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Accelerating Bed Turnover in a Local Hospital: A Workflow and Coordination-Driven Approach

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Abstract:
Bed turnover time is a critical performance indicator in inpatient services because it directly influences bed availability, patient flow, and operational efficiency. This study aimed to evaluate the effect of workflow redesign and staff coordination support on bed turnover time in an inpatient unit. A quasi-experimental one-group pretest-posttest design was used, with retrospective operational data collected from January to April 2026. January represented the pre-intervention period, while February to April represented the post-intervention period. A total of 1,492 bed turnover events were analyzed, comprising 479 pre-intervention and 1,013 post-intervention cases. The intervention included workflow restructuring, time-monitoring alerts, assignment of a final checker, improved coordination between nursing and housekeeping staff, infection prevention and control monitoring, and daily performance evaluation. The results showed a reduction in mean bed turnover time from 133.71 to 125.98 minutes and a decrease in median from 48.12 to 42.23 minutes. Statistical analysis indicated a significant difference between periods ($Z = -4.01$; $p < 0.001$). These findings suggest that structured workflow optimization and strengthened interprofessional coordination improve bed readiness and inpatient operational efficiency, supporting sustainable hospital performance improvement.

INTRODUCTION

Hospital service performance strongly influences public access to timely healthcare, especially in inpatient settings where bed availability determines whether patients can be admitted without delay (Schmutz et al., 2023; Wang et al., 2025; Zehir & Zehir, 2023). Bed turnover time becomes a key operational indicator because slow bed readiness reduces hospital capacity and increases waiting time for incoming patients. Delays also create congestion in emergency departments and worsen clinical risk for patients requiring urgent care. Studies show that inefficient inpatient flow contributes to overcrowding and reduced service quality across health systems (Anumolu & Samant, 2026; Bartlett et al., 2023). Health service efficiency is therefore not only an internal hospital issue but also a public health concern that affects population-level access to care. Evidence from healthcare operations research confirms that improving timeliness and process efficiency increases service capacity without requiring additional physical beds (McCrimmon et al., 2025; Noronha et al., 2023). Therefore, optimizing bed turnover time is essential to support equitable, responsive, and sustainable hospital services for society.

The main problem in many hospitals is the slow transition of beds after patient discharge, which limits the number of patients that can be admitted daily (Hamed et al., 2024; Hu et al., 2021; Kim et al., 2024). This issue arises from fragmented coordination between clinical staff, housekeeping teams, and infection control units. Inefficient communication often delays room cleaning, linen replacement, and the final inspection. As a result, discharged beds remain unavailable for longer periods, reducing operational capacity. Research indicates that hospital flow disruptions are commonly caused by long process lead times and weak coordination across departments (Åhlin et al., 2023; Al Harbi et al., 2024). These inefficiencies create bottlenecks that extend beyond inpatient units and affect emergency department crowding. In many cases, hospitals lack structured monitoring systems to track bed turnover performance in real time. Without systematic intervention, these operational delays persist, reducing the overall effectiveness of healthcare delivery systems.

In inpatient units, delays in bed turnover are common during the post-discharge phase, particularly in the transition from discharge to room readiness. This stage involves multiple sequential tasks such as environmental cleaning, waste removal, linen replacement, and final bed inspection (Aguilera et al., 2024; DeMaio et al., 2025; Erdmann et al., 2024). Each step depends on coordination between nursing staff and housekeeping teams. When communication is unclear, delays accumulate, and bed availability decreases. Hospitals often rely on manual reporting systems, which limit the ability to monitor turnaround performance in real time. Studies in hospital operations show that inefficient patient transfer processes and weak capacity coordination significantly reduce throughput performance (Manning & Islam, 2023; Sarpong et al., 2022; Tan et al., 2022). This phenomenon is highly relevant because it directly affects patient wait times and admission rates. Improving this process can strengthen hospital responsiveness and improve patient satisfaction. Therefore, evaluating workflow-based interventions provides practical value for operational improvement at the unit level.

