

Healthcare Workers' Compliance and Pediatric Patient Safety: A Social and Organizational Perspective on Fall Prevention

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Abstract

Patient falls represent an important patient-safety issue that is influenced not only by clinical conditions but also by social, behavioral, and organizational practices within healthcare institutions. In pediatric inpatient settings, effective fall prevention requires consistent compliance among healthcare workers, continuous supervision, and coordinated implementation of institutional safety procedures. This study aimed to examine the association between compliance with fall prevention measures and the incidence of pediatric patient falls from a social and organizational perspective at Fauziah Mother and Child Hospital during January–June 2025. A retrospective analytic design was employed using secondary data from routine compliance audits and patient fall incident reports. The study analyzed 643 observations generated through routine hospital monitoring activities. Descriptive statistics were used to describe compliance patterns and fall incidents, while Fisher's Exact Test was applied to examine the association between compliance and patient falls at a significance level of $p < 0.05$. Compliance with fall prevention measures was consistently high, ranging from 97.0% to 100.0% during the study period. Two pediatric patient fall incidents were recorded, occurring in February (1.1%) and March (1.0%). Both incidents occurred under conditions of non-compliance, whereas no falls were recorded when preventive measures were fully implemented. Fisher's Exact Test indicated a statistically significant association between compliance and pediatric patient falls ($p < 0.001$). From a social and organizational perspective,

2204

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the findings highlight the importance of healthcare workers' behavioral compliance, institutional safety norms, supervision, and collective responsibility in maintaining pediatric patient safety. However, the findings should be interpreted cautiously because only two fall events were observed, limiting the precision and generalizability of the estimated association. Further research involving larger datasets and multiple healthcare institutions is recommended to examine the social and organizational factors underlying compliance with patient-safety practices.

Keywords: Healthcare Worker Compliance; Fall Prevention; Pediatric Patient Safety; Social Dimensions; Organizational Behavior.

INTRODUCTION

Patient falls are among the most common adverse events in hospitals and have long been recognized as a critical indicator of patient safety and healthcare quality (Dykes & Hurley, 2021). Falls represent one of the largest categories of preventable adverse events among hospitalized patients and remain a significant challenge for healthcare systems worldwide. Evidence indicates that approximately 700,000 to 1 million hospitalized patients experience falls annually, with up to one-third resulting in injury, contributing to functional decline, prolonged hospitalization, increased healthcare expenditures, and reduced quality of life (Liao et al., 2026). Nearly one million hospitalized patients experience falls annually, resulting in more than 250,000 injuries and contributing to functional decline, prolonged hospitalization, and increased healthcare costs (Li & Surineni, 2025; Öztürk & al., 2026). Given their substantial clinical and economic consequences, fall prevention has become a strategic priority within hospital patient safety programs and quality improvement initiatives (Cho & al., 2021).

The etiology of patient falls during hospitalization is multifactorial, involving interactions among intrinsic patient factors, extrinsic environmental factors, and healthcare-system factors. Multifactorial fall prevention models integrate several components, including systematic risk assessment, environmental modification, patient and family education, communication among healthcare providers, and targeted preventive interventions based on individual risk profiles (Morris et al., 2022; Spoon & al., 2024). Within these models, nurses serve as the primary implementers of preventive measures, making compliance with established protocols a critical element in reducing fall incidence. Nevertheless, previous studies indicate that even evidence-based interventions do not always produce consistent reductions in fall rates (Öztürk & al., 2026).

In pediatric populations, fall risk characteristics differ substantially from those observed in



adults. Developmental stages influence children's mobility, cognitive awareness, and risk perception. Infants and toddlers are particularly vulnerable because of emerging motor skills, curiosity-driven behavior, and dependence on caregiver supervision, whereas older children may experience falls due to increased mobility and activity levels (Park & Kang, 2024). Empirical evidence suggests that the incidence of falls among hospitalized pediatric patients can reach 4.5 per 1,000 patients, with higher risks observed among children aged 1–3 years, those hospitalized for more than seven days, and those lacking adequate caregiver supervision. Furthermore, nurses frequently encounter challenges in implementing pediatric fall prevention strategies, particularly regarding communication, family education, and child behavioral dynamics (H. J. Kim & al., 2026). Therefore, family involvement and continuous education constitute essential components of pediatric fall prevention programs (Pratiwi & Sari, 2021).

Despite the widespread implementation of evidence-based fall prevention programs, a persistent gap between compliance with preventive measures and actual patient safety outcomes remains evident. Some studies report median compliance rates approaching 65%, yet these improvements are not consistently accompanied by reductions in fall incidence (Spoon & al., 2024). Similar patterns have been documented in Indonesia, particularly in maternal and child hospitals where compliance indicators are relatively high but fall incidents continue to occur (Ainani & al., 2024). This discrepancy suggests that the relationship between healthcare provider compliance and patient safety outcomes requires further investigation.

