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The Influence of Surgical Time Management, Drug Availability, Anesthesiologist Competence, Incident Reporting Systems, and Interdisciplinary Collaboration on Psatient Safety at Level II Iskandar Muda Hospital Banda Aceh

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Abstract

Patient safety during surgical procedures is influenced by several factors, including surgical time management, drug availability, anesthesiologist competence, incident reporting systems, and effective interdisciplinary collaboration. This study aims to analyze the impact of these five factors on patient safety at TK II Iskandar Muda Hospital in Banda Aceh, in order to provide comprehensive strategies for improving healthcare service quality. This study is a quantitative explanatory replication research conducted at Rumah Sakit Tingkat II Iskandar Muda, Banda Aceh, involving 115 medical personnel selected through purposive sampling. Primary data were collected via questionnaires and analyzed using multiple linear regression with SPSS 27, after validity, reliability, and classical assumption tests. This research analyzed factors influencing patient safety, revealing that effective operating time management, incident reporting systems, and inter-professional collaboration significantly enhance safety. Interestingly, increased drug availability showed a negative correlation with patient safety, indicating underlying supply chain management issues. While crucial, anesthesiologist competency did not show a statistically significant relationship in this study, possibly due to already high competency levels. Overall, improving patient safety requires a multi-factorial approach, focusing on incident reporting, collaboration, and operational efficiency, while addressing challenges in drug management.

Keyword: Anesthesiologist Competence, Drug Availability, Interdisciplinary Collaboration, Patient Safety, Surgical Time Management

INTRODUCTION

Patient safety is a fundamental aspect of healthcare services that must be prioritized, particularly in surgical procedures that demand strict adherence to safety standards to prevent adverse outcomes (WHO, 2020). Studies show that 10% of hospitalized patients experience adverse events, many of which are preventable (World Health Organization, 2021). According to the Institute of Medicine (2000), between 44,000 and 98,000 deaths annually in the U.S. are caused by medical errors, underscoring the urgent need for robust patient safety systems. Several critical factors, including time management, medication availability, healthcare workers' competence, and the implementation of incident reporting systems, play a substantial role in shaping patient safety outcomes (Goekcimen, 2023; Mistri, 2023). Poor safety practices not only harm patients but also lead to financial losses, diminished public trust, and psychological distress among healthcare providers (LaGrone et al., 2024). However, structured and evidence-based safety frameworks such as the WHO Surgical Safety Checklist have significantly reduced surgical complications and mortality rates (Haynes et al., 2009). Therefore, implementing a comprehensive and proactive safety management approach is imperative for improving patient outcomes and enhancing healthcare quality across institutions (Arnal-Velasco et al., 2025).

Efficient surgical time management and adequate drug availability are critical in enhancing the quality of care and ensuring patient safety (Lawson et al., 2025). A study by Djawa and Oktamianti (2023) confirmed that implementing Lean Management in hospitals effectively reduces patient waiting time, boosts efficiency, and elevates service quality (Djawa & Oktamianti, 2023). Another research corroborates the positive impact of Lean/Six-Sigma

tools—like DMAIC and LSS—on reducing outpatient waiting times and elevating patient satisfaction (Waiman et al., 2023). The adoption of queue management systems similarly demonstrates measurable reductions in both actual and perceived waiting times, along with superior patient satisfaction in emergency settings (Bidari et al., 2021). Virtual or web-based queuing platforms offer additional benefits by minimizing congestion, optimizing resource utilization, and improving overall operational efficiency (Wavetec, 2023; Naufal et al., 2023). Conversely, drug shortages—frequently sparked by distribution delays—can compromise timely patient care, leading to treatment disruptions and necessitating the deployment of costlier, sometimes less suitable alternatives (Vizient, 2025; GAO, 2025). These findings underscore the pressing need for robust coordination between hospitals and distributors and for resilient mitigation strategies that ensure continuity of critical medication supply.

The competence of anesthesiologists plays a vital role in ensuring patient safety during surgical procedures, encompassing comprehensive pre-anesthesia, intra-anesthesia, and post-anesthesia care (Royal College of Physicians and Surgeons of Canada, 2017). This competence also includes professionalism, medical ethics, health law, health promotion, as well as managerial and leadership skills (American Society of Anesthesiologists, 2025; Duarte-Ortiz, 2018). With these capabilities, anesthesiologists can provide safe and high-quality care while contributing to the development of their profession (Gutiérrez, 2024). Incident reporting systems are also critical for improving hospital service quality. Evaluations using the Health Metrics Network (HMN) method indicate that hospitals have implemented reporting components in accordance with regulations, enabling effective risk identification and management (Alsobou et al., 2025). Nevertheless, despite the presence of such systems, implementation challenges persist. Common barriers include lack of knowledge among staff about incidents and reporting procedures, absence of dedicated reporting teams, fear of administrative sanctions, unclear guidelines, and insufficient feedback (Shemsu, 2024; Anilkumar et al., 2025; Smit et al., 2025). These findings indicate that although the infrastructure for incident reporting exists, its execution faces obstacles that must be addressed to improve patient safety.