Previous studies have examined hospital performance improvement through various operational and managerial approaches. Many researchers focus on patient flow optimization at the hospital-wide level, including emergency department congestion and overall bed management systems. Other studies analyze turnaround efficiency in procedural areas such as operating rooms and diagnostic units. These studies demonstrate that structured workflow interventions can significantly improve service efficiency (Ozkaynak et al., 2022; Valente et al., 2023). However, most of the evidence is not specific to inpatient post-discharge processes. The focus tends to be macro-level rather than micro-operational workflows inside inpatient wards. As a result, a detailed understanding of bed turnover at the unit level remains limited. This limitation creates a knowledge gap regarding how daily coordination among frontline healthcare workers affects actual bed readiness time. Therefore, a more focused analysis at the operational level is required to complement existing hospital-wide studies.

Recent studies emphasize the importance of coordination, communication, and process monitoring in improving healthcare efficiency. However, most studies rely on perception-based data or aggregated performance indicators rather than event-level operational records. This limits the ability to capture real-time workflow variation in inpatient settings. Furthermore, few studies integrate infection control monitoring, final-checker roles, and time-based alerts into a structured bed turnover intervention. Prolonged bed turnover is often associated with weak interdepartmental coordination and unclear role allocation after patient discharge (Franklin et al., 2022; Omonaiye et al., 2024). Although quality improvement frameworks highlight timeliness and efficiency as key dimensions, implementation at the inpatient ward level remains underexplored (Franklin et al., 2023; Sohrab, 2025). This study addresses the gap by using 1,492 event-based turnover records to evaluate actual operational performance. It also positions workflow redesign as a practical mechanism to improve measurable inpatient efficiency outcomes.

In the inpatient unit, bed turnover time remains inconsistent and often exceeds operational targets due to unstructured coordination between nursing staff and housekeeping teams. This condition reduces bed availability and slows patient admission processes. The lack of standardized monitoring and unclear role distribution during post-discharge activities creates inefficiencies in workflow execution. Hospitals require a structured system to ensure that each step of bed preparation is completed within a controlled timeframe. Without intervention, delays persist, affecting service capacity. This study specifically addresses whether workflow redesign and staff coordination assistance can significantly reduce bed turnover time. The problem is relevant because it directly affects hospital responsiveness, patient flow, and service efficiency. A measurable operational improvement is needed to ensure that inpatient services can meet increasing demand without expanding physical infrastructure.

This study aims to analyze the effect of workflow redesign and staff coordination assistance on bed turnover time in an inpatient unit. The intervention includes structured communication between nursing and housekeeping staff, time-monitoring alerts, assignment of final bed readiness checkers, infection prevention and control monitoring, and daily performance evaluation. The scope of the study is limited to inpatient post-discharge bed turnover processes using operational event data collected over four months. The analysis focuses on changes in average and median turnover times before and after the intervention. The study does not assess clinical outcomes but concentrates on operational efficiency indicators. The expected outcome is evidence-based improvement in bed-readiness performance which can support hospital management in optimizing inpatient capacity. This aligns with broader healthcare system goals to improve service efficiency, reduce waiting time, and enhance patient access to timely care.

RESEARCH METHODS

This study employed a quantitative, quasi-experimental design to assess whether a quality improvement intervention influenced bed turnover time in an inpatient unit in 2026 (Pregoner, 2024; Takona, 2024). A one-group pretest-posttest design was selected because the intervention was implemented within an existing clinical workflow and random assignment to a control group was not feasible within routine hospital operations. This design allows comparison of operational performance before and after intervention implementation within the same service setting, making it appropriate for evaluating real-world healthcare process improvements.

The study was conducted in the inpatient unit of a general hospital that serves as a referral facility with high patient turnover and intensive bed utilization. This location was chosen because bed management efficiency is a critical operational issue, and variations in discharge-to-admission flow frequently affect service capacity. The inpatient unit provides a suitable context for evaluating workflow-based interventions, given its continuous admission-discharge cycle and the interdependence of work processes among nursing staff, housekeeping, and infection control teams.

Data collection used total sampling of all recorded bed turnover events documented in hospital operational records from January to April 2026. January represented the pre-intervention phase, while February to April represented the post-intervention phase following the introduction of workflow improvements. The data were obtained from secondary sources, including inpatient operational logs and internal quality monitoring reports. The main variable was bed turnover time, defined as the duration from the start of post-discharge room handling to the point when the bed was ready for the next patient. The intervention included workflow redesign, coordination strengthening, time-monitoring alerts, final checker assignment, infection prevention monitoring, and daily performance evaluation.