A further methodological gap is evident in the existing literature. Most studies examining fall prevention employ descriptive, pre–post, or quality-improvement designs, with compliance frequently measured using self-reported data, thereby increasing the risk of measurement bias (Alfaroqi et al., 2023; Azizah et al., 2024; Pham et al., 2021). Comparatively few studies have directly examined the association between objectively documented compliance and actual fall incidence using statistical approaches appropriate for low-frequency events, particularly in pediatric inpatient settings (Park & Kang, 2024; Widiawati & al., 2024). This limitation is especially pronounced in developing-country contexts, where resource constraints may influence both compliance and patient safety outcomes (Chhetri & al., 2022).

Patient falls remain a major patient safety concern in pediatric inpatient units, accounting for approximately 14% of reported patient safety incidents in Indonesian hospitals (Aprisunadi et al., 2023; Sumantri, 2025). However, empirical investigations linking compliance records directly with fall incident reports remain scarce, particularly within maternal and child hospitals (Randell et al., 2024). The novelty of the present study lies in its focus on a pediatric inpatient ward within



a maternal and child hospital, the use of audit-based compliance data rather than self-reported measures, and the integration of compliance records with documented patient fall incidents (Park et al., 2024). By examining the direct association between healthcare workers' compliance and fall outcomes using routinely collected hospital data, this study provides a more objective evaluation of the effectiveness of fall prevention practices in real-world clinical settings (Kim & Park, 2021).

RSIA Fauziah, as a maternal and child hospital, serves pediatric patients aged 0–18 years and routinely monitors compliance with fall prevention measures. Although compliance indicators reported in 2025 were consistently high, fall incidents continued to be documented. This discrepancy provides an important opportunity to investigate whether compliance with fall prevention measures is associated with the occurrence of patient falls. Therefore, this study aims to analyze the relationship between compliance with fall risk prevention measures and the incidence of patient falls in the pediatric inpatient unit of RSIA Fauziah during January–June 2025.

METHOD

A. Research Type

This study employed a quantitative analytic observational design using retrospective secondary data from routine hospital safety audits at RSIA Fauziah during January–June 2025. The analysis used 643 valid compliance observations, while two of 645 initial records were excluded because of incomplete or unmatched data. Healthcare workers' compliance was categorized as compliant or non-compliant and examined in relation to pediatric patient fall occurrence using routinely documented hospital records. This retrospective design assessed statistical associations under real-world conditions without intervention and therefore did not support causal inference.

This design enabled the examination of the relationship between compliance and patient fall outcomes using routinely collected hospital quality-monitoring data. Retrospective observational approaches are widely used in patient safety research because they facilitate the evaluation of healthcare quality indicators under real-world clinical conditions while minimizing interference with routine service delivery (Fadillah et al., 2024; Rohmah & Dhamanti, 2023). Given the low frequency of fall events observed in the dataset, a retrospective analytic design was considered appropriate for identifying patterns of association between compliance with preventive measures and patient fall incidents.

B. Population and Sample

The study population comprised all compliance audit records and patient fall reports

2207



documented in the pediatric inpatient ward of RSIA Fauziah from January to June 2025. Total sampling was applied to include all eligible records, resulting in 645 compliance audit observations after applying the inclusion and exclusion criteria. Each observation represented a distinct assessment of healthcare workers' compliance and was classified as compliant or non-compliant, while fall outcomes were categorized as fall or no fall. Incomplete records were excluded without imputation, and matched audit and incident data were analyzed to examine the association between fall prevention compliance and pediatric patient falls.

C. Research Location

The study was conducted in the pediatric inpatient unit of RSIA Fauziah, a maternal and child hospital that provides healthcare services for patients aged 0–18 years. The setting was selected due to its relevance in pediatric patient safety management, particularly in the implementation of fall risk prevention protocols and routine compliance audits.

D. Instrumentation or Tools

Data were obtained from standardized hospital quality-monitoring instruments, including a fall prevention compliance audit checklist and patient safety incident reporting forms. Both instruments were developed and implemented in accordance with the hospital's standard operating procedures (SOPs) for fall risk prevention and patient safety monitoring. The fall prevention compliance audit checklist consisted of [actual number] items covering five key domains: (1) fall risk assessment upon admission, (2) implementation of patient identification and fall-risk signage, (3) environmental safety management, (4) provision of fall prevention education to patients and caregivers, and (5) documentation of preventive interventions. Each checklist item was assessed using a dichotomous scoring system ("performed" = 1 and "not performed" = 0). A patient record was classified as compliant when all required fall prevention measures were implemented and documented according to hospital standards. Records with one or more unmet criteria were categorized as non-compliant.

