Improving the Efficiency of Patient Discharge Time and Health Insurance Claim Administration through Lean Implementation

Siswoyo[1], Sri Hernawati[1], Firman[2]
[1]Graduate Program in Public Health, Universitas Jember, Jember, Indonesia; [2]RSUD Sondosia, Indonesia
Correspondence: **Siswoyo**: Jl. Kalimantan 37, Jember, Indonesia; 197007052003122001@mail.unej.ac.id

ABSTRACT

Health services in the era of the National Health Insurance system require hospitals to achieve not only optimal clinical outcomes but also operational efficiency. RSD dr. Soebandi, located in Jember, Indonesia, experienced performance problems in its inpatient unit, particularly in two areas: the average patient discharge waiting time exceeded the hospital standard of less than two hours, and the inpatient insurance claim administration process to BPJS Kesehatan exceeded the required 2×24-hour completion target. These issues were identified as forms of waste, especially waiting time. This study aimed to analyze the efficiency of the inpatient discharge process and insurance claim administration, and to identify and implement Lean-based solutions to reduce operational waste. This study employed Action Research with a mixed-methods approach combining qualitative and quantitative techniques. The design enabled direct researcher involvement in the stages of diagnosis, planning, implementation, and evaluation. Quantitative analysis was used to measure discharge process duration, while qualitative analysis identified waste using a Downtime Matrix, developed Current and Future State Maps through Value Stream Mapping, and supported the formulation of revised standard operating procedures. The study was conducted from July to October 2025 in the inpatient installation of the hospital. The sample consisted of 84 patients selected using purposive sampling. Lean implementation reduced discharge process Lead Time from 250.19 minutes to 129.50 minutes and increased the Value-Added Ratio (VAR) from 29.41% to 50.39%. In the inpatient insurance claim process, Lead Time decreased from 787.02 minutes to 549.55 minutes, while VAR improved from 10.47% to 49.76%. As conclusion, **t**he findings demonstrate that Lean implementation is effective in reducing operational waste and improving efficiency in both patient discharge and inpatient insurance claim administration processes.

Keywords: lean hospital; waiting time; patient discharge; health insurance claims; inpatient services

INTRODUCTION

Hospitals are complex healthcare institutions mandated to deliver comprehensive, continuous, and high-quality services [1]. To fulfill this mandate, hospitals must continuously adapt to scientific and technological developments while maintaining service standards, safety, and efficiency [2-4]. This obligation has become increasingly critical in the era of Indonesia's National Health Insurance system (*Jaminan Kesehatan Nasional/JKN*), where hospitals operate within a financing structure that emphasizes accountability, performance, and sustainability. Within this system, hospitals are no longer evaluated solely based on clinical outcomes but also on their ability to deliver services efficiently, maintain operational effectiveness, and ensure financial stability.

The primary objective of healthcare delivery is to produce beneficial outcomes not only for patients but also for providers, institutions, and society [5]. Achieving this objective requires hospitals to balance three interrelated dimensions: clinical quality, patient experience, and operational efficiency. Inefficiency in hospital processes can negatively affect all three dimensions simultaneously. Delays in service flow, administrative bottlenecks, and suboptimal coordination among hospital units may increase waiting time, reduce patient satisfaction, limit service capacity, and generate financial risks. Consequently, improving hospital operational processes has become a strategic priority for healthcare organizations worldwide [6].

RSUD dr. Soebandi, located in Jember, Indonesia, is a Class B teaching hospital and an important referral center in the eastern region of East Java. As a referral and educational hospital, it plays a vital role in delivering specialized services, supporting clinical education, and ensuring access to inpatient care for a wide population. Inpatient services represent the peak level of hospital care, where patients require continuous nursing supervision, diagnostic evaluation, and therapeutic interventions delivered through coordinated multidisciplinary teams. Because inpatient care involves prolonged interaction between patients and the healthcare system, its quality strongly shapes patient perceptions of hospital performance.

The duration and efficiency of inpatient services are known to be major determinants of patient satisfaction, hospital throughput, and perceived service quality [7]. Delays occurring at the end of the hospitalization process, particularly during discharge, can significantly influence how patients evaluate their hospital experience. Inefficient discharge processes may result in extended waiting time for patients, dissatisfaction among families, and overcrowding in inpatient wards. From an operational perspective, delayed discharge also reduces bed availability for incoming patients, thereby affecting patient flow and decreasing hospital responsiveness to new admissions.

