



OPTIMIZING NURSE PERFORMANCE IN ELECTIVE SURGERY PATIENT PREPARATION THROUGH A LEAN MANAGEMENT APPROACH: A QUALITY IMPROVEMENT CASE REPORT

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ABSTRACT

Nurse performance in managerial functions is essential to effective elective surgery preparation, as process failures may compromise patient safety, operational efficiency, and service quality. At X hospital, 92 surgical delays due to patient unpreparedness were recorded from January to April 2026, indicating gaps in nurses' planning, organizing, and controlling functions. To analyze the optimization of nurse performance in elective surgery preparation through a Lean Management approach in an inpatient surgical unit. A quality improvement case study integrated the POSAC management framework, Lewin's Planned Change Model, and Lean Management. Data were collected through interviews, validated and reliable 1–5 Likert-scale questionnaires administered to 15 nurses, direct observation, and document review. Data were analyzed using Value Stream Mapping (VSM), 5-Why Analysis, Fishbone Diagram, and the USG Priority Matrix based on five Lean Thinking principles. Overall nurse managerial performance was categorized as good. SOP compliance had the highest mean score (4.27), while the nurse-to-patient ratio (2.67) and cross-unit coordination (3.20) were the lowest. VSM identified 23 preparation steps, with only 9 (39%) classified as value-added. Implementation of cross-unit SOPs, visual management, and digital preoperative education resulted in 0% preparation defects during 11 days of monitoring, a 53.85% reduction in surgical delays (13 to 6 cases), 75% checklist compliance, and 100% shift-briefing adherence. Lean Management can optimize nurse performance, reduce process defects, and strengthen patient safety in elective surgery preparation. Sustainability requires SOP legalization, hospital information system integration, and periodic audits.

Keywords: elective surgery preparation; lean management; nurse performance; patient safety; process improvement; value stream mapping

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INTRODUCTION

Nurse performance in carrying out managerial functions in preoperative care is one of the key elements determining safety, efficiency, and quality of hospital services. Elective surgery preparation is a foundational component of perioperative care that directly determines patient safety, operational efficiency, and the quality of surgical services; therefore, the quality of nurse performance at this stage is a key indicator of the overall success of surgical services (Potter et al., 2021). Nevertheless, in clinical practice across various healthcare facilities, this process is frequently hindered by recurring systemic problems that have not been fully resolved. When nurse performance in this process is characterised by defects, including incomplete documentation, delays in patient transfer, inconsistent preoperative education, and suboptimal cross-unit communication, the consequences are multidimensional, including surgery cancellation or delay, resource waste, patient anxiety, increased nursing workload, and increased risk of safety incidents (WHO, 2021).

In X hospital, several performance-related problems were consistently identified as having the potential to trigger surgical delays and increase patient risk. These problems included incomplete documentation, non-uniform patient education, delays in patient arrival, suboptimal inter-unit

communication, and duplication of work that consumed nurses' time and energy. During January–April 2026, 92 surgical delay events due to patient unpreparedness were recorded, with the peak occurring in January 2026 at 51 cases, indicating that optimisation of nurse performance during the preoperative preparation stage had not yet been implemented systematically.

Lean Management, rooted in the Toyota Production System (TPS) and adapted to healthcare services by Marsilio & Pisarra (2021) and Graban (2016), provides a systematic framework for eliminating waste (*muda*), reducing process variation, and improving healthcare workforce performance through the creation of patient-centred value. It is operationalised through five sequential principles: Identify Value, Map the Value Stream, Create Flow, Establish Pull, and Pursue Perfection. Systematic reviews confirm that lean interventions in hospitals consistently reduce waiting time, improve patient flow, and enhance service performance, particularly when supported by leadership commitment, frontline staff involvement, and continuous evaluation (Tlapa et al., 2020; Zepeda-Lugo et al., 2020). This case study reports the optimisation of nurse performance in elective surgery preparation through a Lean Management approach operationalised through five core principles in X hospital during April–May 2026, with nurses serving as frontline change agents within Lewin's planned change framework.