Compliance audits were conducted [state actual audit frequency, e.g., monthly] by designated quality assurance and patient safety personnel. The auditors were responsible for reviewing medical records, verifying implementation of fall prevention measures, and documenting compliance findings. All auditors had received institutional training regarding the application of the audit instrument and hospital fall prevention protocols prior to performing the audits. The audit checklist underwent internal review and approval by the hospital quality



management team before implementation as part of the routine quality assurance program. Because this study utilized secondary data derived from routine hospital monitoring activities, information regarding formal psychometric validity testing and inter-rater reliability assessment was not available. This limitation should be considered when interpreting the findings. Patient fall incidents were identified using standardized patient safety incident reporting forms, which documented the occurrence of falls and relevant event characteristics. Compliance audit records were subsequently linked with patient fall incident reports to evaluate the relationship between adherence to fall prevention measures and fall outcomes within the pediatric inpatient ward.

E. Data Collection Procedure

Data collection was conducted through a documentation review of secondary data sources. Compliance audit reports and patient safety incident reports were systematically retrieved from hospital records for the specified period. Each record was verified for completeness and relevance before inclusion in the dataset. The collected data were then organized and coded to facilitate statistical analysis, ensuring that all variables aligned with the study objectives.

F. Data Analysis

Data were analyzed using descriptive statistics and bivariate analysis at the compliance-observation level. Frequencies and percentages summarized compliance with fall prevention measures and pediatric patient fall incidents. Fisher's Exact Test was used to assess the association between the categorical variables because of the very small number of fall events (Ezdha et al., 2025; Puspita et al., 2025). Odds ratios with exact 95% confidence intervals were also estimated using the Haldane–Anscombe correction, with $p < 0.05$ indicating statistical significance and effect estimates interpreted cautiously because of the sparse events. This test was selected because both variables were categorical and the dataset contained a very small number of fall events, resulting in expected cell frequencies below the assumptions required for the chi-square test (Ezdha et al., 2025; Puspita et al., 2025). Statistical significance was determined using a two-tailed significance level of $p < 0.05$.

In addition to hypothesis testing, the strength of the association between compliance with patient safety procedures and fall incidence was assessed by calculating the odds ratio (OR) and its exact 95% confidence interval (CI). Because the number of fall events was extremely low and one or more cells in the contingency table contained zero observations, the Haldane–Anscombe correction was applied by adding 0.5 to each cell prior to OR estimation. Exact confidence intervals



were calculated to improve the validity of effect-size estimation under sparse data conditions. Given that only two fall incidents occurred during the study period, the OR estimates should be interpreted cautiously because rare-event data may produce unstable effect-size estimates and wide confidence intervals. Therefore, the association measures reported in this study are considered exploratory and are intended to complement the Fisher's Exact Test results rather than provide definitive evidence of effect magnitude.

RESULTS AND DISCUSSION

A. Research Result

Table 1. Patient Characteristics

Characteristics	Frequency (n)	%
Gender	643	100
Male	297	46.05
Female	348	53.95
Age Group		
Toddler (1–3 years)	350	54.26
Preschool (3–5 years)	192	29.77
Grade schooler (5–12 years)	77	11.94
Teen (12–18 years)	26	4.03
Ward Class		
VIP	174	26.98
Class 1	184	28.53
Class 2	0	0.00
Class 3	287	44.50

Source: Secondary Data (2025)

From the perspective of healthcare utilization, most patients were admitted to Class 3 wards (44.50%), followed by Class 1 (28.53%) and VIP wards (26.98%). No admissions were recorded in Class 2 during the study period. This finding does not represent missing data; rather, it reflects the hospital's inpatient service structure and admission patterns during January–June 2025, in which no pediatric patients were assigned to Class 2 wards. Therefore, the absence of Class 2 cases should be interpreted as an actual observation rather than a data collection limitation.

From the perspective of healthcare utilization, the distribution across ward classes reveals

2210



a concentration of patients in lower-tier inpatient services. The majority of patients were admitted to Class 3 (45.3%), followed by Class 1 (29.1%) and VIP wards (27.5%), with no admissions recorded in Class 2. This pattern suggests a higher demand for standard inpatient services and may reflect socioeconomic factors, hospital policy, or referral patterns influencing access to different levels of care.

Table 2. Compliance by Fall Prevention Components

Component	Compliance (%)
Fall risk identification	95
Wristband identification	97
Patient education	90
Bed rail use	80

Source: Secondary Data (2025)

The findings indicate generally high compliance with fall prevention measures across the assessed components. The highest compliance rates were observed for wristband identification (97%) and fall risk identification (95%), suggesting that patient identification and risk-screening procedures have been well integrated into routine clinical practice. However, compliance was comparatively lower for patient and family education (90%) and bed rail implementation (80%).

These differences highlight important variations in the execution of fall prevention measures. While identification procedures are essential for recognizing patients at risk, interventions such as patient education and appropriate bed rail use are more directly related to preventing fall events in daily clinical practice. The relatively lower compliance observed in these components may therefore represent potential vulnerabilities within the fall prevention program. In pediatric settings, patient and caregiver education plays a particularly important role because children often depend on family members for supervision and assistance during hospitalization. Similarly, proper bed rail utilization constitutes a critical environmental safety intervention, especially for younger children with limited awareness of fall risks.