Interdisciplinary collaboration among medical professionals such as surgeons, anesthesiologists, and nurses plays a crucial role in enhancing patient safety. A study by Sillero and Buil (2021) in Spain revealed that communication failures are a primary cause of sentinel events in operating rooms. Similarly, a study by Dinius et al. (2020) in Germany demonstrated that higher levels of interprofessional collaboration correlate with improved patient safety. This study, involving 326 hospital team members, found that better perceptions of team collaboration were associated with improved safety-related behaviors and overall patient safety.

Research on the influence of factors such as time management, drug availability, medical staff competence, incident reporting systems, and interdisciplinary team collaboration on patient safety particularly in surgical procedures is of paramount importance. One of the most critical aspects is interprofessional collaboration, where healthcare professionals work synergistically to provide safe, effective, and coordinated care. A study by Nuwsath (2024) indicated that interprofessional collaboration can significantly reduce medical errors, improve cross-disciplinary care coordination, and create a supportive work environment for better clinical decision-making. The findings of this study are expected to provide actionable recommendations for hospitals to enhance service quality and reduce adverse patient outcomes. For instance, implementing technology-based reporting systems may increase compliance with surgical safety protocols. Furthermore, according to a systematic review by Sudrajat et al. (2022), the use of digital and electronic media such as audio recordings and computerized

systems can improve surgical teams' adherence to time-out procedures, which are a component of the surgical safety checklist.

Based on the above background, this study will be conducted under the title: "The Influence of Surgical Time Management, Drug Availability, Anesthesiologist Competence, Incident Reporting Systems, and Interdisciplinary Collaboration on Patient Safety at Level II Iskandar Muda Hospital, Banda Aceh." The primary objective of this research is to examine the influence of these variables on patient safety and to provide a comprehensive understanding of strategies for enhancing patient safety during medical procedures. This study is expected to offer a detailed overview of the significance of each factor and their interactions in ensuring optimal patient safety.

METHOD

This study employed an explanatory research design with a quantitative approach to investigate the causal relationships between the independent variables—*surgical time management*, *drug availability*, *anesthesiologist competence*, *incident reporting systems*, and *interdisciplinary collaboration*—and the dependent variable, patient safety. According to Sekaran and Bougie (2017), explanatory research aims to determine whether changes in one variable cause changes in another. The study was a replication, using similar constructs and methods from prior research to validate previous findings while exploring new variable interactions in a different setting. It was conducted at Level II Iskandar Muda Hospital in Banda Aceh, selected for its relevance to the surgical environment and access to appropriate clinical personnel.

The population included surgical personnel such as specialists, nurses, anesthesiologists, and hospital management staff involved in perioperative care. Using purposive sampling, 115 participants were selected based on their direct roles in surgical services and patient safety. Data were collected primarily through structured questionnaires administered to eligible respondents and supplemented by literature review to contextualize the findings. Operational definitions for each variable ensured precise measurement and objective analysis. The data aimed to assess the strength and nature of the causal relationships to provide evidence-based recommendations for improving surgical safety practices in hospital settings.

RESULTS AND DISCUSSION

Descriptive Statistical Test Results

Based on the descriptive statistical analysis, all independent and dependent variables in this study showed mean scores above 4, indicating positive responses from most participants. Variables such as Operation Time Management, Drug Availability, Anesthesiologist Competence, Incident Reporting System, and Interdisciplinary Collaboration were all rated highly, suggesting these aspects are well-managed in supporting surgical services. The dependent variable, Patient Safety, also received a high average score, with low standard deviations across items, reflecting consistent responses and a strong foundation for further inferential analysis.

Classical Assumption Test Results

Table 1. Normality Test Results

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		**127**
Normal Parameters[a,b]	Mean	.0000000

One-Sample Kolmogorov-Smirnov Test			
			Unstandardized Residual
N			**127**
	Std. Deviation		1.94382583
Most Extreme Differences	Absolute		.089
	Positive		.082
	Negative		-.089
Test Statistic			.089
Asymp. Sig. (2-tailed)[c]			.16
Monte Carlo Sig. (2-tailed)[d]	Sig.		.16
	99% Confidence Interval	Lower Bound	.012
		Upper Bound	.019

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. Lilliefors' method based on 10000 Monte Carlo samples with starting seed 112562564.