METHOD

This study used a case report design within a nursing service quality-improvement framework, integrating quantitative and qualitative data to comprehensively describe nurse performance and evaluate the formative impact of lean interventions on such performance (Creswell & Clark, 2018). The analytical framework incorporated the POSAC management functions (Planning, Organizing, Staffing, Actuating, Controlling) and Lewin's planned change model.

The study was conducted in X hospital, West Java, during April–May 2026. Fifteen nurses working in the inpatient unit were recruited using random sampling. Four data sources were triangulated: (1) an in-depth interview with the Nurse Unit Manager (NUM) on 24 April 2026, guided by Mintzberg's managerial role framework and the POSAC management functions; (2) a structured questionnaire administered from 24–27 April 2026 consisting of 12 items assessing POSAC managerial function performance and 10 items assessing preoperative defects (Likert scale 1–5, with higher scores indicating better performance); (3) direct observation of the surgical preparation process and outpatient education from 22–28 April 2026; and (4) document review, including applicable SOPs, checklists, COT delay log data (January–April 2026), and the hospital information system dashboard.

Data were analysed using four complementary lean tools: (a) Value Stream Mapping (VSM) to map process steps and distinguish value-added from non-value-added activities (Marin et al, 2021); (b) 5-Why Analysis to trace the root causes of surgical delays (Ohno, 1988); (c) a Fishbone Diagram structured according to POSAC to visualise factors contributing to performance deficiencies; and (d) the USG Priority Matrix (Urgency × Seriousness × Growth) to rank problems according to intervention priority. The intervention was structured using Lewin's three-stage model (Unfreezing–Moving–Refreezing) and operationalised through the five principles of Lean Thinking (Marsilio & Pisarra, 2021). The residency student served as an internal change agent (Marquis & Huston, 2024). The impact on nurse performance was evaluated using Donabedian's structure–process–outcome framework.

RESULT

Assessment of nurse performance using a questionnaire based on POSAC managerial functions and Mintzberg's managerial roles showed that the overall mean score was in the good category. The highest-scoring items were compliance with the surgical preparation SOP (mean 4.27) and completeness of information regarding patients scheduled for surgery (mean 4.20). The lowest-scoring item was the nurse-to-patient ratio (mean 2.67), reflecting the actual ratio of 1:7–1:8 in the

field, considerably below the ideal standard of 1:3–4 for a surgical unit. The cross-unit coordination item also received a relatively low score (mean 3.20), indicating weak synergy among the inpatient unit, outpatient clinic, COT, and other supporting units; these two indicators therefore represented critical points for nurse performance optimisation.

Table 1.
Assessment of Nursing Managerial Function Performance

No.	Function	Indicator	Mean Score
1	Planning	Surgical preparation SOP	4.27
2	Planning	Availability of equipment and medications	3.80
3	Organizing	Nurse-to-patient ratio *	2.67
4	Staffing	Task allocation according to competence	3.60
5	Actuating	Regular supervision	3.70
6	Controlling	Routine performance evaluation	3.90
7	Interpersonal	Staff-supervisor relationship	4.00
8	Informational	Completeness of information on scheduled surgery patients	4.20
9	Informational	Staff awareness of relevant information	4.00
10	Decisional	Problems handled appropriately	4.00
11	Interpersonal	Coordination with PPA	4.13
12	Interpersonal	Cross-unit coordination *	3.20

Table 2.
Performance in Elective Preoperative Patient Preparation (n = 15)

Preoperative Preparation Defect Indicator	Mean	SD
Preoperative checklist completed in full	4.60	0.51
Preoperative medical record completed in full	4.13	0.74
Errors in patient transfer	4.07	0.80
Incomplete preoperative preparation	3.87	0.92
Surgical delay due to inappropriate fasting	3.67	0.90
Surgical delay because medical consultation had not been completed	3.60	0.91
Blood request not made before surgery	3.47	1.06
Surgical site hair removal not performed	3.27	1.10
Surgical delay because enema was not performed	3.20	1.08
Repetitive activities / redundant documentation *	2.20	0.94
Total Performance (Mean ± SD)	36.07 ± 5.34	

The questionnaire (n = 15) identified repetitive activities or redundant documentation (mean 2.20/5) as the lowest-scoring item, serving as the strongest proxy for process waste and an indicator of reduced nurse performance efficiency, whereas completeness of the preoperative checklist (4.60) and completeness of medical records (4.13) received the highest scores. Assessment of managerial functions identified the nurse-to-patient ratio as the most critical structural deficiency (mean 2.67), followed by cross-unit coordination (3.20) and competence-based task assignment (3.60).