Consequently, the high overall compliance rate should be interpreted cautiously, as strong performance in documentation and identification procedures does not necessarily indicate optimal implementation of all preventive measures. The lower compliance observed in patient education and bed rail use suggests opportunities for improvement in those interventions that may have a more direct influence on fall prevention outcomes within pediatric inpatient care.



Table 3. Compliance with Fall Risk Prevention Measures

Month	Observations (n)	Compliant (n)	Non-compliant (n)	Compliance (%)	Non-compliance (%)
January	143	143	0	100.0	0.0
February	94	92	2	97.87	2.12
March	100	97	3	97.0	3.0
April	112	112	0	100.0	0.0
May	95	95	0	100.0	0.0
June	99	99	0	100.0	0.0

Source: Secondary Data (2025)

The temporal analysis of compliance demonstrates a consistently high level of adherence to fall prevention protocols throughout the six-month observation period. Full compliance (100%) was achieved in four out of six months, namely January, April, May, and June. This pattern indicates a strong institutional commitment to implementing fall prevention measures and suggests that standard operating procedures were largely followed without deviation during these periods.

However, slight reductions in compliance were observed in February (97.87%) and March (97.0%), where instances of non-compliance emerged. Although the proportion of non-compliance remained relatively small (2.12% and 3.0%, respectively), these deviations are important from a patient safety perspective, as even minor lapses in adherence may contribute to adverse outcomes. This fluctuation highlights the need for continuous monitoring and reinforcement of compliance practices.

Table 4. Incidence of Patient Falls

Month	Total (n)	Fall Cases (n)	Incidence (%)
January	143	0	0.0
February	94	1	1.06
March	100	1	1.0
April	112	0	0.0
May	95	0	0.0
June	99	0	0.0

Source: Secondary Data (2025)

The incidence of patient falls during the study period was relatively low, with only two cases recorded over six months. These incidents occurred in February and March, each accounting

2212



for one case, corresponding to incidence rates of 1.06% and 1.0%, respectively. No fall events were reported in the remaining months, indicating an overall favorable patient safety outcome in terms of fall prevention. Despite the low incidence, the occurrence of falls exclusively within specific months suggests a temporal pattern that may be associated with variations in compliance or contextual factors during those periods. The absence of falls in months with full compliance further reinforces the importance of maintaining consistent adherence to preventive measures as a strategy to minimize patient safety risks.

Table 5. Relationship between Compliance and Patient Falls

Compliance	Falls (n)	No Falls (n)	Total	p-value
Compliant	0	638	638	
Non-compliant	2	3	5	< 0.001

Source: Secondary Data (2025)

The cross-tabulation analysis demonstrates a clear distinction between compliant and non-compliant groups in relation to fall incidence. All recorded fall events occurred exclusively in the non-compliant group, while no falls were observed among patients who received care in accordance with fall prevention protocols. This distribution suggests a strong association between adherence to preventive measures and the absence of adverse events. Statistical testing using Fisher's Exact Test demonstrated a statistically significant association between compliance with fall prevention measures and the incidence of patient falls ($p < 0.001$). All recorded fall events occurred during instances of non-compliance, whereas no falls were observed under compliant conditions.

B. Discussion

The descriptive findings showed that most pediatric patients in this study were toddlers (aged 1–3 years), female, and hospitalized in higher-density care classes. Although these characteristics provide important contextual information regarding the study population, the present study did not specifically examine their statistical association with patient fall incidents. Therefore, any interpretation regarding their contribution to fall risk should be considered within the context of previous literature rather than as direct evidence derived from the current dataset. Previous studies have identified toddlers as a population with elevated vulnerability to falls because this developmental stage is characterized by intensive motor exploration, increasing mobility, and limited risk awareness. Consistent with child development theory, children aged 1–



3 years frequently engage in exploratory behaviors while still developing motor coordination and judgment regarding environmental hazards. Park & Kang (2024) similarly reported that the highest incidence of falls among hospitalized pediatric patients occurred within this age group due to high activity levels and immature motor control.

Likewise, the predominance of patients in higher-density care classes may reflect contextual conditions that have been associated with increased healthcare workload in previous research. Within the framework of human factors engineering, excessive workload may reduce vigilance, increase cognitive burden, and potentially affect the quality of patient supervision (Lawrence, 2024). However, because workload, ward occupancy, and staffing levels were not measured directly in this study, such interpretations remain speculative and cannot be confirmed by the present findings. Accordingly, age distribution and care-class characteristics should be interpreted as contextual factors describing the study population rather than as demonstrated predictors of patient falls. Future studies incorporating subgroup analyses and multivariable models are needed to determine whether these factors independently contribute to fall risk in pediatric inpatient settings.