Data analysis was performed using SPSS software, including descriptive statistics, normality testing, and nonparametric comparative tests. The Mann-Whitney U test was used to compare pre- and post-intervention bed turnover times, while the Kruskal-Wallis test was used to compare month-to-month changes across the post-intervention period. The effectiveness of the intervention was determined based on statistically significant differences in bed turnover time between periods. To ensure data validity, operational records were triangulated by cross-checking inpatient logs, housekeeping reports, and quality assurance documentation to confirm the consistency of recorded bed turnover events. Additionally, data cleaning procedures were applied to remove incomplete or inconsistent records before analysis to maintain the accuracy and reliability of the dataset.

RESULTS AND DISCUSSION

Results

A total of 1,492 bed turnover events were analyzed to evaluate changes in inpatient operational performance following the implementation of a structured quality improvement intervention. The dataset comprised 479 events during the pre-intervention period (January 2026) and 1,013 during the post-intervention period (February to April 2026). Bed turnover time was measured in minutes from the initiation of room cleaning until the bed was ready for reuse. This operational definition ensures that every recorded event reflects a standardized and comparable workflow process across the entire observation period. The use of event-based measurement is important because it captures real operational conditions at the unit level rather than aggregated estimates. Each turnover event represents a complete cycle of post-discharge room processing, including cleaning initiation, preparation activities, and final readiness confirmation. Differences in the number of events between the pre- and post-periods reflect natural variations in patient admission and discharge patterns, which are common in hospital service operations. These variations are influenced by fluctuating patient demand, seasonal service load, and hospital capacity utilization. Therefore, the dataset provides a realistic representation of inpatient workflow performance before and after the intervention, allowing a valid comparison of operational efficiency.

Table 1. Descriptive Statistics of Bed Turnover Time

Period	N	Mean (minutes)	Median (minutes)	SD	Minimum	Maximum
Pre-intervention (January)	479	133.71	48.12	234.20	3.60	1203.67
Post-intervention (February–April)	1013	125.98	42.23	216.00	0.92	1443.82

Table 1 presents the descriptive statistics for bed turnover time before and after the intervention. The results show reductions in both the mean and median during the post-intervention period. The mean decreased from 133.71 minutes to 125.98 minutes, indicating an overall improvement in average bed readiness performance across the inpatient unit. The median also decreased from 48.12 minutes to 42.23 minutes, indicating that the typical or central value of bed turnover time decreased after the intervention. This consistent reduction in central tendency suggests that the intervention contributed to improved operational efficiency in bed management processes. However, the difference between mean and median values in both periods indicates that the data distribution is not symmetrical and is influenced by extreme values.

The data variability remains high in both periods, as reflected in standard deviation values of 234.20 minutes in the pre-intervention period and 216.00 minutes in the post-intervention period. These values indicate that bed turnover performance varies widely across individual cases. Some beds are prepared very quickly, while others experience substantial delays due to operational constraints. The minimum and maximum values further confirm this wide dispersion, with extremely fast and extremely slow turnover times observed in both periods. Despite this variability, the reductions in both the mean and median values provide evidence that the intervention contributed to a general improvement in bed turnover efficiency, even though inconsistencies across cases persist.

Table 2. Test of Normality

Period	N	Mean (minutes)	Median (minutes)	SD	Minimum	Maximum
Pre-intervention (January)	479	133.71	48.12	234.20	3.60	1203.67
Post-intervention (February–April)	1013	125.98	42.23	216.00	0.92	1443.82

Table 2 presents the results of the Shapiro–Wilk normality test for both the pre-intervention and post-intervention groups. The results show that both groups have p-values below 0.05, indicating that the distribution of bed turnover time is not normal. This finding indicates that the data do not follow a symmetrical distribution and exhibit irregular variation across observations. In operational hospital data, such non-normal distributions are common due to the presence of extreme values and inconsistent workflow conditions.