Table 3.
Surgical Delays Due to Patient Unpreparedness, January–April 2026 (RSP UI COT Log Data)

Month	Number of Delays	Percentage (%)
January 2026	51	55.4%
February 2026	12	13.0%
March 2026	16	17.4%
April 2026	13	14.1%
Total	92 cases	100%

Baseline data demonstrated a persistent pattern of surgical delays due to failures in patient preparation. Based on data obtained from the Central Operating Theatre (COT), a total of 92 surgical delay events due to patient unpreparedness were recorded during January–April 2026. The peak occurred in January 2026, with 51 cases (55.4% of the total), indicating a systemic performance problem requiring urgent attention. Although the number of delays decreased in subsequent months, surgical delays continued to occur, indicating that patient preparation performance had not yet been optimal.

VSM analysis of the 23-step elective surgical preparation pathway revealed that only 9 steps (39%) were value-added, while the remaining 14 were classified as non-value-added. These included

repeated confirmation of undocumented DPJP instructions (waiting waste), duplicated documentation across units (overprocessing waste), informal and inconsistent inter-unit information handover (defect waste), and delayed preoperative education delivered only when patients were admitted to the inpatient unit (overprocessing waste). Two critical bottlenecks were identified: the absence of a cross-unit SOP and preoperative education provided only at night when patients were admitted, leaving very limited preparation time.

Three independent 5-Why chains tracing documentation defects, delayed patient preparation, and medication errors during handover all converged on the same root problem: the absence of an integrated and standardised process for elective surgical preparation across units. Subordinate causes included DPJP instructions not documented in SPRI/AFIA, shift handovers that did not formally include medication checks, and the absence of a structured preoperative education pathway beginning in the outpatient clinic.

The POSAC-structured Fishbone Diagram highlighted planning as the most dominant performance-deficiency category, characterised by the absence of a cross-unit SOP for procedures other than caesarean section and curettage, the lack of a standardised clinical pathway, and suboptimal logistical planning for enema materials (fleet enema and phosphosoda). Organizing deficiencies (nurse-to-patient ratio 1:7–8; mixed rooms with various specialties) exacerbated planning gaps, while controlling weaknesses (2–3 medication-error incidents per review period) reflected downstream effects of upstream performance weaknesses.