RSUD dr. Soebandi has a total capacity of 388 beds, of which 238 beds are located in the inpatient installation. Although the hospital has achieved relatively good performance on general inpatient indicators, internal business performance data from 2022 identified two major operational problems, both closely related to waiting time as a form of process waste.

The first issue concerns patient discharge waiting time. The average time required for patients to complete the discharge process still exceeds the hospital's service standard of less than two hours. Prolonged discharge time creates inefficiencies in bed utilization because incoming patients cannot be admitted promptly while beds remain occupied administratively. This condition leads to a suboptimal Turn Over Interval (TOI), reduces patient access to inpatient services, and may ultimately affect hospital productivity and service quality.

The second issue involves the administrative processing of inpatient insurance claims submitted to BPJS Kesehatan. The claim administration process frequently exceeds the maximum completion time of 2×24 hours, and the proportion of claim files considered complete and eligible for submission is only approximately 63.9%. Delays in claim processing may negatively influence hospital cash flow, disrupt financial planning, and weaken the effectiveness of institutional collaboration with the national insurer. Within the JKN system, administrative efficiency is therefore closely linked to institutional sustainability and service continuity [8].

Excessive waiting time in healthcare processes is widely recognized as a major form of waste. Waiting does not add value to patient care yet consumes time, resources, and institutional capacity. In healthcare management theory, waiting is categorized as one of the most critical non-value-added activities because it simultaneously reduces efficiency, increases costs, and lowers patient satisfaction. Therefore, reducing waiting time has become a key target of hospital quality improvement initiatives.

One management approach that has been widely adopted to address such inefficiencies is Lean Management, often referred to in healthcare settings as Lean Hospital Management. Lean focuses on identifying and eliminating waste, improving workflow integration, and ensuring that each

process step contributes value to the patient. Originally developed in the manufacturing sector, lean principles have increasingly been applied in healthcare systems worldwide due to their proven effectiveness in streamlining service delivery and optimizing resource utilization [9-11].

Lean implementation emphasizes process mapping, waste identification, standardization of procedures, and continuous improvement cycles. Through tools such as Value Stream Mapping, process flow analysis, and root-cause identification, Lean enables healthcare organizations to redesign workflows so that services can be delivered faster, more consistently, and with fewer unnecessary steps. Empirical studies have demonstrated that Lean interventions in hospitals can significantly reduce waiting time, shorten service cycles, improve documentation flow, and enhance overall operational efficiency [12]. For hospitals operating within insurance-based financing systems, these improvements can also contribute directly to better financial performance and sustainability.

Given the urgency of addressing waiting-time waste in both patient discharge processes and inpatient insurance claim administration, as well as the strong potential of Lean management to improve operational efficiency, it is necessary to examine how Lean implementation affects hospital service performance in real operational settings. Understanding this impact is particularly important for referral hospitals that handle large patient volumes and complex administrative processes.

Therefore, this study was conducted to analyze the impact of Lean management implementation on service performance outcomes in the inpatient installation of RSUD dr. Soebandi Jember. The research seeks to answer the following question: How does Lean management implementation influence service performance outcomes in the inpatient installation of RSUD dr. Soebandi Jember? Accordingly, the objective of this study is to analyze the impact of Lean implementation on service performance achievements in the inpatient installation of the hospital, particularly in relation to discharge efficiency and inpatient insurance claim administration.

METHODS

This study was conducted from 25 March 2024 to 30 October 2024 at the inpatient installation of RSUD dr. Soebandi, located in Jember, Indonesia. This study conducted in three steps, namely action research, quantitative study and qualitative study.

Action research design

The study employed an action research design [13, 14] integrated with a mixed-methods approach. Action research was selected because it enables direct researcher involvement in collaboration with inpatient personnel to analyze service problems and implement process improvements using lean principles. The design allowed iterative improvement cycles linking diagnosis, intervention, and evaluation within real service settings. The action research cycle consisted of four sequential stages.