The non-normality of the data reflects the real-world nature of inpatient service processes, where delays and accelerations occur unpredictably. Factors such as staffing availability, workload distribution, cleaning duration, and discharge timing can significantly affect turnover time. Because the assumption of normality is violated, parametric statistical tests cannot be used for comparative analysis. Instead, non-parametric methods are more appropriate because they do not require normality assumptions and are more robust for skewed operational data. This step is important to ensure the validity and reliability of the statistical conclusions drawn from the dataset.

Table 3. Mann–Whitney U Test

Group	N	Mean Rank	Sum of Ranks
Pre-intervention	479	811.54	388729.00
Post-intervention	1013	715.74	725049.00

Table 3 presents the results of the Mann–Whitney U test comparing bed turnover time between the pre-intervention and post-intervention periods. The results show that the mean rank for the pre-intervention group is higher than that of the post-intervention group. This indicates that bed turnover times were generally longer before the intervention was implemented. In contrast, the lower mean rank in the post-intervention group indicates that bed turnover times became shorter after the intervention. The difference in rank distribution reflects a shift in operational performance toward improved efficiency in inpatient bed readiness.

The statistical test results show a Mann–Whitney U value of 273769.00, a Z value of -4.01, and a p-value of < 0.001. This indicates that the difference between the two periods is statistically significant and not caused by random variation. The results confirm that the intervention is associated with a meaningful reduction in bed turnover time. In practical terms, this suggests that workflow improvements and strengthened coordination contributed to faster completion of post-discharge room processes and to improved bed readiness for subsequent patients.

Table 4. Monthly Descriptive Statistics of Bed Turnover Time

Month	N	Mean (minutes)	Median (minutes)	SD	Minimum	Maximum
January	479	133.71	48.12	234.20	3.60	1203.67
February	307	202.12	78.27	267.05	0.92	1443.82
March	417	133.31	49.17	220.04	1.12	1416.97
April	289	34.53	23.35	59.91	2.58	595.88

Table 4 presents the monthly distribution of bed turnover time across the four-month observation period. January represents the baseline condition with a mean turnover time of 133.71 minutes. In February, the mean increases sharply to 202.12 minutes, indicating a decline in operational performance during the early phase of intervention implementation. This increase suggests that the initial adaptation process may have temporarily disrupted workflow efficiency due to changes in procedures and staff coordination patterns. Such transitional effects are common when new operational systems are introduced in healthcare settings.

In March, the mean turnover time decreases again to 133.31 minutes, which is close to the baseline level observed in January. This indicates partial recovery and stabilization of the workflow after the initial disruption phase. April shows a significant improvement, with the mean dropping to 34.53 minutes and the median to 23.35 minutes. This reflects a substantial acceleration in bed readiness processes. The standard deviation in April also decreases to 59.91, indicating more consistent performance across cases. The reduction in variability suggests that operational processes became more standardized and predictable.

Table 5. Kruskal–Wallis Test

Test Statistic	Value
Kruskal–Wallis H	248.50
df	3
Asymp. Sig.	< 0.001

Table 5 presents the results of the Kruskal–Wallis test used to compare bed turnover time across four months. The test produces an H value of 248.50 with a p-value of < 0.001, indicating that there are statistically significant differences in bed turnover time across January, February, March, and April. This means that the performance of bed turnover processes was not constant across time but varied significantly between months.

The pattern of results suggests a dynamic change in operational performance. February shows the highest turnover time, indicating a temporary decline in efficiency. March shows improvement, while April shows the strongest performance improvement. This pattern suggests that the intervention effect was not immediate but developed progressively over time as staff adapted to the new workflow system. The statistical results confirm that these monthly changes are meaningful and reflect real operational improvement rather than random variation.

Table 6. Monthly Achievement of Operational Performance Indicator

Month	Achieved	Not Achieved	Total Cases	Achievement (%)
January	302	177	479	63.05
February	128	179	307	41.83
March	246	171	417	58.99
April	273	16	289	94.46

Table 6 presents the monthly achievement rate of operational performance indicators based on bed turnover time standards. In January, the achievement rate was 63.05 per cent, reflecting moderate baseline performance. In February, the achievement rate drops significantly to 41.83 per cent, indicating reduced operational efficiency during the early phase of intervention implementation. This decline aligns with the increase in mean turnover time observed in Table 4, suggesting temporary workflow disruption.

