emphasize the importance of structured education and mentoring to reduce resistance and minimize data input errors.

On the theme of process flow, preventive measures are carried out through the alignment of clinical and administrative workflows so that each stage, recording, verification, billing, and file closure has clear dependencies, so that the risk of billing not being completed or printing resumes without complete data can be minimized. This is in line with Febriani and Sutopo (2020) who emphasized the importance of rearranging the process flow to prevent delays and service queues. On the theme of security and *data backup*, prevention includes *routine backups*, *restriction of access rights*, *strengthening*

firewalls *and antivirus, and developing SOPs for handling information security incidents, as recommended by Nasution and Kurniawan (2021).*

Recommendations for Potential Risk Improvement Plan for Failure in the Implementation of Electronic Medical Records (RME) at Rizani Paiton Hospital

In addition to precautions, this study resulted in an operational improvement plan to lower RPN at high priority risk. On the network theme, the short-term plan includes the addition of routers at weak points and configuration adjustments, the medium term in the form of increasing server capacity and the preparation of downtime SOPs, and long-term development of network architecture with system redundancy. Harbi, et al. (2022) emphasized that technical interventions focused on failure modes with the highest RPN are able to reduce systemic risk and improve the reliability of SIMRS. On the device theme, the improvement plan includes the addition of laptops to the visit cart, the replacement of unresponsive devices, and the implementation of a routine maintenance schedule integrated with general/IT units.

On the theme of forms and documentation, the improvement plan is directed at improving transfusion forms, CPPT, initial assessments, and other forms in accordance with the Ministry of Health's accreditation standards and guidelines, as well as accelerating the integration of manual forms into RME. This is in line with the KARS and Ministry of Health guidelines which emphasize the importance of completeness, clarity, and traceability of clinical information. Meanwhile, on the HR theme, improvements include the establishment of PIC RME/SIMRS in each unit for periodic monitoring and feedback, the application of rewards and punishments to filling compliance, and the integration of RME materials in the orientation of new employees. Harbi and Puspitasari (2020) emphasized that quality management requires leadership that is able to internalize standards into work culture, including in the use of information systems.

In terms of the process flow, the improvement plan includes the development of an auto-locking feature to prevent medical resumes from being printed before all elements of RME and billing are met, as well as an acceleration of form digitization to reduce reliance on manual documents. This is in line with the WHO principle on *quality of care* which emphasizes the importance of a reliable information system to ensure appropriate and consistent service. Meanwhile, on the theme of security and data backup, improvements include strengthening information security policies, improving audit trails, and periodic evaluation of cyber threats within the framework of hospital risk management, as recommended by Nasution and Kurniawan (2021) and Rubiyanti (2023). Thus, the FMEA-based improvement plan is not only reactive, but also oriented towards strengthening systems, processes, and human resources in a sustainable manner to ensure the successful implementation of RME and service quality at Rizani Paiton Hospital.

In terms of management and leadership, Sari, et al. (2024) emphasized the importance of transforming hospital management strategies in the face of digitalization and strengthening risk management, while Veranita and Purwadhi (2024) showed the role of transformational leadership in the effectiveness of organizational policies in the digital era. In the context of RS Rizani, management's commitment to implement RME comprehensively, establish a SIMRS PIC in each unit, develop a timeline for improving features with vendors, and allocate a budget for infrastructure strengthening and training reflects strategic management practices that are in line with the recommendations of the two studies.

4. CONCLUSION

This study found as many as 25 potential failure *modes* in the application of Electronic Medical Records (RME). The calculation of *the Risk Priority Number* (RPN) shows that potential failures with high-risk categories include signal or network interference, limited number of computer/laptop devices, non-conformity of the RME form with standards, and server or database interference, so it requires priority handling. Based on these results, recommendations for preventive measures are

focused on controlling the causes before failures occur, including strengthening network and server infrastructure, auditing and adding devices, aligning forms with accreditation standards and guidelines of the Ministry of Health, continuous training for RME users, restructuring clinical and administrative process flows, and strengthening security mechanisms and data backup. The proposed improvement plan includes the addition of routers and WiFi access points, increased server capacity, replacement and addition of laptops in priority units, revision and integration of RME, strengthening of data validation mechanisms, and development of operational standards of information security procedures, which are in line with the literature on the importance of technology, process, and human resource readiness in the successful implementation of RME.

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