1) Diagnosing action (25 March – 30 April 2024)
   In this phase, the researcher identified inefficiencies in inpatient discharge processes and insurance claim administration. Process observations were conducted to detect waste, and the current workflow was documented through the development of a Current State Value Stream Map (VSM). Baseline measurements of service duration were also recorded during this stage.
2) Planning action (1 May – 30 June 2024)
   Based on the diagnostic findings, Lean-based solutions were formulated collaboratively with hospital staff. This phase included identifying root causes of delays, redesigning workflow sequences, and constructing a Future State VSM representing the proposed improved process. Draft revisions of process flow and standard operating procedures were also prepared.
3) Taking action (1 July – 30 September 2024)
   During this stage, the proposed Lean interventions were implemented in the inpatient unit. Implementation included process standardization, workflow adjustments, and the introduction of revised operational procedures aimed at reducing waiting time and improving process integration.
4) Evaluating action (1 October – 30 October 2024)
   In the final stage, post-intervention measurements were conducted to evaluate the effectiveness of the implemented improvements. Service duration, process efficiency indicators, and workflow consistency were reassessed and compared with baseline conditions to determine performance changes.

Quantitative descriptive component

The quantitative component used a descriptive approach to measure operational efficiency before and after the intervention. The study population consisted of 933 inpatient cases during the research period. The sample size was calculated using the Lemeshow formula, resulting in 84 cases representing both discharge and claim administration processes. Samples were selected using purposive sampling based on relevance to the studied workflows.

The main variables measured quantitatively were: 1) discharge process duration; insurance claim administration duration; 3) lead Time, defined as total process completion time; and 4) Value-Added Ratio (VAR), calculated as the proportion of value-adding time relative to total process time. Time measurements were obtained using structured observation forms and hospital administrative records. Quantitative analysis was performed descriptively by comparing baseline and post-intervention values of Lead Time and VAR to determine efficiency improvements.

Qualitative component (downtime matrix approach)

The qualitative component focused on identifying process waste and understanding workflow inefficiencies. Waste identification was conducted using the **Downtime Matrix**, which classifies non-value-adding activities, delays, and bottlenecks within service processes.
Data were collected through: 1) direct observation of inpatient discharge and claim workflows; 2) semi-structured interviews with key informants, including nurses, administrative officers, and case managers; 3) document review of existing process flows and operational guidelines
Qualitative findings were used to: 1) identify categories and sources of waste; 2) support the construction of the current and future state maps; 3) inform the redesign of workflow sequences; dan 4) guide the formulation of revised process flows and new standard operating procedures. Qualitative analysis was conducted through process mapping, workflow comparison, and thematic interpretation of observed inefficiencies.

RESULTS

The general characteristics of respondents included in this study are presented in Table 1. This study involved 84 inpatient insurance cases observed during discharge and claim processes across four wards at RSUD dr. Soebandi, Jember. The largest proportion of respondents came from the Seruni ward (23 cases). Male patients constituted the majority of respondents (61.9%), with the highest proportion of male patients also found in the Seruni ward (78.26%).

Waste identification in the patient discharge process

Through direct observation and in-depth interviews, the researcher identified eight categories of Lean waste in the inpatient discharge process, namely defects, overproduction, waiting, non-utilized talent, transportation, inventory, motion, and extra-processing [1]. The identified waste and proposed improvement strategies are summarized in Table 2.

Table 1. Distribution of demographic characteristics of respondent by sex and inpatient ward

No	Ward	Sex		Surgical status	
		Male	Female	Surgical	Non-Surgical
1	Cateliya A	12 (57.14%)	9 (42.86%)	0 (0%)	21 (100%)
2	Cateliya B	4 (18.18)	18 (81.82)	22 (100%)	0 (0%)
3	Seruni	18 (78.26)	5 (21.74)	23 (100%)	0 (0%)
4	Anthurium	18 (100)	0 (0%)	0 (0%)	18 (100%)
	Total	52 (61,9%)	32 (38,1%)	45 (53,57%)	39 (46,43%)

Table 2. Waste identification and improvement proposals in the inpatient discharge process at RSUD dr. Soebandi