In March, performance begins to recover, with the achievement rate rising to 58.99 per cent. April shows a substantial improvement, with the achievement rate reaching 94.46 per cent, indicating that most cases meet the operational standard. This result aligns with the sharp reduction in both mean and median turnover times in April. The consistency between faster turnover time and a higher achievement rate indicates that the intervention improved not only efficiency but also compliance with operational targets, resulting in stronger, more stable inpatient service performance.

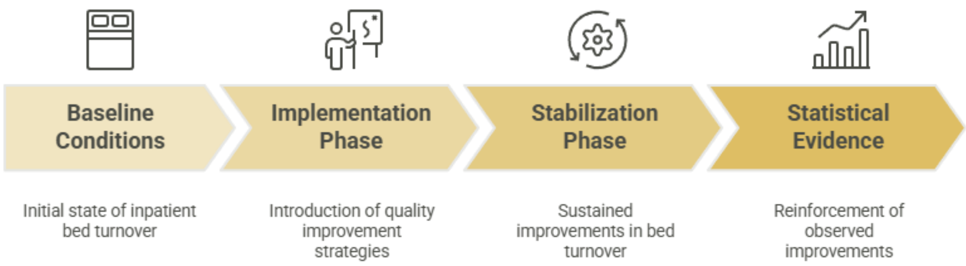

Figure 1. Quality Improvement Intervention Timeline for Inpatient Bed Turnover Performance

Figure 1 illustrates the sequential timeline of the structured quality improvement intervention designed to improve inpatient bed turnover performance. The figure begins with baseline conditions, representing the initial state of bed turnover before intervention, where delays and process variability were still present. The implementation phase describes the introduction of quality improvement strategies, including workflow standardization, staff coordination, and clearer bed readiness procedures. The stabilization phase reflects the period in which the new processes became more consistent and embedded into routine inpatient operations. Finally, the statistical evidence stage emphasizes that the observed improvements were supported by formal analysis rather than descriptive changes alone. Overall, the figure shows that performance improvement occurred as a staged process, moving from problem identification to intervention, stabilization, and evidence-based confirmation. This visual summary helps readers understand the logical flow of the study and clearly connects the operational intervention with measurable improvements in bed turnover efficiency over time.

Discussion

The findings indicate that the quality improvement intervention was associated with a significant reduction in bed turnover time in the inpatient unit. This result aligns with previous studies that emphasize the role of process efficiency and coordination in improving hospital flow performance. Similar to prior research, the present study confirms that delays in inpatient bed readiness are driven not only by technical cleaning duration but also by structural workflow issues, such as communication gaps and unclear task allocation. Studies on hospital throughput have consistently shown that fragmented coordination and weak handoff systems contribute to prolonged patient flow and reduced bed availability, which is consistent with the baseline condition observed before the intervention. However, this study adds stronger empirical evidence by quantifying improvements using event-level operational data rather than perception-based or aggregated indicators, thereby strengthening the validity of the observed efficiency gains.

Compared with the existing literature, this study's results show both consistency and contextual differences. Prior studies have largely focused on hospital-wide patient flow optimization or turnaround processes in procedural units, such as operating rooms and diagnostic services, rather than inpatient post-discharge bed turnover. In contrast, this study specifically examines inpatient bed readiness after discharge, which is often overlooked despite being a critical determinant of hospital capacity utilization. The finding that workflow redesign and coordination strengthening significantly reduce turnover time supports earlier evidence that structured interventions improve operational performance (Lee et al., 2021; Samadbeik et al., 2024). However, the magnitude and temporal pattern of improvement observed in this study, particularly the delayed yet strong improvement in April, suggest that inpatient workflow adaptation may require longer stabilization periods than in procedural environments.

From a theoretical perspective, the findings reinforce process improvement theory in healthcare, which emphasizes that performance efficiency is shaped by both task execution and coordination structures. The results support the idea that operational outcomes such as bed turnover time are multidimensional indicators influenced by communication, role clarity, and real-time monitoring mechanisms. This is consistent with quality improvement frameworks that define timeliness, coordination, and standardization as core determinants of service performance (Bhaladhare & Rishipathak, 2025; Endalamaw et al., 2024). The observed reduction in variability, alongside improved central tendency, further supports the theoretical understanding that process standardization reduces operational uncertainty. Therefore, this study extends existing theory by demonstrating how micro-level workflow redesign within inpatient units can produce measurable improvements in system-level performance indicators.