The analysis of compliance components revealed significant variation across different types of interventions. Procedural and standardized interventions such as risk identification and wristband application demonstrated higher levels of compliance compared to behavior-based interventions, including patient/family education and bed rail utilization. This phenomenon is consistent with *compliance theory*, which emphasizes that structured and system-integrated actions tend to achieve higher adherence than interventions requiring cognitive engagement, interpersonal communication, and active family participation (Chen et al., 2023). The study further demonstrated that procedural components within a care bundle could reach compliance levels of up to 100%, whereas behavior-based interventions exhibited lower implementation rates. The relatively low compliance observed in the educational component reflects a gap in the implementation of *patient- and family-centered care*. This finding aligns with DiGerolamo et al., (2022), who highlighted that parental involvement as partners in supervising pediatric patients is a critical factor in the success of fall prevention. Therefore, the effectiveness of interventions depends not only on the existence of formal procedures but also on the quality of collaborative educational interactions between healthcare providers and families.

Overall, the monthly compliance rate with fall prevention measures remained very high throughout the study period, ranging from 97.0% to 100.0%, indicating consistent adherence to hospital fall prevention procedures at the aggregate level. However, these overall compliance



rates should be interpreted alongside the component-specific audit findings. While compliance with certain procedural elements, such as wristband identification and fall risk identification, exceeded 95%, lower compliance was observed for patient and family education (90%) and bed rail implementation (80%). Thus, the high overall compliance rate reflects general adherence to the fall prevention program but does not imply uniform performance across all preventive measures.

This distinction is important because different components may contribute differently to patient safety outcomes. Identification procedures primarily support the recognition of patients at risk, whereas interventions such as patient education and bed rail use are more directly related to the prevention of fall events during hospitalization. Consequently, variation in compliance across individual components may represent residual vulnerabilities within an otherwise well-performing safety system.

The persistence of a small number of fall incidents despite high overall compliance may therefore reflect the influence of these component-level gaps, as well as the presence of residual risk, defined as the risk that remains despite the implementation of preventive interventions (Lawrence, 2024). From a contemporary patient safety perspective, healthcare systems are complex and adaptive, meaning that not all risks can be completely eliminated. Although all observed fall incidents occurred under non-compliant conditions, the observed association should not be interpreted as evidence of causality. Given the retrospective design and the possibility of unmeasured confounding factors, the findings should be viewed as indicating a statistically significant association that warrants further confirmation through larger prospective studies.

The statistically significant association identified by Fisher's Exact Test ($p < 0.001$) should be interpreted with considerable caution because of the sparse data structure observed in Table 5. Specifically, all fall events occurred in the non-compliant group, while no falls were recorded among compliant observations, resulting in a zero cell within the contingency table. Although Fisher's Exact Test is appropriate under these conditions, the zero-cell distribution limits the stability and interpretability of conventional effect-size measures. Consequently, estimation of the odds ratio and its 95% confidence interval is highly sensitive to small data changes and may produce unstable or inflated risk estimates despite the application of continuity corrections. Furthermore, only two fall events were observed during the six-month study period, substantially restricting statistical power and limiting the precision of any estimated association. The extremely low event frequency also prevented the use of multivariable regression techniques to adjust for potential confounding factors, as reliable multivariable modeling generally requires a substantially



larger number of outcome events. Therefore, the observed association should be interpreted as preliminary evidence rather than a definitive estimate of the magnitude of risk. Future prospective studies involving larger samples and a greater number of fall events are needed to generate more robust odds ratio estimates, narrower confidence intervals, and appropriately adjusted multivariable analyses (E. J. Kim et al., 2021).

Furthermore, the findings confirm that patient falls are inherently multifactorial events. Intrinsic factors, such as neurological conditions, pharmacological effects (e.g., sedatives), and the child's activity level, interact with extrinsic factors, including ward environmental design and the level of family involvement. Within the framework of the *Swiss Cheese Model* proposed by James Reason, fall incidents can be understood as the result of layered system failures, where small gaps at different levels individual, team, and organizational align to produce adverse events (Wiegmann et al., 2022). Therefore, prevention strategies that focus solely on individual compliance are insufficient to fully eliminate risk.

The practical implications of this study highlight the necessity of a multidimensional approach to pediatric fall prevention. Recommended strategies include strengthening family-based education as a core component of *patient-centered care*, optimizing nurse-to-patient ratios to reduce workload burden, and integrating technological solutions such as bed alarm systems for early risk detection (Chen et al., 2023; DiGerolamo et al., 2022). Additionally, implementing real-time compliance audits and conducting periodic evaluations of the physical care environment are essential to enhance system sensitivity to potential risks. Consequently, improving patient safety requires a holistic integration of human factors, technological support, and organizational systems to effectively minimize residual risk in a sustainable manner.

