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A STUDY TO ANALYSE FMEA IN THE RADIOLOGY DEPARTMENT

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Abstract

In the rapidly evolving field of healthcare, ensuring high-quality and safe patient care is of utmost importance." The FMEA quality tool is crucial for improving patient safety and the quality of care in the radiology department. It helps to identify potential risks and errors in radiology processes, like misdiagnoses or equipment malfunctions. By proactively addressing these risks, we can enhance the effectiveness and efficiency of the department. This study is to assess the existing processes and identify potential risks and errors in the radiology department, then to explore the principles and application of the FMEA quality tool in the context of radiology services, and then to develop a comprehensive FMEA framework tailored to the specific needs of the radiology department. The sample for this study will be patients and technicians. The sample size is 60, inclusive of patients and technicians. By doing this study, it will be helpful to find the modes that are ineffective and things that are not up to standards using the FMEA quality tool and provide suggestions in order to provide an effective work process in order to obtain quality work and satisfy patients. It is also important to enhance patient safety and optimize radiology department processes.

Key Words: Error Prevention, FMEA, Radiology Equipment, Patient Safety, Quality assurance

INTRODUCTION:

In this study, we aim to delve into the potential failure modes that can occur within the radiology department and examine their impact on patient care, safety, and overall department

efficiency. By conducting this analysis, we hope to identify any areas of improvement and develop strategies to mitigate risks and enhance the quality of care provided to patients. Understanding these failure modes will enable us to implement proactive measures, thereby ensuring a safe and efficient radiology department. Through this study, we will explore the various processes involved in the radiology department, from scheduling appointments to conducting diagnostic procedures and delivering accurate results. By analyzing potential failure modes and their effects, we can identify critical areas requiring attention and develop targeted interventions to prevent or minimize risks. Ultimately, the findings of this study will contribute to the ongoing improvement efforts within the Radiology department. It will provide valuable insights into the importance of FMEA and its potential impact on patient outcomes.

REVIEW LITERATURE:

Evan Thornton's study (2010) emphasizes the use of Failure Modes and Effects Analysis (FMEA) as a proactive tool for predicting and preventing failures in clinical radiology services. Thornton highlights FMEA's importance in ensuring patient safety and its role in identifying potential risks before they impact patient care [1]. Similarly, Hani H. Abujudeh (2009) discusses how FMEA can be utilized to evaluate radiologic processes and mitigate risks associated with radiologic care. Abujudeh positions FMEA as an effective method for proactive error prevention, thereby enhancing overall patient safety [2]. Michael A. Bruno (2014) explores fundamental aspects of quality and safety in radiology, emphasizing FMEA's role in fostering an organizational culture committed to continuous improvement and safety [3]. Ali Mahdavi (2023) focuses on using FMEA to identify hazards and risks within the radiology department. Mahdavi highlights FMEA's significance in creating safer working environments for hospital staff and improving operational safety [4]. Mohammad Hossein (2019) presents a review of FMEA applications across various hospital wards. Hossein underscores FMEA's role in preventing medical errors through proactive risk analysis and its effectiveness in enhancing overall patient safety [5]. Jessica Hernandez (2015) examines the integration of Lean Six Sigma principles with FMEA in radiology operations. Hernandez's study complements FMEA's approach by adding methods for improving patient care through streamlined processes [6]. JWL OOI (2020) evaluates patient safety culture in radiology facilities and highlights FMEA's importance in identifying areas for improvement and implementing targeted interventions. OOI's work demonstrates FMEA's effectiveness in enhancing safety culture within radiology

departments [7].Howard Lee (2017) assesses FMEA's effectiveness in clinical trials, identifying 114 failure modes across six core processes. Lee's findings indicate that addressing high-risk modes through FMEA led to significant risk reductions [8]

OBJECTIVES:

1. To identify the existing defects in the radiology department.
2. To analyse the consequences of failure mode at the radiology department.

RESEARCH METHODOLOGY:

This study, conducted from February 6th to April 5th, employed a quantitative research approach. Primary data was collected through structured questionnaires disseminated virtually to post-Diagnostic patients and technicians within the radiology domain, with an additional literature review incorporated. The questionnaire comprised two sections: one capturing demographic traits and the other scrutinizing contemporary safety measures using Likert scales. Using convenience sampling, a total of 60 individuals participated, consisting of 30 patients and 30 technicians. Data analysis involved descriptive statistics such as frequency distribution and percentage, chi-square, and correlation analysis, facilitated by SPSS software.