The study also provides important practical implications for hospital management. The results show that interventions focusing on communication between nursing and housekeeping staff, assignment of final checkers, and implementation of time-monitoring alerts can significantly improve bed readiness. These findings suggest that operational delays are best addressed through coordination mechanisms rather than isolated task optimization. The improvement observed in April indicates that sustained application of structured workflow systems leads to stronger performance outcomes over time. In practical terms, hospitals can improve inpatient throughput without increasing physical capacity by strengthening post-discharge coordination systems and implementing real-time performance monitoring tools. This approach is particularly relevant for resource-constrained healthcare settings where demand for inpatient beds frequently exceeds availability.

The monthly trend analysis provides additional insight into implementation dynamics and supports existing literature on quality improvement adaptation phases. The increase in turnover time during February followed by progressive improvement in March and strong performance in April is consistent with studies indicating that initial implementation of workflow changes often leads to temporary disruption before stabilization occurs (Ozkaynak et al., 2022; Zarbo, 2022). This pattern suggests that staff adaptation and system familiarization are critical determinants of early intervention performance. The findings also highlight that quality improvement should be evaluated over time rather than at a single post-intervention point, as early fluctuations may not reflect the intervention's long-term effectiveness. This temporal perspective contributes to a more nuanced understanding of implementation outcomes in healthcare operations. Further implications arise from integrating real-time monitoring and accountability mechanisms into the intervention. The use of time-monitoring alerts and continuous performance tracking appears to have strengthened operational discipline and reduced delays in bed readiness. This finding is consistent with previous research that highlights the importance of feedback systems and visibility in improving healthcare workflow performance (Bartlett et al., 2023; Mitchell et al., 2025). The involvement of infection prevention and control personnel also ensures that efficiency gains do not compromise service quality, reinforcing the balance between speed and safety in healthcare operations. Overall, the study contributes to the growing evidence that integrated workflow redesign, supported by monitoring and clear role allocation, is essential for sustainable improvement in inpatient service efficiency.

In conclusion, this study contributes to both theoretical development and practical hospital management by demonstrating that structured workflow redesign and coordination strengthening significantly improve bed turnover performance. Unlike prior studies that focus on broader patient flow metrics or procedural settings, this research provides specific evidence on inpatient post-discharge bed readiness using granular operational data. The findings confirm that efficiency improvements are achieved not only through task optimization but also through systemic coordination and monitoring mechanisms. Therefore, the study offers a practical model for hospitals aiming to enhance inpatient capacity utilization, reduce operational delays, and improve overall service performance through targeted workflow interventions.

CONCLUSION

This study concludes that implementing workflow redesign and improving staff coordination significantly reduced bed turnover time in the inpatient unit. The intervention consisted of structured post-discharge communication, time-monitoring alerts, assignment of final checkers, infection prevention and control supervision, and routine daily performance evaluation. Descriptive results showed a decline in mean bed turnover time from 133.71 minutes before the intervention to 125.98 minutes after, accompanied by a reduction in median bed turnover time from 48.12 minutes to 42.23 minutes, indicating improved operational efficiency in bed readiness. Inferential analysis using the Mann–Whitney U test confirmed a statistically significant difference between the pre-intervention and post-intervention periods ($Z = -4.01$; $p < 0.001$), showing that the improvement was not due to random variation. Monthly trend analysis revealed a non-linear pattern: February experienced a temporary increase in turnover time, followed by a recovery in March and a substantial improvement in April. The best performance was achieved in April, with a mean turnaround time of 34.53 minutes and an operational achievement rate of 94.46 per cent, indicating greater consistency and compliance with service standards. These findings suggest that structured coordination and monitoring systems can enhance inpatient efficiency. However, given the single-site setting and the one-group pretest-posttest design without a control group, the results should be interpreted cautiously, and further studies are needed for broader validation.

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