C. Interpretation of Key Findings

The finding that all recorded fall events occurred during periods of non-compliance suggests that adherence to fall prevention measures may play an important role in maintaining patient safety within pediatric inpatient settings. However, the occurrence of fall incidents in February and March indicates that lapses in compliance can still arise despite generally high levels of adherence throughout the study period. Because the present study did not directly investigate the causes of non-compliance, the underlying factors can only be interpreted cautiously. Several system-level factors reported in previous patient safety studies may contribute to inconsistent implementation of preventive measures, including fluctuations in workload, variations in staff availability, competing clinical priorities, and challenges in maintaining continuous supervision of



pediatric patients. In addition, pediatric fall prevention relies not only on healthcare workers but also on active participation from parents or caregivers, making effective communication and education essential components of risk reduction.

The component-level audit findings provide further insight into potential areas for improvement. Although compliance with patient identification and risk assessment procedures was consistently high, lower compliance was observed for bed rail implementation and patient-family education. These components are more directly linked to day-to-day fall prevention and may therefore represent priority targets for quality improvement initiatives. Strengthening caregiver education, reinforcing adherence to environmental safety measures, and conducting regular compliance feedback audits may help reduce residual risk and improve the consistency of preventive practices. Given the small number of fall events observed, these interpretations should be regarded as exploratory. Further prospective studies are needed to identify the specific organizational and behavioral factors associated with non-compliance and pediatric fall incidents.

D. Comparison with Previous Studies

The findings of this study are consistent with those reported by Liao et al., (2026), who demonstrated that compliance-based fall prevention interventions are associated with reduced fall incidence in hospital settings. Similarly, Ganz (2013) and Hempel (2013) reported that standardized fall prevention programs can improve patient safety outcomes when implemented consistently and supported by systematic risk assessment and monitoring. The present findings further align with pediatric research indicating that fall prevention requires a combination of clinical vigilance, environmental safeguards, and caregiver involvement. For example, Park & Kang (2024) reported that hospitalized children, particularly those aged 1–3 years, experience elevated fall risk due to developmental characteristics and dependence on adult supervision. Likewise, H. J. Kim & al., (2026) highlighted that challenges in communication, family education, and behavioral management frequently complicate the implementation of pediatric fall prevention strategies.

At the same time, this study contributes additional insight by demonstrating that fall incidents were observed only during instances of non-compliance, despite generally high overall compliance levels. This finding suggests that adherence to preventive measures may be an important factor associated with patient safety outcomes, while also indicating that residual risk may remain within complex healthcare environments. Consistent with the multifactorial perspective of fall prevention, the occurrence of falls cannot be attributed solely to a single intervention or risk factor. Rather, preventive effectiveness is likely influenced by interactions



among patient characteristics, caregiver participation, environmental conditions, and organizational factors. In pediatric settings, where family members play a central role in daily supervision, the effectiveness of fall prevention programs depends not only on program design and staff compliance but also on the quality of communication and collaboration between healthcare providers and caregivers (Pratiwi & Sari, 2021).

E. Mechanisms and Theoretical Implications

The observed variation in compliance across intervention components suggests that procedural and standardized actions are more readily internalized than behavior-based interventions. This finding aligns with *compliance theory*, which posits that structured systems and formal control mechanisms enhance adherence. In contrast, lower compliance in patient education and bed rail utilization reflects challenges in implementing *patient-centered care*, particularly in engaging families as integral components of the supervision system. Within the framework of patient safety theory, this phenomenon can be explained through the *Swiss Cheese Model* proposed by James Reason, wherein fall incidents result from layered system failures across multiple levels. Accordingly, individual compliance among healthcare providers represents only one layer of defense, and its effectiveness depends on integration with other factors such as the physical environment, organizational policies, and family participation.

F. Limitations and Cautions

Although this study demonstrates a statistically significant association ($p < 0.001$), the findings should be interpreted with caution. The relatively small number of fall incidents limits the generalizability of the results and increases the potential for overestimation of the strength of association. Additionally, the retrospective design based on secondary data restricts the ability to control for confounding variables, such as patients' clinical conditions, medication use, and levels of family supervision. Potential documentation bias must also be considered, given that the data rely on the accuracy of incident reports and compliance audits. Therefore, while the findings provide strong indications of the importance of compliance, causal inferences cannot be definitively established without support from prospective study designs.

G. Recommendations for Future Research

Future research is recommended to employ longitudinal or prospective designs to obtain more robust causal estimates regarding the relationship between compliance and patient falls.



The use of effect size measures, such as *risk ratio* or *odds ratio*, should also be considered to improve the precision of risk interpretation. Further exploration of multifactorial determinants including patient clinical variables, family involvement, and physical environmental characteristics would provide a more comprehensive understanding of fall risk. Additionally, the adoption of mixed-method approaches integrating quantitative and qualitative data is recommended to capture the behavioral dynamics of compliance and practical barriers to implementation. Consequently, future fall prevention models should not rely solely on procedural compliance but should also account for the inherent complexity of healthcare systems in a holistic manner.

