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Competency Mentoring Failure Mode and Effect Analysis (FMEA) as Effort for Early Detection of Healthcare Service Problems at RSUD Sadikin

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ABSTRACT

Hospitals are not systematically designed to detect service errors as in non-healthcare products, thus increasing risks to patient safety. RSUD Sadikin in Pariaman City, which has been operating for only seven years, has not yet established mechanisms or training to detect service errors. This community service activity aimed to enhance managerial competence in managing the risk of healthcare service errors through the application of Failure Mode and Effect Analysis (FMEA). The activity was conducted in the form of a workshop involving 30 participants from top, middle, and lower management levels in Oktober-November 2025 at Sadikin Hospital. FMEA competence was assessed before and after the workshop using a paired t-test. The results showed that the mean pre-test score was 70.67 (SD±17.604) and the post-test score was 84.67 (SD±14.794), with an improvement of 14.00 points (SD±14.004), which was statistically significant (p=0.000). These findings indicate that the FMEA workshop effectively improved participants' managerial competence in early detection and mitigation of service risks. Follow-up mentoring is recommended to evaluate the sustainability of training effects at 3, 6, and 9 months after the activity.

Keywords: early detection, FMEA, hospital, patient safety, service quality

INTRODUCTION

The quality of healthcare services is a key indicator in assessing hospital performance and accountability. Poor service quality is often attributed to various forms of waste within service processes, which can negatively impact patient safety, reduce productivity, and deteriorate human capital (Rahma et al., 2025). Waste reflects inefficiencies and ineffectiveness within the healthcare system, which may manifest as service defects, prolonged waiting times, redundant processes, and suboptimal utilization of human resources. (Astiena, 2022). In the hospital context, these forms of waste can be identified using the DOWNTIME principles Defect, Overproduction, Waiting, Non-Utilized Talent, Transportation, Inventory, Motion, and Extra Processing all of which contribute to reduced efficiency, diminished quality of care, and compromised patient safety (Astiena, 2022).

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One of the critical issues in government hospitals in Indonesia is the prolonged outpatient waiting time, where in many regional general hospitals (RSUD), the duration exceeds the national standard of ⩾ 60 minutes (Kementerian Kesehatan Republik Indonesia, 2008), (Astiena, 2022). Studies conducted in various regional general hospitals (RSUD) show that patient waiting times are largely > 60 minutes (Sari et al., 2025) and can even exceed >180 minutes (Suhairi et al., 2025), which contributes to a decline in patient satisfaction (Zhang et al., 2023). Prolonged waiting times also contribute to increased costs and heightened work-related stress among healthcare workers (Fryburg, 2021). In the long term, these conditions undermine public trust and the hospital's financial performance.

Sadikin Hospital (RSUD Sadikin) in Pariaman City, a Class D hospital that has been operating for seven years, faces similar challenges. Document reviews and field observations revealed instances of medication errors, such as drug mix-ups, as well as the unavailability of essential medical supplies when needed. In addition, weaknesses were identified in stock documentation, low compliance with work schedules, and delays in BPJS claims, all of which negatively affect the hospital's revenue. These conditions indicate that risk management related to service errors has not been functioning optimally, and that an effective mechanism for early detection of potential service failures (proactive risk assessment) is not yet in place.

Most hospitals in Indonesia, including RSUD Sadikin, still rely on a reactive approach to quality and patient safety management, addressing errors only after an adverse event has occurred. In contrast, a more effective strategy is a proactive approach that enables the identification of potential risks before incidents take place (El-Awady, 2023). One of the methods recognized as effective within this approach is Failure Mode and Effect Analysis (FMEA). FMEA is a structured method used to identify and prevent potential failures within a process. This approach is widely applied as a foundation for system improvement, as it functions to define, trace, and eliminate sources of failure in a workflow or production process. Each identified risk is then evaluated using a Risk Priority Number, which serves as the basis for determining the priority of corrective actions (Alifka & Apriliani, 2024).

The conceptual framework of this community engagement initiative is grounded in the application of FMEA as a proactive risk management tool that identifies potential failures across various points in the service process, improves system design, and enhances managerial awareness of the importance of patient safety. Strengthening the managerial competencies of healthcare personnel in implementing FMEA is expected to reduce defects and waiting times, reinforce a quality-oriented culture, and improve patient satisfaction and organizational efficiency. This community service activity contributes directly to strengthening hospital governance by enhancing the managerial human resource capacity in risk analysis and continuous quality improvement. Specifically, the program focuses on an FMEA workshop aimed at improving the ability of RSUD Sadikin's managerial staff to detect service-related problems early and apply systematic strategies for preventing service errors.