Source: Normality test results using SPSS 27

Based on table 1 above, it can be seen that the results of the normality test value on the Kolmogorov-Smirnov are known to have a significant value of 160 or 0.160 which is above 0.05. So it can be concluded that the regression model in this study is normally distributed.

Table 2. Multicollinearity Test

Coefficients[a]				
Model		**Collinearity Statistics**		**Hasil Uji**
		Tolerance	**VIF**	
1	X1	.341	2.929	Tolerance value >0.1, and VIF value <10, then there are no symptoms of multicollinearity.
	X2	.258	3.880	Tolerance value >0.1, and VIF value <10, then there are no symptoms of multicollinearity.
	X3	.168	5.945	Tolerance value >0.1, and VIF value <10, then there are no symptoms of multicollinearity.
	X4	.131	7.626	Tolerance value >0.1, and VIF value <10, then there are no symptoms of multicollinearity.
	X5	.122	8.198	Tolerance value >0.1, and VIF value <10, then there are no symptoms of multicollinearity.

a. Dependent Variable: Y

Source: SPSS 27 output of the multicollinearity test

Based on the multicollinearity test results presented in Table 3, all independent variables showed tolerance values above 0.1 and VIF values below 10, indicating no significant multicollinearity. This confirms that each variable contributes uniquely to the dependent variable, patient safety, and ensures the regression coefficients remain unbiased. Therefore, the

data meet the requirements for multiple regression analysis, strengthening the validity of the model used in this study at Iskandar Muda Level II Hospital.

Table 3. Heteroscedasticity Test

Coefficients[a]							
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**Results**
		B	**Std. Error**	**Beta**			
1	(Constant)	3.324	.738		4.506	.000	
	X1	-.090	.039	-.305	-2.273	.025	Significance value (>0.05), then there is no Heteroscedasticity symptom
	X2	-.017	.050	-.054	-.350	.727	Significance value (>0.05), then there is no Heteroscedasticity symptom
	X3	.122	.038	.610	3.189	.002	Significance value (>0.05), then there is no Heteroscedasticity symptom
	X4	.099	.053	.405	1.868	.064	Significance value (>0.05), then there is no Heteroscedasticity symptom
	X5	-.188	.043	-.981	-4.363	.000	Significance value (>0.05), then there is no Heteroscedasticity symptom
a. Dependent Variable: ABS_RES (Y)							

Source: Heteroscedasticity test results using SPSS 27

Based on the heteroskedasticity test results in Table 3, variables X1 (Operation Time Management), X2 (Drug Availability), and X4 (Incident Reporting System) show no indication of heteroskedasticity, as their significance values are above 0.05, except for X1 which is slightly below the threshold. In contrast, variables X3 (Anesthesiologist Competence) and X5 (Interdisciplinary Collaboration) exhibit heteroskedasticity, with significance values of 0.002 and 0.000 respectively, indicating inconsistent error variances. This suggests a violation of classical assumptions, and remedial measures such as data transformation or robust regression may be needed to improve the model's accuracy and reliability.

Hypothesis Testing Results

Table 4. Partial Test (t-Test)

Coefficients[a]							
	Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**Description/Results**
		B	**Std. Error**	**Beta**			
1	(Constant)	4.537	1.217		3.729	.000	
	X1 (Uptime management)	.356	.065	.282	5.480	.000	The significance value (<0.05), and coefficient value of 0.356 means that operating time management has a positive effect on patient safety (H1 is supported).
	X2 (Drug availability)	-.258	.082	-.186	-3.144	.002	The significance value (<0.05), and coefficient value -0.258 means that drug availability has no effect on patient safety (H2 is not supported)
	X3 (Anesthesiologist Skills)	-.003	.063	-.004	-.055	.956	The significance value (>0.05), and coefficient value -0.003 means that the competence of anesthesiologists has no effect on patient safety (H3 is not supported)
	X4 (Incident reporting system)	.483	.087	.460	5.537	.000	The significance value (<0.05), and coefficient value of 0.483 means that the incident reporting system has an effect on patient safety (H4 is supported)
	X5 (Interdisciplinary Collaboration)	.362	.071	.439	5.101	.000	The significance value (<0.05), and coefficient value of 0.362 means that interdisciplinary collaboration has an effect on patient

Coefficients[a]						
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**Description/Results**
	B	**Std. Error**	**Beta**			
						safety (H5 is supported)
a. Dependent Variable: Y						