The study focused on the Radiology Department's Quality division. Employing an Action research design, primary data was collected through structured questionnaires. The sample comprised OP Patients and Technicians, with a total sample size of 60 individuals. Stratified Random Sampling was the sampling technique utilized.

ANALYSIS AND INTERPRETATION FOR PATIENT PERCENTAGE ANALYSIS ANXIETY OR DISCOMFORT

TABLE-1

Parameters	No Of Respondents	Percentage %
Yes	14	46.7
No	16	53.3
Total	30	100%

Among 30 patients, 46.7% experienced discomfort during their scan, while 53.3% did not.

TABLE-2**Reason for Anxiety/Discomfort**

Parameters	No of respondents	Percentage
Lack of communication regarding the procedure	5	35.7%
Equipment malfunction	2	14.3%
Uncomfortable environment	5	35.7%
OTHERS	2	14.3%
Total	14	100%

Among 14 patients who felt discomfort/anxiety 35.70% responded lack of communication and uncomfortable environment and 14.30% responded to equipment malfunction and others.

WEIGHTED AVERAGE TABLE -3**Radiology Department Performance Metrics**

s. n o	parameters	highly satisfi ed 5	satisfied 4	neutral 3	dissatisfied 2	highly dissatisfied 1	total	weighted average
1	cleanliness/ maintenanc e of equipment	8	11	10	1	0	30	3.86
2	Level of privacy maintained at Radiology Departmen t	5	15	9	1	0	30	3.5
3	Overall Satisfaction Radiology Departmen t	4	11	13	2	0	30	3.56

Among 30 patients weighted average of 3.86 for the cleanliness /maintenance of equipment, 3.56 for overall satisfaction and 3.5 for the level of privacy maintained at Radiology department.

ANALYSIS AND INTERPRETATION FOR TECHNICIANS**PERCENTAGE ANALYSIS****CAUSE OF FAILURE****TABLE -4**

Parameters	No of respondents	Percentage
LACK OF TRAINING	2	7%
EQUIPMENT MAINTENANCE	10	33.33%
POOR COMMUNICATION	4	13.33%
PATIENT NON -COMPLIANCE	14	47%
TOTAL	30	100%

Among 30 Technicians 7% said that it was due to lack of training, 33.33% felt it was due to equipment maintenance problems, 13.33% said due to poor communication and a maximum of 47% found the failures were caused due to patient's non-compliance.

TABLE-5**Radiology Efficiency and Quality Metrics**

S. NO	PARAMETER	VERY LOW 5	LOW 4	MODERATE 3	HIGH 2	VERY HIGH 1	TOTAL	WEIGHTED AVERAGE
1	EFFECTIVENESS OF RADIOLOGY DEPARTMENT IN USING PROCEDURE	9	4	8	4	5	30	3.26

2	ENSURING PATIENTS PRIVACY	7	8	5	5	5	30	3.23
3	IMPACT DUE TO POOR COMMUNICATION	12	7	7	3	1	30	3.866
4	RATE EQUIPMENT ERRORS	15	4	10	1	0	30	4.1

Among 30 technicians the highest weighted average of 4.1 was for equipment errors and least was for ensuring patient privacy of 3.23.

TABLE-6

Awareness of safety protocols

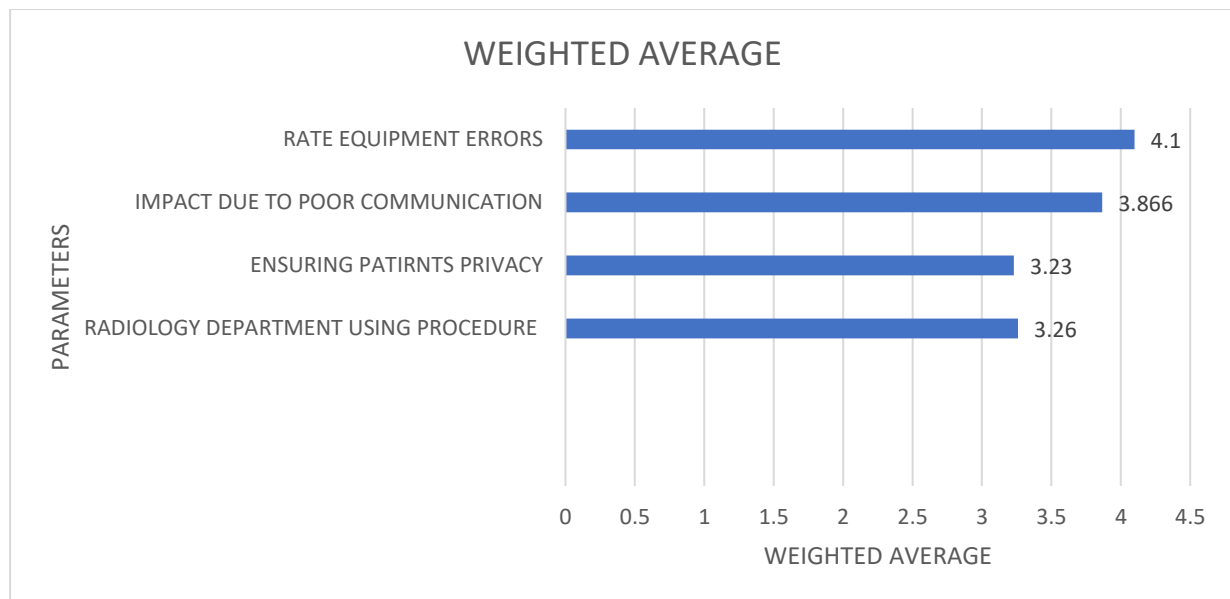
Parameters	No Of Respondents	Percentage %
Yes	25	84%
No	5	16%
Total	30	100%