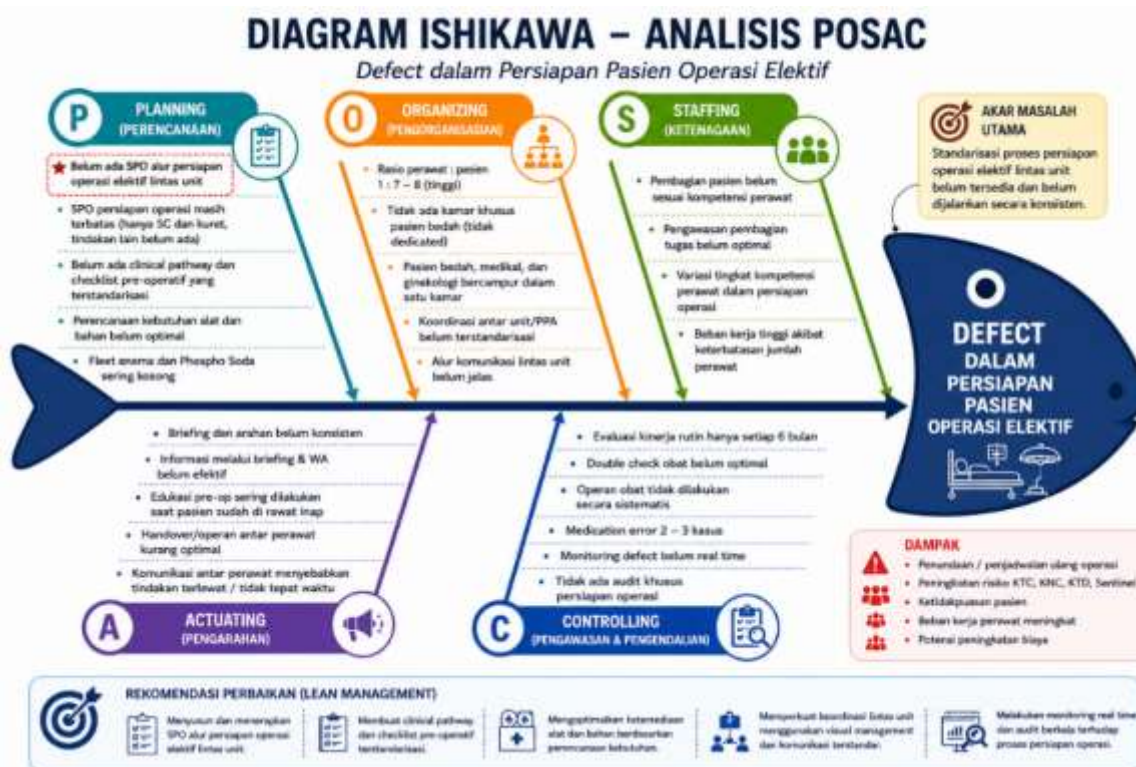


Figure 2. Ishikawa Diagram of the Causes of Surgical Preparation Defects

The Ishikawa Diagram identified defects in elective surgical preparation across the POSAC dimensions, with planning and organizing emerging as the main contributing factors. Key planning gaps included the absence of a comprehensive cross-unit surgical preparation SOP, standardized clinical pathway and checklist, and adequate equipment and material planning. Organizing problems included a 1:7–8 nurse-to-patient ratio, high room occupancy, and the absence of dedicated surgical-patient grouping. Staffing also showed variation in task allocation according to nurse competence, while actuating and controlling mechanisms were insufficient to prevent medication errors, handover miscommunication, and preparation delays. These findings indicate

that defects were influenced not only by individual compliance but also by system-level weaknesses in standardization, resource organization, communication, and quality control.

From a Mintzberg managerial-role perspective, the Nurse Unit Manager (NUM) performed interpersonal, informational, and decisional roles, but gaps remained particularly in the monitor, disseminator, and resource allocator functions. Recurring defects indicated that identified problems were not consistently translated into preventive actions, while informal communication and limited resources affected information continuity and workload management. Therefore, performance optimization should prioritize cross-unit process standardization, resource allocation, structured communication, and proactive monitoring to reduce surgical preparation defects sustainably

Table 6.

USG Priority Matrix for Performance Problems in Elective Surgery Preparation								
Priority Problem / Issue				U	S	G	U×S×G Score	Priority
No cross-unit SOP and visual management				5	5	5	125	Priority 1
Shift handover and medication double-checking not standardised				5	5	4	100	Priority 1
Delayed preoperative education (only provided in inpatient unit)				4	5	5	100	Priority 2
Repetitive activities and redundant documentation (waste)				4	4	4	64	Priority 2
Weak cross-unit coordination				3	4	4	48	Priority 3
Weak logistics management (enema supply stock)				3	4	3	36	Priority 3
Non-ideal nurse-to-patient ratio (1:7–8)				3	3	3	27	Priority 4

Implementation of the Five Lean Thinking Principles

Table 7.