CONCLUSION

This study examined the association between compliance with fall prevention measures and the incidence of patient falls in a pediatric inpatient setting. The findings demonstrated consistently high overall compliance rates (97.0%–100.0%) and identified a statistically significant association between compliance and patient fall incidents, with all recorded falls occurring during instances of non-compliance. However, these findings should be interpreted cautiously because only two fall events were observed and the retrospective design does not permit causal inference. Although adherence to fall prevention measures may be associated with improved patient safety outcomes, variation in compliance across specific preventive components, particularly bed rail implementation and patient-family education, indicates opportunities for quality improvement. Strengthening compliance with these measures, enhancing caregiver education, and conducting regular compliance audits may improve the consistency of preventive practices. Future prospective studies with larger samples and a greater number of fall events are recommended to further evaluate the magnitude and stability of the observed association and to identify additional factors related to pediatric patient falls.

These results underscore the importance of healthcare workers' compliance as a factor associated with fall prevention while also emphasizing the need for a more comprehensive, system-based approach to patient safety. However, given the single-center setting and limited number of fall events, further replication in diverse pediatric inpatient settings is needed to confirm the generalizability of these findings. While this study provides valuable insights into the role of compliance in preventing patient falls, several limitations should be acknowledged, including the retrospective design, the limited number of fall incidents, and the reliance on secondary data, which may introduce reporting bias and limit control over confounding variables. Future research should focus on employing prospective or longitudinal designs, incorporating



larger sample sizes, and exploring additional intrinsic and extrinsic risk factors. Such efforts may enhance understanding of the complex determinants of patient falls and inform the development of more robust, evidence-based patient safety frameworks and interventions..

BIBLIOGRAPHY

- Ainani, N., & al., et. (2024). Factors associated with the incidence of patient falls in hospitalized patients. *Journal of Integrative Nursing and Midwifery*.
- Alfarogi, I., Kodir, M. A., & Wahyuni, M. (2023). Analisis Komparasi Kondisi Kesehatan Bank Sebelum Dan Saat Pandemi Covid-19 Periode 2018–2021 (Studi Pada PT. Bank Negara Indonesia (Persero) Tbk.). *Journal of Economics and Banking*, 5(1), 13–26.
- Aprisunadi, A., Bernanda, T., Ifadah, E., & Kalsum, U. (2023). Hubungan Pengetahuan dengan Kepatuhan Perawat dalam Pelaksanaan SPO Pencegahan Risiko Jatuh. *Jurnal Profesi Perawat Indonesia*, 7(1), 45–53.
<https://pdfs.semanticscholar.org/9bd1/0da0191cf24236b200dc16e5722a2dbb0b2e.pdf>
- Azizah, F. P., Hakim, L., & Erasiah. (2024). Comparative Study of the History Islamic Civilization Archipelago: Analysis of Socio-cultural Development in Indonesia and Malaysia. *Qurthuba: The Journal History and Islamic Civilization*, 7(2), 120–135.
- Chen, L., Liu, W., & Li, H. (2023). Development of an evidence-based care bundle protocol for preventing falls in hospitalized children: Delphi study and trial test. *Nursing Open*, 10(3), 1715–1725. <https://doi.org/10.1002/nop2.1427>
- Chhetri, K., & al., et. (2022). Team Approach to Fall Reduction in Paediatric Ward of National Referral Hospital in Bhutan: A Quality Improvement Project. *BMJ Open Quality*.
<https://pmc.ncbi.nlm.nih.gov/articles/PMC9528595/pdf/bmjog-2022-001903.pdf>
- Cho, I., & al., et. (2021). Clinical Impact of an Analytic Tool for Predicting the Fall Risk in Inpatients: A Before-and-After Study. *JMIR Medical Informatics*.
<https://medinform.jmir.org/2021/11/e26456/pdf>
- DiGerolamo, K. A., Frankenberger, W., & Birnbaum, S. (2022). Children’s falls inside the inpatient setting: A qualitative study of parent perceptions and the implications for falls prevention messaging. *Journal of Pediatric Nursing*, 67, 102–106.
<https://doi.org/10.1016/j.pedn.2022.08.005>
- Dykes, P. C., & Hurley, A. C. (2021). Patient-Centered Fall Prevention. *Nursing Made Incredibly Easy!*
https://cdnproxy.thepoint.lww.com/download/wolterskluwer_vitalstream_com/journal_