Sumber: Analisis regresi linear parsial dengan SPSS 27

Based on the partial test (t-test) results in Table 4, the variable X1 (Operation Time Management) shows a significance value of 0.000 with a t-value of 5.480, indicating a significant influence on patient safety (Y). Similarly, X2 (Drug Availability) has a significance value of 0.002 and a negative t-value of -3.144, suggesting a statistically significant but inverse relationship with Y. In contrast, X3 (Anesthesiologist Competence) has a significance value of 0.956 and a t-value of -0.055, implying no significant effect on patient safety. Meanwhile, X4 (Incident Reporting System) and X5 (Interdisciplinary Collaboration) both demonstrate significance values of 0.000 and strong positive t-values, indicating significant and positive impacts on Y. Overall, four out of five independent variables (X1, X2, X4, and X5) significantly affect patient safety at Iskandar Muda Level II Hospital in Banda Aceh, highlighting the importance of operational management, incident reporting, and interdisciplinary collaboration.

Table 5. Simultaneous Test (F Test)

ANOVA[a]							
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Result**
1	Regression	3877.253	5	775.451	197.085	.000[b]	Because the significance value (<0.05) means that simultaneously the variables X1, X2, X3, X4, & X5 have an influence on the variable Y.
	Residual	476.086	121	3.935			
	Total	4353.339	126				
a. Dependent Variable: Y							
b. Predictors: (Constant), X5, X1, X2, X3, X4							

Source: ANOVA output from SPSS 27

Based on the results of the simultaneous F-test shown in Table 5, the F value is 197.085 with a significance level of 0.000. Since the significance value is less than 0.05, it can be concluded that the independent variables X1 (Operation Time Management), X2 (Drug Availability), X3 (Anesthesiologist Competence), X4 (Incident Reporting System), and X5 (Interdisciplinary Collaboration) have a significant simultaneous effect on the dependent variable (Patient Safety). The high F value indicates that the regression model is effective in explaining variations in patient safety. Therefore, the combination of these five independent variables can collectively account for changes in the level of patient safety at Iskandar Muda Level II Hospital in Banda Aceh. These findings highlight the importance of integrating both managerial and clinical aspects to comprehensively enhance patient safety.

Table 6. Coefficient of Determination (R Square)

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.944[a]	.891	.886	1.98358

a. Predictors: (Constant), X5, X1, X2, X3, X4

Source: SPSS regression analysis results 27

Based on the data in table 6 above, it can be seen that the Adjusted R Square value of 0.886 or 88.6% of the variation in Patient Safety can be explained or interpreted by the variables of Operation Time Management, Drug Availability, Anesthesiologist Competence, Incident Reporting System and Interdisciplinary Collaboration. While the remaining 11.4% is influenced by other factors or aspects not explained in this study.

Table 7. Multiple Linear Regression Analysis

Coefficients[a]						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	4.537	1.217		3.729	.000
	X1	.356	.065	.282	5.480	.000
	X2	-.258	.082	-.186	-3.144	.002
	X3	-.003	.063	-.004	-.055	.956
	X4	.483	.087	.460	5.537	.000
	X5	.362	.071	.439	5.101	.000

a. Dependent Variable: Y

Source: Multiple linear regression equation of SPSS 27

Based on the results of multiple linear regression analysis from SPSS output, the following equation model was obtained:

$$\mathbf{Y = 4.537 + 0.356X_1 - 0.258X_2 - 0.003X_3 + 0.483X_4 + 0.362X_5}$$

Notes:

- **Y** = Patient Safety (dependent variable)
- $\mathbf{X_1}$ = Operation Time Management
- $\mathbf{X_2}$ = Availability of Drugs
- $\mathbf{X_3}$ = Anesthesiologist Competence
- $\mathbf{X_4}$ = Incident Reporting System
- $\mathbf{X_5}$ = Interdisciplinary Collaboration
- **4.537** = Constants

The Influence of Surgical Time Management on Patient Safety

The analysis of the research findings indicates that surgical time management has a significant effect on patient safety. Based on the partial significance test (t-test), the surgical time management variable (X_1) showed a significance value of 0.000, which is less than the threshold of 0.05. This result suggests that surgical time management independently exerts a statistically significant influence on patient safety levels. Furthermore, a one-unit increase in

surgical time management is associated with a 0.362 increase in patient safety, indicating a clear positive relationship. This influence is further supported by the standardized coefficient (Beta) value of 0.282, positioning surgical time management as a key determinant in enhancing patient safety. These findings underscore the importance of efficient time management in surgical procedures to minimize risk and improve healthcare service quality.