Optimising Nurse Performance through the Five Principles of Lean Thinking		
Lean Principle	Intervention Implemented	Result
Identify Value	In-depth interview with NUM to clarify patient and clinical value expectations; questionnaire for 15 nurses to identify activities perceived as valuable and redundant activities (waste); direct observation of the surgical preparation pathway on 22–28 April 2026; review of COT delay data from January–April 2026 (n=92 cases) as quantitative evidence of waste.	Agreed value was for patients to arrive at COT physically, administratively, and psychologically ready, on time, and without defects. High-value activities such as comprehensive education, identity verification, and document completeness were hindered by redundant activities such as repeated confirmation of DPJP instructions and duplicated form completion across units.
Map the Value Stream (VSM)	Mapping 23 steps in the elective surgical preparation pathway from outpatient clinic through inpatient care to COT; classification into value-added (VA) and non-value-added (NVA); 5-Why analysis of three independent problem chains; POSAC-based Fishbone Diagram; USG matrix analysis to determine intervention priorities.	Of 23 process steps, only 9 (39%) were value-added, lower than the Lean Healthcare benchmark (50–65%). Two major bottlenecks were identified: no cross-unit SOP beyond caesarean section and curettage procedures, and preoperative education delivered only when patients entered the inpatient unit. 5-Why analysis identified the common root cause as the absence of an integrated cross-unit process standard.
Create Flow	Development of a draft Cross-Unit Elective Surgery Planned Patient Pathway SOP (85%); visual management using reminding signs and a surgical preparation checklist dashboard; per-shift monitoring sheet for real-time patient readiness; digital preoperative education through posters for outpatients and inpatients; standardised	Patient preparation completeness reached 100% with no administrative defects during 11 days of monitoring. Surgical delays decreased from 13 cases in April 2026 to 6 cases in May 2026 (53.85% reduction). Checklist use reached 75%. A remaining constraint was the limited COT WhatsApp broadcast system, which prevented

Lean Principle	Intervention Implemented	Result
	surgical preparation checklist integrated with the dashboard.	consistent digital education.
Establish Pull	Surgical-patient briefing at every shift change; use of the scheduled-surgery dashboard to identify unmet preparation needs; visual marking of patient readiness status on the unit dashboard; real-time coordination between inpatient care, COT administration, and supporting units.	Surgical-patient briefing reached 100% at every shift change. Work patterns changed from reactive to proactive because the team could identify patient unpreparedness before the scheduled surgery. However, the cross-unit pull system still requires integration with the hospital information system (SIMRS) to operate optimally.
Pursue Perfection (Continuous Improvement/Kaizen)	Planning monthly SOP compliance audits; integrating surgical preparation indicators into unit quality monitoring; strengthening the NUM's role as change leader and facilitator of a kaizen culture; providing staff feedback based on monitoring results; planning SOP legalisation and full SIMRS integration.	A foundation for a kaizen culture began to develop through NUM and team commitment and planned periodic evaluation. Long-term indicators such as SOP compliance, cross-unit coordination, and staff satisfaction require 3–6 months of observation for comprehensive evaluation. A reduction in administrative defects to 0% and a 53.85% reduction in surgical delays indicate early success of continuous improvement.

Implementation followed the five principles of Lean Thinking (Marsilio & Pissarra 2021), embedded within Lewin's Unfreeze–Move–Refreeze model. Table 7 describes the application of each principle and the resulting formative performance achievements.

The most notable achievement was 0% defects in patient preparation completeness during the 11-day monitoring period, a marked change compared with the 92 delay events recorded over the preceding four months, indicating a measurable improvement in nurse performance. The 53.85% reduction in surgical delays during the first month of implementation is consistent with Nazri et al. (2018), who reported a reduction in surgery cancellation from 15% to 4% following lean standardisation in a Malaysian surgical hospital, as well as Aini and Suryani (2020), who documented a 23% increase in surgical safety checklist compliance in an Indonesian perioperative nursing context.

DISCUSSION

This study shows that Lean Management, when systematically operationalised through its five foundational principles, can optimise nurse performance rapidly and measurably in elective surgery preparation, even in an inpatient environment with limited resources and high patient acuity. This finding is consistent with the realist review by Mahmoud et al. (2021) of 55 lean healthcare studies, which found that lean contributes to reduced waiting time, increased healthcare workforce productivity, and improved patient satisfaction when implementation is supported by staff involvement and organisational commitment. The initial assessment revealed a fundamental misalignment between where nurse performance effort was invested repetitive documentation and repeated confirmation and activities that were genuinely valuable to surgical patients, namely education, verification, and timely readiness. This misalignment, analogous to the concept of the hidden factory described by Graban (2016) in healthcare waste, provided the basis for reorienting nurse performance around value as defined by patients.