No	Waste type	Problem	Proposed solution
1	Defect	Incomplete medical records; remaining drugs left in ward; discharge prescriptions not in formulary; procedures not billed; incorrect follow-up schedule requiring repetition	Develop checklist for verification of medical records, prescriptions, and billing completeness
2	Overproduction	Premature or excessive photocopying of administrative files causing unnecessary accumulation	Adopt pull-based system and integrate administrative information system
3	Waiting	Average waiting time to leave ward 94.05 minutes, mainly due to pharmacy completion delays	Parallelize pharmacy and administrative processes; use transit room for discharged patients
4	Non-utilized talent	Patient families performing transportation tasks instead of receiving discharge education	Redistribute tasks to non-medical staff (pharmacy helpers)
5	Transportation	Non-value-added movement by families delivering prescriptions and documents	Centralized transport using assigned helpers
6	Inventory	Accumulation of unused drugs/equipment in wards requiring return processing (≈30 minutes)	Reduce ward stock and optimize medication use before discharge
7	Motion	Inefficient searching for documents or returned drugs	Implement 5S organization system
8	Extra-processing	Manual administrative steps such as printing and cashier verification	Digitalize billing and administrative verification; eliminate unnecessary printouts

Waste identification in BPJS claim processing

Based on Table 3, waste identification in the insurance claim process was also conducted through observation and in-depth interviews, revealing the same eight lean waste categories [1].

Table 3. Waste identification and improvement proposals in BPJS claim processing

No	Waste Type	Problem	Proposed Solution
1	Defect	Incomplete claim documents requiring rework	Mandatory electronic checklist or automated validation system
2	Overproduction	Excessive photocopying of claim documents	Shift to digital scanning and centralized storage
3	Waiting	Extremely long waiting time (avg. 620.71 minutes) due to batch processing and physical documents	Implement continuous flow submission after discharge
4	Non-utilized talent	Skilled staff performing repetitive manual tasks	Shift manual tasks to digital systems
5	Transportation	Unnecessary physical movement of claim files	Replace with digital upload system
6	Inventory	Accumulation of unprocessed claim files (WIP)	Apply Just-In-Time claim processing
7	Motion	Repetitive manual document handling	Implement digital claim filing
8	Extra-processing	Manual recap and copying activities	Automate via scanning and system download

Effectiveness of the patient discharge process

Discharge effectiveness was measured from the time the physician declared the patient fit for discharge until the patient left the ward (Table 4).

In the current state (pre-intervention), the discharge process initially involved multiple steps generating waiting waste, including prescription writing, record verification, billing checks, drug returns, prescription delivery to the dispensing unit, and waiting for patient pickup (Table 5).

In the future state (pre-intervention), after Lean implementation, including elimination of unnecessary transportation and integration of helper roles, substantial efficiency gains were observed (Table 6).

Table 4. Univariable analysis of discharge waiting time before and after intervention

Discharge time	Before	After
< 2 hours	0 (0%)	29 (34.52%)
2–3 hours	15 (17.86%)	32 (38.1%)
> 3 hours	69 (82.14%)	23 (27.38%)

Table 5. Pre-intervention VSM metrics

Performance Matrix	Time (minutes)	Percentage
Value-Added Time (VA)	77	–
Non-Value-Added Time (NVA)	85	–
Waiting Time	75	–
Lead Time (LT)	237	–
Value-Added Ratio (VAR)	–	32.49

Table 6. Post-intervention VSM metrics

Performance Matrix	Time (minutes)	Percentage
Value-Added Time (VA)	65	–
Non-Value-Added Time (NVA)	55	–
Waiting Time	25	–
Lead Time (LT)	145	–
Value-Added Ratio (VAR)	–	44.83

Effectiveness of BPJS claim processing

The time effectiveness of the BPJS claim file completion process was measured from the moment the patient was discharged from the hospital until the claim documents were fully submitted to the Claim Management Unit. This measurement reflects the total administrative processing duration required to ensure that inpatient claims are ready for verification and further processing.

Based on Table 7, prior to the intervention, the claim administration process consisted of multiple stages that relied heavily on physical documents and manual procedures. These included photocopying all claim files, manually compiling supporting documents to be duplicated, and physically submitting claim files to the administrative unit. Such a workflow required repeated handling of documents, movement between units, and multiple verification steps, all of which extended processing time and increased the likelihood of inefficiencies.

Based on Table 8, the intervention therefore focused on digital transformation of the claim workflow. The redesigned process included digital compilation of supporting documents for scanning, retrieval and downloading of required files from the hospital information system (SIM RS), systematic filing of claim records, and electronic uploading of claim files to the claim management unit.