Effective surgical time management includes meticulous preoperative planning, optimal scheduling, and the timely execution of procedures. Its primary aim is to reduce patient waiting times, avoid unnecessary delays, and ensure the availability of adequate resources. A well-organized system minimizes the risk of complications, infections, and other adverse events that may arise from poor time management. The implementation of strict protocols throughout the surgical process from patient preparation to postoperative recovery contributes to a safer surgical environment. Moreover, the use of information technology to monitor and manage surgical schedules can enhance both efficiency and accuracy in the operating room.

This study aligns with existing literature emphasizing the critical role of time management in patient safety. Relevant studies have shown that surgical time efficiency directly correlates with a reduction in adverse event rates and an increase in patient satisfaction. Proper time management can alleviate stress for both the medical team and patients, fostering a safer and more conducive environment for clinical procedures. Efficient scheduling also supports optimal allocation of human resources and equipment, preventing staff fatigue that could lead to medical errors. Therefore, investing in comprehensive surgical time management strategies is crucial to improving safety standards in healthcare institutions.

The connection between surgical time management and patient safety can also be observed in its impact on decision-making processes. Properly managed time enables surgical teams to conduct thorough evaluations, verify procedures, and communicate effectively thus reducing the likelihood of errors caused by time pressure or haste. In contrast, poor time management may result in case backlog, potentially compromising the quality of care for subsequent patients. Consequently, proactive and responsive time management is essential to maintain consistent safety standards throughout surgical procedures. Prior research has identified surgical time management as vital in improving the efficiency of medical interventions and preventing adverse events. This is consistent with the findings that time management significantly influences patient safety. A study by Elmonita et al. (2022) emphasized that patient safety is a fundamental element that must be upheld to protect patients from harm due to medical interventions. This supports the notion that effective surgical time management constitutes a systematic effort to ensure safe and high-quality care (Ministry of Health Regulation of the Republic of Indonesia No. 11 of 2017).

In conclusion, surgical time management serves as a cornerstone in establishing a safe and effective surgical environment. Hospitals must continuously optimize their surgical time management systems through ongoing staff training, the adoption of advanced scheduling technologies, and regular monitoring and evaluation of surgical timing performance. By doing so, healthcare service quality can be significantly improved, and patient safety risks can be minimized. Prioritizing this aspect will yield far-reaching positive impacts on institutional reputation and public trust in the healthcare services provided.

The Influence of Drug Availability on Patient Safety

The analysis of the research findings reveals that drug availability has a significant influence on patient safety. Based on the partial significance test (t-test), the drug availability variable (X_2) yielded a significance value of 0.002, which is less than the 0.05 threshold. This result indicates that drug availability independently has a statistically significant effect on

patient safety levels. Interestingly, however, the study found a negative effect, with the standardized coefficient (Beta) recorded at -0.186. This suggests that an increase of one unit in drug availability is associated with a 0.169 decrease in patient safety. This unexpected negative relationship warrants further investigation to identify the underlying causes.

Adequate drug availability is typically expected to enhance patient safety by ensuring timely and appropriate therapeutic interventions. However, in the context of this study, the findings may indicate the presence of other issues, such as storage problems, expired medications, misidentification of drugs, or even inappropriate usage due to excessive availability. This highlights that availability alone is insufficient; an effective pharmaceutical supply chain management system including proper storage, distribution, and administration is equally critical. Without proper oversight, a surplus in drug availability may paradoxically compromise patient safety rather than support it.

The implications of these findings suggest that hospitals must focus not only on the quantity of drug availability but also on the quality and safety of drug management systems. This includes routine audits of medication stock, staff training on proper drug handling and administration, and the implementation of systems designed to detect and prevent medication errors. There may be workflow inefficiencies in the pharmacy process from procurement to administration that lead to mistakes such as incorrect identification or improper dosing despite the availability of the medication. Investigating whether such practices are present is essential for understanding how they may contribute to reduced patient safety.

If available drugs are of substandard quality or fail to meet regulatory standards, they may negatively affect treatment outcomes and compromise patient safety. Furthermore, the risk of misuse or dosage errors due to lack of oversight, despite an abundant drug supply, may also explain the observed relationship. Therefore, it is crucial to conduct further qualitative analysis to explore the root causes behind this negative association. While drug availability is generally considered a key factor in patient safety ensuring continuity of care and reducing the risk of medication errors availability alone does not guarantee safety without the support of a robust management system. Elmonita et al. (2022) emphasize that patient safety is a fundamental element that must be preserved to protect patients from the risk of harm resulting from medical interventions. This implies that every aspect of medication management, from procurement to administration, must be handled with precision to ensure patient safety.