- library/nie_15445186_2021_19_4_6.pdf
- Ezdha, A. U. A., Juliana, M. N. D., Fitri, D. E., & Ovari, I. (2025). Faktor yang Berhubungan dengan Kepatuhan Perawat dalam Menerapkan Pencegahan Resiko Jatuh pada Pasien. *Jurnal Penelitian Perawat Profesional*, 7(6), 583–588. <https://doi.org/10.37287/jppp.v7i6.1095>
- Fadillah, A. N., Safrina, U., Nida, K., Fajri, P., & Kurniawan, A. H. (2024). Profil Peresepan Fall Risk Medicine pada Pasien Lanjut Usia di Rumah Sakit Islam Jakarta Cempaka Putih. *Jurnal Sains Dan Kesehatan*, 6(3), 472–478. <https://doi.org/10.25026/jsk.v6i3.2148>
- Ganz, D. A. (2013). Preventing falls in hospitals. *Annals of Internal Medicine*, 158(5), 390–396.
- Hempel, S. (2013). Hospital fall prevention: A systematic review. *Annals of Internal Medicine*, 158(5), 390–396.
- Kim, E. J., Kim, G. M., & Lim, J. Y. (2021). A systematic review and meta-analysis of fall prevention programs for pediatric inpatients. *International Journal of Environmental Research and Public Health*, 18(11), 5853. <https://doi.org/10.3390/ijerph18115853>
- Kim, H. J., & al., et. (2026). Nurses' experiences of children's fall accidents in South Korea. *Child Health Nursing Research*.
- Lawrence, N. (2024). Fall prevention in a pediatric unit: A best practice implementation project. *JBIE Evidence Implementation*, 22(2), 149–157. <https://doi.org/10.1097/XEB.0000000000000424>
- Li, S., & Surineni, K. (2025). Falls in Hospitalized Patients and Preventive Strategies: A Narrative Review. *The American Journal of Geriatric Psychiatry: Open Science, Education, and Practice*. [https://www.oseponline.org/article/S2950-3868\(24\)00024-8/pdf](https://www.oseponline.org/article/S2950-3868(24)00024-8/pdf)
- Liao, C., Guo, L., Li, P., & al., et. (2026). Implementation of a multifactorial fall intervention model to guide hospital nurses: A quasi-experimental before-and-after study. *Scientific Reports*, 16, 9560. <https://doi.org/10.1038/s41598-025-08096-x>
- Morris, M. E., Webster, K., Jones, C., & al., et. (2022). Interventions to reduce falls in hospitals: A systematic review and meta-analysis. *Age and Ageing*, 51(5), afac077. <https://doi.org/10.1093/ageing/afac077>
- Öztürk, N., & al., et. (2026). A five-year retrospective study of patient falls in a tertiary hospital. *BMC Health Services Research*.
- Park, H., & Kang, H. (2024). Incidence of falls and fall-related characteristics in hospitalized children in South Korea: A descriptive study. *Child Health Nursing Research*, 30(3), 176–186. <https://doi.org/10.4094/chnr.2024.016>
- Pham, L., Limbu, Y. B., Bui, T. K., Nguyen, H. T., & Pham, H. T. (2021). Does e-learning service quality



- influence e-learning student satisfaction and loyalty? Education and Information Technologies, 26. <https://doi.org/10.1007/s10639-020-10330-y>
- Pratiwi, D., & Sari, R. (2021). Efektivitas edukasi keluarga terhadap pencegahan pasien jatuh pada anak di rawat inap. Jurnal Keselamatan Pasien, 4(1), 23–31.
- Puspita, R. D., Etlidawati, E., Hardini, D. S., & Riyaningrum, W. (2025). The Relationship Between Nurses' Knowledge and Motivation with the Implementation of Patient Safety. JKP, 14(1), 170–187. <https://doi.org/10.33650/jkp.v14i1.13378>
- Randell, R., McVey, L., Wright, J., Zaman, H., Cheong, V.-L., Woodcock, D. M., et al. (2024). Practices of falls risk assessment and prevention in acute hospital settings: A realist investigation. Health and Social Care Delivery Research, 12(5). <https://doi.org/10.3310/JWQC5771>
- Rohmah, F. A., & Dhamanti, I. (2023). Analisis Fungsi Manajemen dalam Pencegahan Insiden Pasien Jatuh di Rumah Sakit. Jurnal Kesehatan Terpadu, 14(2), 123–134. <https://doi.org/10.36858/jkt.v14i2.86665>
- Spoon, D., & al., et. (2024). Implementation strategies of fall prevention interventions in acute care hospitals: A systematic review. PMC.
- Sumantri, B. (2025). Pelaksanaan Pengkajian Risiko Pasien Jatuh oleh Perawat di Rumah Sakit Pamela Tebing Tinggi Tahun 2023. Medistra Medical Journal, 2(2). <https://doi.org/10.35451/mmj.v2i2.2728>
- Widiawati, A., & al., et. (2024). Factors Influencing Pediatric Nurses' Compliance with Fall Risk Prevention in an Indonesian Hospital. Jurnal Ners Dan Kebidanan Indonesia. <https://ejournal.almaata.ac.id/index.php/JNKI/article/view/4932>
- Wiegmann, D. A., Wood, L. J., Cohen, T. N., & Shappell, S. A. (2022). Understanding the “Swiss Cheese Model” and its application to patient safety. Journal of Patient Safety, 18(2), 119–123. <https://doi.org/10.1097/PTS.0000000000000810>