This community engagement activity is grounded in the understanding that low-quality hospital services often stem from various forms of waste that lead to service errors and ultimately reduce patient safety and satisfaction. The application of the Failure Mode and Effect Analysis (FMEA) method is used as a managerial tool to detect potential failures early, analyze the causes and impacts of risks, and determine priority preventive actions before errors occur.

Through FMEA training and mentoring, it is expected that the managerial competencies of healthcare personnel will improve in risk detection, service process enhancement, and the continuous strengthening of quality and patient safety. The general objective of this activity is to enhance the managerial competence of healthcare staff in the early detection of service-related problems at RSUD Sadikin through the application of the

FMEA method. The specific objectives include: (1) mapping the current quality of services at RSUD Sadikin; (2) assessing participants' baseline and post-training competencies in implementing FMEA; (3) conducting post-training mentoring to observe the application of acquired competencies; and (4) developing sustainability strategies to ensure continuous improvement in the quality of healthcare services within the hospital.

METHOD

This Location and Duration of the Community Service

This community service was carried out at RSUD Sadikin in Pariaman City from October to November 2025. The target of this community service activity was the hospital management.

Materials and Equipment

To address managerial challenges related to the early detection of failure modes at RSUD Sadikin, a workshop on the use of the Failure Mode and Effect Analysis (FMEA) tool was conducted.

This method was selected because it enables the identification, prevention, and mitigation of potential risks in healthcare services before adverse events or medical errors occur. This differs from the Root Cause Analysis (RCA) approach, which identifies problems and their causes only after an incident has happened. The workshop highlighted several advantages of FMEA for RSUD Sadikin: (1) early detection of potential risks, (2) identification of appropriate corrective and preventive actions, (3) enhanced effectiveness of risk management and patient safety, and (4) the promotion of a culture of safety and continuous learning within the hospital environment.

Several points delivered during the workshop related to FMEA competencies were as follows: 1) Competency Unit: Application of FMEA for the early detection of problems in health services at RSUD Sadikin, and 2) Competency elements, performance indicators, and assessment methods

Implementation Method

The activity began with an initial approach to the hospital management. After obtaining approval and leadership commitment, the team proceeded with a situational analysis of service processes. Participants were then invited to join a workshop on problem detection using the FMEA method.

Data Collection Methods

Pre-tests and post-tests were administered via questionaires, distributed before and after the workshop, to assess participants' knowledge and competency improvement regarding FMEA. The target participants of this program consisted of top management, middle management, technical-level management, and healthcare personnel, totaling 30 individuals. This number was considered adequate for the implementation of the community service activity, as the program was conducted in a Type D hospital. The selected participants represented key and essential units, including the hospital director, head nurses, department heads, professional staff, and designated representatives. Prior to the implementation phase, a pre-test and post-test questionnaire was developed to assess competency achievement following the workshop. The questionnaire was developed by the community service team based on qualitative observations at the RSUD in question as well as at several other RSUDs. Content validity was assessed prior to question development through the expertise of the team, which includes a university lecturer, a healthcare

professional (physician), and individuals with education in hospital management. Limitation of this questionnaire, construct validity and reliability were not assessed before conducting the study at the RSUD, considering that it is a type D hospital with a limited management team, all of whom participated in the activity. The competency assessment elements of the workshop are presented in Table 1 as follows:

Table 1. Pre-test and post-test assessment elements of the FMEA Workshop at Sadikin regional general hospital, Pariaman City, 2025

No.	Assessment Item	Number of Questions	Question Codes
1	Identifying potential failure modes in service processes	3 questions	P1, P2, P3
2	Determining the causes and effects of each failure mode	2 questions	P4, P5
3	Assessing risk levels by calculating the Risk Priority Number (RPN)	3 questions	P6, P7, P8
4	Menetapkan prioritas tindakan pencegahan dan perbaikan	2 questions	P9, P10

Table 1 shows four competency elements used as indicators for assessing the workshop. These elements include: (1) identification of failure modes (3 questions), (2) analysis of the causes and effects of each failure (2 questions), (3) assessment of risk levels and calculation of the Risk Priority Number (RPN), and (4) determination of priority corrective actions.