The Influence of Anesthesiologist Competence on Patient Safety

The findings of this study indicate that anesthesiologist competence (X_3) does not have a statistically significant effect on patient safety. Based on the partial significance test (t-test), the variable of anesthesiologist competence (X_3) yielded a significance value of 0.956, which is far greater than the 0.05 threshold. This suggests that, within the context of this research model, the level of anesthesiologist competence does not independently correlate with either an increase or decrease in patient safety. It is important to note that anesthesiologists play a critical role throughout all surgical stages preoperative, intraoperative, and postoperative. They are responsible for assessing the patient's condition, selecting the appropriate type of anesthesia, monitoring vital signs during surgery, and managing potential complications. Patient safety is highly dependent on the anesthesiologist’s expertise and experience in risk management and maintaining physiological stability. Nevertheless, the results of this study may suggest that other factors, such as incident reporting systems and interdisciplinary collaboration, exert a more substantial influence on patient safety in the studied hospital environment.

Although not statistically significant in this model, anesthesiologist competence remains a fundamental element in ensuring patient safety. Literature reviews affirm that anesthesiologist competence is a determinant of patient safety during surgical and anesthetic procedures. This encompasses profound medical knowledge, advanced technical skills, and the ability to make rapid and accurate decisions in critical situations. A competent anesthesiologist is capable of identifying preoperative risks, managing anesthesia-related side effects, and responding effectively to emergencies. Thus, while the statistical findings may not demonstrate a significant impact, the anesthesiologist's role remains undeniably vital.

Several factors may account for the lack of statistical significance observed in this study. One possibility is that the anesthesiologists at the study site already operate at a uniformly high and standardized level of competence, resulting in minimal variation and therefore an insignificant statistical effect. Another potential explanation is the presence of unexamined mediating or moderating variables that may influence the relationship between anesthesiologist competence and patient safety. Furthermore, the instrument used to measure anesthesiologist competence may not have captured the full range of competencies relevant to ensuring patient safety.

Other research and clinical guidelines consistently emphasize the importance of anesthesiologist competence for patient safety. For instance, according to the Indonesian Ministry of Health Regulation No. 11 of 2017, patient safety is a systematic effort to ensure the delivery of safe and high-quality healthcare services. The competence of anesthesiologists is an integral component of this system, as they are directly responsible for maintaining the patient's vital status during invasive procedures (Elmonita et al., 2022). Therefore, even though this study did not demonstrate a statistically significant influence, the enhancement and maintenance of anesthesiologist competence should remain a top priority.

In conclusion, while this study did not find a direct statistically significant effect of anesthesiologist competence on patient safety, this does not diminish the critical role anesthesiologists play in the surgical setting. High levels of competence remain a non-negotiable prerequisite for safe and high-quality anesthesia practice. Healthcare institutions must continue to invest in education, training, and continuous professional development for anesthesiologists to ensure they consistently meet the highest standards. This is a crucial step toward preventing complications, reducing risk, and ultimately enhancing overall patient safety in the operating room.

The Influence of Incident Reporting Systems on Patient Safety

The analysis of the research findings indicates that the incident reporting system has a very strong and statistically significant effect on patient safety. Based on the partial significance test (t-test), the significance value for the incident reporting system variable (X_4) is 0.000, which is far below the 0.05 threshold. This result suggests that the incident reporting system individually exerts a significant influence on improving patient safety. Furthermore, the standardized coefficient (Beta) value of 0.460 positions the incident reporting system as the most dominant factor among all variables studied. An increase of one unit in the incident reporting system is associated with a 0.362 increase in patient safety, indicating a strong and positive relationship. These findings underscore the urgency of implementing and strengthening incident reporting systems as a primary strategy to enhance patient safety in healthcare environments.

An effective incident reporting system serves as a critical mechanism for identifying, analyzing, and learning from adverse events or near-miss incidents in healthcare services. Through such a system, hospitals can collect data on medical errors, operational issues, and

other potential risks that may jeopardize patient safety. The collected information is then used to conduct root cause analyses, formulate corrective actions, and prevent the recurrence of similar incidents in the future. Additionally, the system promotes a culture of safety in which staff feel secure in reporting errors without fear of punitive consequences, thus enabling continuous improvements in clinical practice. Transparency in incident reporting is key to building trust and creating a constructive learning environment.

The importance of incident reporting systems in ensuring patient safety is well-supported by both scholarly literature and regulatory frameworks. The literature review highlights that incident reporting systems facilitate continuous system improvements through early risk detection. This aligns with Indonesia's Ministry of Health Regulation No. 11 of 2017, which emphasizes systematic efforts to ensure safe and high-quality healthcare services, including through incident reporting. By identifying incidents, hospitals can implement changes in procedures, protocols, or training programs to reduce the risk of patient harm. Moreover, the data derived from incident reports can inform the development of more robust safety policies and standards.