The above table indicates that among 30 patients 84% said that they were aware of safety protocols and 16% were not aware of safety protocols.

TABLE-7**Evaluation of Radiology Department Parameters**

S.N O	PARAMETER S	VERY LOW 5	LOW 4	MODERA TE 3	HIGH 2	VERY HIGH 1	TOT AL	WEIGHT ED AVERAG E
1	EFFECTIVENESS OF RADIOLOGY DEPARTMENT IN USING PROCEDURE	9	4	8	4	5	30	3.26
2	ENSURING PATIENTS PRIVACY	7	8	5	5	5	30	3.23
3	IMPACT DUE TO POOR COMMUNICATION	12	7	7	3	1	30	3.866
4	RATE EQUIPMENT ERRORS	15	4	10	1	0	30	4.1

The above table indicates that among 30 technicians the highest weighted average of 4.1 was for equipment errors and least was for ensuring patient privacy of 3.23.



CHI-SQUARE ANALYSIS:

The chi-square test of independence is a statistical test used to determine if there is a significant association between two categorical variables.

1. The study aimed to investigate the association between gender and adherence to the scan procedure, with the following hypotheses:

- **H₀:** There is no significant relationship between gender and adherence to the scan procedure.
- **H₁:** There is a significant relationship between gender and adherence to the scan procedure.

Upon analysis, it was found that gender significantly influences adherence to the scan procedure ($\chi^2 = 7.5$, $p = 0.006$), with females demonstrating higher adherence rates compared to males. The observed "p-value" of 0.006 falls below the significance level of 0.05, leading to the rejection of the null hypothesis (H_0). This suggests a significant relationship between gender and adherence to the scan procedure.

2 The study aimed to examine the association between gender and level of privacy satisfaction, with the following hypotheses:

- **Ho:** There is no significant relationship between gender and level of privacy.
- **H1:** There is a significant relationship between gender and level of privacy.

The analysis revealed a significant correlation ($\chi^2 = 8.844$, $p = 0.031$), indicating that gender influences privacy satisfaction. Males exhibited higher dissatisfaction rates (46.7%) compared to females (20%). Thus, rejecting the null hypothesis (Ho) suggests that gender plays a role in shaping individuals' preferences or behaviors regarding privacy levels.

DISCUSSION:

- It is suggested to provide amenities and relaxation techniques to enhance patient comfort during scans. • This can improve patient experience and reduce anxiety.
- It is suggested to prioritize regular equipment maintenance to prevent malfunctions.
- It is suggested to improve communication and training in the radiology department to make procedures more effective. Additionally, focus on minimizing equipment errors and safeguarding patient privacy.
- It is suggested to inform technicians about gender-based differences in patient adherence to the scan procedure, prompting them to consider this factor when assisting.
- It is recommended to introduce educational programs for technicians to enhance their comprehension of safety protocols.
- It is suggested to review and adjust protocols to uphold patient privacy and confidentiality in the radiology department.

CONCLUSION:

The study highlights the need to address various aspects within the radiology department to enhance efficiency and patient satisfaction. This involves prioritizing communication protocols, streamlining scheduling processes, and maintaining equipment regularly.

Additionally, investing in technician training and patient education can improve safety measures. Continuous monitoring of processes and feedback enables proactive improvements, while upholding patient privacy is crucial for trust and ethical compliance.

These proactive steps foster a culture of continuous improvement in the radiology department.

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