Data Management and Analysis

Data analysis was performed using descriptive statistics and T-tests to evaluate the increase in scores achieved by the participants. The conceptual framework of this community engagement activity is illustrated in Figure 1 as follows:

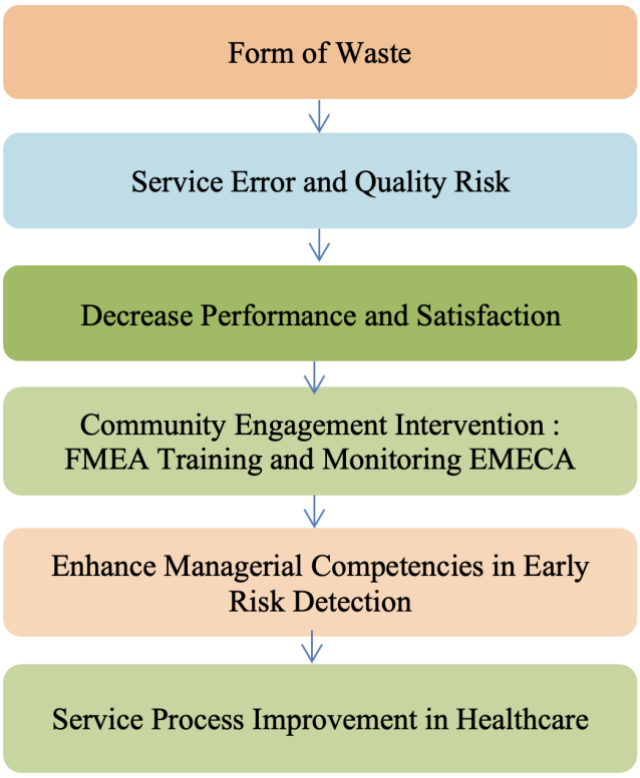

Figure 1. Conceptual framework of the community service implementation

Figure 1 illustrates the conceptual framework of the FMEA workshop implementation, which consists of the following components: (1) Waste—such as Defects, Overproduction, Waiting, Non-Utilized Talent, Transportation, Inventory, Motion, and Extra Processing—leads to decreased efficiency and reduced quality of hospital services; (2) Service errors arising from these forms of waste negatively affect patient safety and the hospital's reputation; (3) The FMEA intervention serves as a proactive approach to identify, analyze, and prevent potential failures within healthcare systems; (4) Strengthening managerial competencies of healthcare personnel is a key factor enabling the hospital to conduct early detection of risks; and (5) The expected outcome is continuous improvement in service quality, efficiency, and patient safety at RSUD Sadikin.

RESULTS AND DISCUSSION

This community service activity was carried out on November 5th, 2025, at RSUD Sadikin. The program ran smoothly, with RSUD Sadikin enthusiastically supporting the activity by assigning staff to participate, providing the venue for the event, and arranging refreshments. Staff assignments were made to ensure that the 30 targeted participants could attend the activity in full.

Figure 2 Presentation of FMEA material and discussion

The activity began with an opening by the organizing committee, followed by the administration of a pre-test to the participants. The FMEA implementation material was delivered by lecturers from the Master's Program in Administration, Universitas Andalas, and by the leadership of RSUD Dr. Sadikin. Participants were very enthusiastic and paid close attention to the material presented. The distribution of targeted participants, who also served as the respondents of this activity, is shown in Table 2 below

Table 2. Frequency distribution of respondents in the FMEA Workshop at RSUD Sadikin Pariaman City, 2025

No.	Participant Category	Frequency	Percentage
1	Top Management / Hospital Directors	2	7%
2	Middle Management (Heads of Installation, Subdivision Heads)	2	7%
3	Lower Management (Heads of Units: Surgery, Radiology, Medical Records, Nutrition, Operating Room, ICU, Emergency Department, PONEK, and Perinatology)	7	23%
4	Professionals (Physicians and Pharmacists)	4	13%
5	Other Health Professionals (Sanitarians,	3	10%

No.	Participant Category	Frequency	Percentage
	Epidemiologists, Health Administrators)		
6	Service Staff	4	13%
7	Management Staff	3	10%
8	Student Participants	5	17%
	Total	30	100%

Based on Table 2, the respondents came from various job positions and professional backgrounds at RSUD Sadikin. The largest proportion of respondents were from the lower management level (service implementation leaders), namely the heads of service/care units. Professionals such as specialist doctors and pharmacists also participated in the workshop activities. Several points delivered during the workshop related to FMEA competencies were as follows: 1) Competency Unit: Application of FMEA for the early detection of problems in health services at RSUD Sadikin, and 2) Competency elements, performance indicators, and assessment methods, as outlined in Table 3, are as follows.