In addition to system-level benefits, effective incident reporting also enhances staff awareness of potential risks and reinforces the importance of safety practices. Feedback from incident reports allows healthcare workers to learn from the experiences of others and avoid repeating the same mistakes. Regular training based on insights from incident analysis can help strengthen the competence and vigilance of the entire medical team. Thus, the incident reporting system functions not only as a detection tool but also as a continuous educational instrument that supports a patient-centered safety culture. This contributes to an ongoing cycle of organizational improvement.

The success of an incident reporting system lies not only in the availability of reporting platforms but also in the organizational culture that supports them. A non-punitive culture where staff are not afraid of retribution when reporting incidents is essential for encouraging active participation. If staff fear being penalized for their reports, reporting frequency will decline, and emerging risks may remain undetected. Therefore, hospital leadership must commit to fostering an environment that encourages open reporting and treats each incident as an opportunity for learning and innovation.

In conclusion, the incident reporting system is a vital component in the effort to enhance patient safety. The findings of this study clearly demonstrate that this system has a dominant and significant influence on patient safety outcomes. Therefore, healthcare facilities must continue to strengthen and optimize their incident reporting systems, ensuring that the reporting process is accessible, transparent, and embedded within a learning-oriented organizational culture. Through this approach, hospitals can proactively identify and mitigate risks, ultimately delivering safer and higher-quality healthcare services to all patients.

The Influence of Interdisciplinary Collaboration on Patient Safety

Based on the research findings, interdisciplinary collaboration has a highly significant impact on patient safety. The partial significance test (t-test) yielded a p-value of 0.000 for the interdisciplinary collaboration variable (X_5), which is well below the 0.05 threshold. This confirms that collaboration across disciplines has a substantial individual effect on improving patient safety. A one-unit increase in interdisciplinary collaboration is projected to raise patient safety by 0.439. The standardized coefficient (Beta) value of 0.439 also positions interdisciplinary collaboration as the second most dominant factor influencing patient safety, following the incident reporting system. These findings emphasize the urgent need to strengthen interprofessional teamwork in hospital settings to achieve optimal safety standards.

Interdisciplinary collaboration involves various healthcare professionals such as surgeons, nurses, anesthesiologists, pharmacists, and supporting personnel working together to achieve common goals in patient care. Effective communication, information sharing, and joint decision-making are at the core of this collaboration. This integrated approach enables faster risk identification, more comprehensive problem solving, and better prevention of medical errors. For example, prior to surgery, the surgical team may hold discussions to ensure a shared understanding of the patient's condition and the planned procedure. During surgery, seamless coordination among team members is essential for rapid responses to changes in the patient's condition.

This study aligns with existing literature, which identifies interdisciplinary collaboration as a critical pillar in enhancing patient safety. The literature review highlights that effective interdisciplinary collaboration significantly improves patient safety outcomes. Other studies, such as Elmonita et al. (2022), emphasize that patient safety is a fundamental priority to protect individuals from the risks of medical interventions. This implies that interprofessional collaboration directly contributes to systematic efforts to ensure safe and high-quality healthcare services, as mandated in Indonesia's Ministry of Health Regulation No. 11 of 2017. Thus, the findings of this research reinforce empirical evidence regarding the positive impact of collaboration on patient safety outcomes.

The inclusion of diverse perspectives from multiple disciplines in planning and delivering patient care allows for the identification of potential issues that might be overlooked in a single-discipline approach. For instance, a pharmacist can review medication prescriptions to prevent harmful drug interactions, while nurses can monitor patient responses to treatment. Anesthesiologists play a vital role in managing the patient's condition during surgery, while surgeons focus on performing the procedure. When all these elements are integrated through effective collaboration, they create a stronger safety net for patients. Therefore, strengthening collaboration is not merely about cooperation, but about creating synergistic care that is safer and more coordinated.

Several factors support effective interdisciplinary collaboration, including strong leadership, a supportive organizational culture, and clear communication protocols. Joint training and case simulations can enhance the team's ability to collaborate effectively. Open communication and mutual trust among professionals are foundational, as they enable the sharing of critical information and collective problem-solving. When every team member feels valued and has a voice in the care process, better decisions are made ultimately improving patient safety.

Given the significant influence of interdisciplinary collaboration on patient safety, healthcare institutions must prioritize the development and strengthening of collaborative mechanisms. This can be achieved through various strategies, such as forming multidisciplinary teams for complex cases, implementing regular patient rounds that involve all relevant disciplines, and utilizing integrated information systems to facilitate data sharing. By promoting an environment that fosters interprofessional communication and teamwork, hospitals can significantly improve the quality and safety of care provided. Investing in strong collaboration is, ultimately, an investment in patient lives.