The VSM finding that only 39% of process steps were value-added was substantially lower than the benchmark for lean healthcare implementation, in which the typical VA ratio ranges from 50–65% after initial mapping (Winner et al., 2022). The two identified bottlenecks absence of a cross-unit SOP and delayed preoperative education are congruent with Nazri et al. (2018), who found that SOP standardisation was among the interventions with the greatest impact on team performance in reducing surgical cancellations. Implementation of visual management through a checklist dashboard and reminding signs at the nurse station contributed directly to improved nurse

performance in preparation compliance and reduced surgical delays. This finding supports Winner et al. (2022), who reported that visual management in perioperative inpatient units can reduce errors and improve nursing compliance with standard procedures.

The 53.85% reduction in surgical delays and 100% preparation completeness during monitoring provide early evidence that nurse performance optimisation through a standardised process flow can be achieved rapidly through focused interventions. Checklist compliance of 75%, which remained below the 95% target, is consistent with the general trajectory of performance improvement during lean implementation, in which an initial achievement of 60–80% may occur before a new work culture becomes internalised (Tlapa et al., 2020). The shift from reactive to proactive preparation performance, demonstrated by 100% briefing compliance, reflects adoption of the pull system in its early phase. In lean terminology, this represents a transition from a push system, in which preparation is triggered by routine or sudden needs, toward a pull system, in which preparation is triggered by verified readiness requirements at the next receiving stage. SIMRS integration remains a critical enabler for formalising this pull mechanism across units (Marsilio & Pisarra, 2021).

The study findings confirm that the main root problem in elective surgical preparation performance at RSP UI was the absence of a structured and integrated standard system across units. This is consistent with lean literature emphasising that performance deficiencies in healthcare are not solely caused by individual factors but also by weaknesses in systems and non-standardised processes (Graban, 2016). A nurse-to-patient ratio of 1:7–8, considerably above the ideal ratio, combined with the absence of a cross-unit SOP, creates conditions conducive to reduced performance and recurring defects. The dominance of problems in the planning and organising dimensions of POSAC indicates that nurse performance optimisation must begin with the managerial foundation. This finding is consistent with Marquis and Huston (2024), who emphasised that the effectiveness of nursing service performance depends substantially on the quality of resource planning and organisation. The formative phase of this study established structural and cultural prerequisites for kaizen, namely a standardised performance baseline, committed leadership, and a performance measurement system.

Mahmoud et al. (2021) emphasised that lean success is not a one-time event but a work culture that requires time for behavioural internalisation; Marquis and Huston (2024) similarly emphasise the need for sustained implementation. SOP legalisation, audit mechanisms, and SIMRS integration planned for the next phase are necessary institutionalisation measures to sustain the performance optimisation achieved. The nurse's role as a change agent was central to the success of this performance optimisation. Consistent with Sari and Hariyati (2021), frontline nurses who understand lean principles and are empowered to identify inefficiencies provide indispensable insight into process failures that may not be visible through management-level analysis. This confirms the relevance of Lewin's model in the context of changing perioperative nursing practice in Indonesia.

Use of Lewin's change model helped structure the performance optimisation process systematically, from building awareness (unfreezing), implementing interventions (moving), to sustaining performance changes (refreezing). This approach is relevant to clinical-practice changes involving multiple professions and work units. Several limitations should be acknowledged. First, the relatively short evaluation period (11 days) limits the ability to assess the long-term sustainability of performance optimisation. Second, the case-report design limits generalisability of the findings to other settings with different performance characteristics. Third, several performance outcome indicators could not be fully evaluated because of time limitations. More comprehensive evaluation over a longer period is needed to confirm the sustainability of the intervention's impact on nurse performance.

CONCLUSION

Optimisation of nurse performance in elective surgery preparation in the 5th Floor Inpatient Unit of RSP UI, structured through the five principles of Lean Management and Lewin's change model, achieved a 53.85% reduction in surgical delays, 0% preparation defects during monitoring, and 100% briefing compliance at every shift during the first month of intervention.

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