Table 3. Competency elements, performance indicators, and assessment methods of the FMEA Workshop at RSUD Sadikin, Pariaman City, 2025

No.	Competency Element	Performance Indicators (Assessment Criteria)	Assessment Method	Remarks
1	Identifying potential failure modes in service processes	- Able to map the service process flow comprehensively. - Able to identify potential error points in the process.	Observation during group discussions and workflow analysis.	Completed
2	Determining the causes and impacts of each failure mode	- Able to explain the cause–effect relationship of errors. - Able to assess potential impacts on patient safety and service quality.	Assessment of group work outputs and case study discussions.	Completed
3	Assessing risk levels by calculating the Risk Priority Number (RPN)	- Able to assign severity, occurrence, and detection scores logically. - Able to construct the RPN table in accordance with FMEA guidelines	Evaluation of worksheets and participants' practice results.	Completed
4	Establishing priority actions for prevention and improvement	- Able to interpret RPN results to determine risk priorities. - Able to propose appropriate mitigation actions.	Assessment of improvement action plans.	Completed
5	Evaluating the effectiveness of the FMEA Workshop	- Participants demonstrate increased competency before and after the FMEA workshop.	Comparison of FMEA competency levels before and after using statistical analysis.	Completed

No.	Competency Element	Performance Indicators (Assessment Criteria)	Assessment Method	Remarks
6	Evaluating the effectiveness of risk mitigation actions	- Able to compare results before and after improvement actions. - Able to show improvements in quality and reduction of risks.	Assessment of post-training mentoring results.	In progress

Based on Table 3, it is evident that five out of the six FMEA competency elements were implemented in this community engagement activity. The scope of this article is limited to the fifth competency element, namely the assessment of FMEA competency, while the sixth element evaluating the effectiveness of risk-mitigation actions has not yet been measured. This is because such evaluation requires follow-up assessments at 3, 6, 9, 12, and 24 months after the workshop. Furthermore, evaluating risk-mitigation effectiveness at the hospital service level requires the preparation of new assessment tools, administrative approval, mobilization of resources, and cross-unit collaboration following the establishment of organizational commitment.

Table 4. Distribution of mean managerial competency levels of respondents (n=30) before and after the FMEA Workshop at Sadikin District Hospital, Pariaman City, 2025

Variable	Mean	SD	SE	p-value	N
Managerial Competencies in FMEA					
- Pre-Test	70.67	17.604	3.214	0.000*	30
- Post-Test	84.67	14.794	2.701		

**T-test*

Based on Table 4, it can be seen that the managerial FMEA competency score among the target partners before the workshop (pre-test) had an average of 70.67 with a standard deviation of 17.604. After the FMEA workshop, the managerial FMEA competency score (post-test) increased to an average of 84.67 with a standard deviation of 14.794. The paired t-test showed a difference of 14.00 points between the pre-test and post-test scores. This difference was statistically significant with a p-value of 0.000. It can be concluded that the FMEA workshop was effective in improving managerial competencies in identifying, preventing, and mitigating negative risks in healthcare services, and is therefore expected to enhance the quality of healthcare services for the community. This community engagement program will be continued by implementing improvement projects in each managerial unit at RSUD Sadikin, with effectiveness evaluated after two months.

The results of this community service activity show that the application of the Failure Mode and Effect Analysis (FMEA) method has significant potential to improve hospital service quality, particularly at RSUD Sadikin. The increase in participants' knowledge after the training indicates that most had not previously understood proactive risk-analysis methods, making this training highly relevant to meeting quality improvement needs. These findings are consistent with those of Amelia et al., who demonstrated that FMEA is effective in preventing potential failures in emergency department services by reducing the Risk Priority Number (RPN) before and after intervention, including redesigning service areas to minimize the risk of COVID-19 transmission among patients (Amelia et al., 2022). In the pharmacy and laboratory units, the effectiveness of FMEA is further reinforced through the implementation of e-prescribing, the installation of designated service lines,

improved documentation of critical results, and needs mapping, all of which help reduce the risk of service failures (Pertiwiwati et al., 2023).