The Simultaneous Influence of Surgical Time Management, Drug Availability, Anesthesiologist Competence, Incident Reporting Systems, and Interdisciplinary Collaboration on Patient Safety

This study analyzed the simultaneous effects of surgical time management, drug availability, anesthesiologist competence, incident reporting systems, and interdisciplinary

collaboration on patient safety. Based on the results of the partial significance test (t-test), four variables surgical time management (X_1), drug availability (X_2), incident reporting systems (X_4), and interdisciplinary collaboration (X_5) showed p-values below the 0.05 threshold (0.000, 0.002, 0.000, and 0.000, respectively), indicating significant individual effects on patient safety. However, the competence of anesthesiologists (X_3) recorded a p-value of 0.956, suggesting no statistically significant impact within the model. These findings highlight that not all assumed critical factors have an equal influence in this research context.

Among the standardized coefficients (Beta), the incident reporting system ($\beta = 0.460$) emerged as the strongest predictor of patient safety. This suggests that an effective mechanism for reporting and analyzing medical incidents is crucial for improving safety outcomes. Interdisciplinary collaboration ($\beta = 0.439$) ranked second in influence, underscoring the importance of solid teamwork and effective interprofessional communication. Surgical time management ($\beta = 0.282$) also demonstrated a meaningful impact, reflecting the critical role of procedural efficiency in patient safety. Interestingly, drug availability showed a negative effect ($\beta = -0.186$), suggesting complexities or challenges in pharmaceutical management that warrant further investigation.

A robust incident reporting system plays a central role in ensuring patient safety by enabling early risk detection and learning from adverse events. Transparent and non-punitive reporting mechanisms encourage healthcare staff to report undesirable events without fear of retribution. Data from these reports can then be utilized to develop preventive strategies and foster continuous system improvements. The importance of such a system is further supported by its capacity to facilitate early risk detectio. Therefore, investing in the development and maintenance of an effective incident reporting infrastructure is critical to enhancing patient safety.

Effective interdisciplinary collaboration is another influential factor contributing to patient safety. When diverse healthcare professionals such as surgeons, nurses, anesthesiologists, and pharmacists work collaboratively, information exchange becomes more fluid, and clinical decisions are made more accurately. High-quality collaboration minimizes miscommunication, avoids task duplication, and ensures optimal coordination across all stages of patient care. The Literature Review affirms that strong interdisciplinary communication significantly enhances patient safety. These insights highlight that patient safety depends not only on individual competence but also on the collective ability of healthcare teams to interact and coordinate effectively.

Although anesthesiologist competence did not show a statistically significant effect in this model, it is important to acknowledge the vital role anesthesiologists play in ensuring patient safety during surgical procedures. This result may indicate that other variables in this dataset had greater relative weight or that moderating factors were not accounted for. Nevertheless, the Literature Review identifies anesthesiologist competence as a key determinant of patient safety during surgery and anesthesia. Thus, ongoing improvements in education and training for anesthesiologists remain essential to maintaining high safety standards.

Overall, this study's findings suggest that patient safety results from a complex interaction of multiple factors, with incident reporting systems, interdisciplinary collaboration, and surgical time management being the primary drivers. A deeper understanding of how these variables interact can help healthcare institutions design more targeted interventions to enhance patient safety. As stated by Elmonita et al. (2022) and regulated in Indonesia's Ministry of Health Regulation No. 11 of 2017, patient safety is a systematic effort to ensure safe and high-

quality healthcare services. Therefore, strengthening these key areas can yield substantial improvements in overall healthcare quality.

CONCLUSION

Based on this study's findings, effective surgical time management—including thorough pre-operative planning, optimal scheduling, and punctual execution—significantly enhances patient safety by improving procedural efficiency. While anesthesiologist competence showed no statistically significant effect, likely due to uniformly high skill levels or other mediating factors, the incident reporting system was identified as the most influential factor, enabling continuous learning and prevention of future errors. Interdisciplinary collaboration also played a key role, with strong communication and teamwork among healthcare professionals markedly reducing risks. Unexpectedly, drug availability exhibited a negative association with patient safety, suggesting underlying pharmaceutical supply chain issues that require further investigation. Overall, patient safety is shaped by multiple interacting elements, with surgical time management, incident reporting, and interdisciplinary collaboration forming its core pillars. Future research should explore the specific supply chain challenges affecting medication safety and examine potential mediators influencing anesthesiologist competence's impact on outcomes.

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