The context of district hospitals (RSUD) in West Sumatra Province also indicates that service quality continues to face several challenges, particularly related to service waste arising from defects in care delivery and prolonged waiting times. Limited managerial and staff capability in detecting risks early contributes to the suboptimal quality of services. In this situation, FMEA becomes a highly relevant tool, as it can identify failure modes, trace their causes and effects, and establish risk priorities by assessing severity, occurrence, and detection to generate a Risk Priority Number (RPN) as the basis for targeted interventions (Ningsih et al., 2020). This approach enables hospitals to improve service quality proactively by implementing preventive measures before incidents occur.

The significant increase in participants' knowledge scores during the training demonstrates that the FMEA method had previously been neither widely understood nor frequently practiced. Nevertheless, participants showed strong interest and enthusiasm to adopt it in their daily responsibilities. This training is expected not only to enhance knowledge but also to influence attitudes and ultimately develop the practical competencies of healthcare workers in applying effective risk management. This is supported by the findings of Hasanah et al., who state that the success of FMEA implementation depends not only on technical knowledge but also on the attitudes and readiness of healthcare personnel to apply it consistently (Hasanah et al., 2025). Therefore, the training in this program was combined with hands-on practice and the assignment of FMEA projects within each participant's respective unit to ensure real-world implementation and to enable evaluation of its effectiveness after two months.

The implementation of the training, which followed the formal stages of FMEAincluding team formation, process mapping, identification of failure modes, RPN calculation, root-cause identification, process redesign, and monitoring—enabled participants to understand the method comprehensively (Ningsih et al., 2024). This training approach aligns with the model used by Pramesona et al., which emphasizes a combination of material delivery, interactive discussion, and hands-on FMEA development to maximize participants' skills across various managerial and service domains (Pramesona et al., 2023). At Hospital "X," the training involved staff ranging from management to technical units, enabling the quality improvement process to occur comprehensively and collaboratively.

The implementation of FMEA across various service areas at Hospital "X" demonstrated that this method is capable of identifying specific risks that were previously unmapped in a systematic manner. In clinical services and the pharmacy department, FMEA successfully detected risks such as medication mix-ups, stock unavailability, and outdated documentation, which then led to recommendations including standardized SOPs, strengthened digital inventory systems, the use of barcodes, and improved staff capacity. In the human resources area, FMEA identified issues such as unfriendliness, noncompliance with duty schedules, and technical incompetence by tracing root causes such as high workload or weak supervision. Meanwhile, in the finance and BPJS claims unit, FMEA revealed potential failures such as delayed claims, rejected claims, and reduced revenue due to late data entry or poor coordination, leading to recommendations for a more accurate and timely claims monitoring system. Through this cross-departmental analysis, FMEA enables Hospital "X" to shift from a reactive approach to a preventive, risk-based quality management system.

The medical records department particularly after the implementation of the Electronic Medical Record (EMR) system also exhibited a relatively high rate of failures, including data entry errors, mislabeling, and miscommunication among staff. Through FMEA, these risks can be mapped from low to very high hazard levels, enabling the

development of more targeted risk-control strategies. Throughout the program, the partner institution demonstrated cooperative and enthusiastic engagement. Scheduling conflicts with local government activities did not significantly hinder the training, and conducting the workshop on weekdays was considered more effective than holding it on weekends, which could have reduced participant attendance (Yudianti & Arini, 2024).

Overall, the results of this program demonstrate that FMEA is a highly effective method for strengthening service quality and patient safety through systematic risk identification and the establishment of measurable improvement priorities. Cross-unit involvement, increased knowledge, attitude changes, and hands-on FMEA practice provide a strong foundation for RSUD "X" to develop a more proactive and sustainable quality management system.

CONCLUSION

From this community service activity, it can be concluded that the FMEA workshop was effective in enhancing managerial competencies in identifying, preventing, and mitigating negative risks in healthcare services, thereby contributing to the improvement of healthcare quality for the community. This program was followed by project implementation within each managerial staff's respective work units at RSUD Sadikin, with effectiveness evaluations conducted after two months. It is recommended that participants apply FMEA optimally over the next two months so that the effectiveness of FMEA in reducing failure risks within their respective units can be clearly observed. The hospital also needs to strengthen managerial support by providing adequate resources and reinforcing relevant policies.

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