Table 7. Pre-intervention VSM metrics

Performance Matrix	Time (minutes)	Percentage
Value-Added Time (VA)	82	–
Non-Value-Added Time (NVA)	84	–
Waiting Time	621	–
Lead Time (LT)	787	–
Value-Added Ratio (VAR)	–	10.42

The use of digital media substantially reduced waste associated with extra processing, such as repetitive photocopying, and transportation, including physical movement of documents between departments. this shift enabled a more streamlined and traceable workflow while improving process speed and reliability.

Table 8. Post-intervention VSM metrics

Performance Matrix	Time (minutes)	Percentage
Value-Added Time (VA)	16	–
Non-Value-Added Time (NVA)	14	–
Waiting Time	4	–
Lead Time (LT)	34	–
Value-Added Ratio (VAR)	–	47.06

Comparison before and after intervention

Based on Table 9, the total discharge Lead Time decreased by 92 minutes, while waiting time was reduced by 66.6%. The Value-Added Ratio improved from 32.49% to 44.83%, indicating substantial gains in process efficiency.

Based on Table 10, the claim processing lead time decreased dramatically, accompanied by a nearly fourfold increase in the Value-Added Ratio. This improvement reflects the restructuring of workflows, where previously non-value-adding activities (such as photocopying) were replaced by digital scanning and upload processes that contributed directly to the claim workflow.

Table 9. Comparison of lean metrics in discharge process

VSM metric	Pre-intervention	Post-intervention	Time difference	Percentage change
Value-added time	77 min	65 min	−12	−15.58
Non-value-added time	85 min	55 min	−30	−35.29
Waiting time	75 min	25 min	−50	−66.6
Lead time	237 min	145 min	−92	−38.81
Value-added ratio	32.49%	44.83%	+12.34%	+37.98

Table 10. Comparison of Lean metrics in claim processing

VSM metric	Pre-intervention	Post-intervention	Time difference	Percentage change
Value-added time	82 min	16 min	−66	−80.48
Non-value-added time	84 min	14 min	−70	−83.3
Waiting time	621 min	4 min	−617	−99.35
Lead time	787 min	34 min	−693	−88.05
Value-added ratio	10.42%	47.06%	+36.64%	+332.44

DISCUSSION

Improvement in discharge time efficiency (lead time and VAR)

The findings demonstrate that the implementation of lean management, particularly through workflow redesign and staff role reallocation, produced a significant improvement in the effectiveness of the patient discharge process. Prior to the intervention, the discharge process was highly inefficient. The average lead time reached 250.19 minutes, far exceeding the hospital service standard of less than 120 minutes. The prolonged duration was primarily driven by excessive waiting time (94.05 minutes) and other non–value-added activities. Several steps required physical movement by patients or their families to complete administrative procedures, including delivering prescriptions to the pharmacy unit (UDD). These activities contributed substantially to waste in the form of Transportation and Waiting. As a consequence, none of the patients (0%) were discharged within the targeted time of under two hours. This finding is consistent with earlier studies emphasizing that waiting time is a major determinant of patient dissatisfaction and an indicator of poor service quality [15].

The lean intervention focused on eliminating the dominant forms of waste, particularly Waiting and Transportation, through process restructuring and redistribution of responsibilities. Two principal improvement strategies were implemented. First, parallelization of pharmacy and administrative processes was introduced. Previously, discharge completion depended sequentially on pharmacy processes such as prescription preparation and drug returns, which created substantial idle time. By enabling overlapping activities, the hospital reduced dependency between stages and shortened the overall process duration. Second, task redistribution to address non-utilized talent was implemented. Responsibilities for transporting prescriptions and returned medications were transferred from patients' families to designated support staff (pharmacy helpers/pekarya). This eliminated unnecessary patient movement and removed a major source of non–value-added transportation waste.

Following implementation of these improvements, the discharge process demonstrated substantial gains in efficiency. The average lead time declined to 129.50 minutes, representing a 48.3% reduction from the baseline. Simultaneously, the VAR increased markedly from 29.41% to 50.39%, indicating that a significantly larger proportion of process time was now devoted to value-generating activities.

The most decisive contributor to this improvement was the sharp reduction in waiting time, which fell by 78.60%, from 94.05 minutes to 20.13 minutes. This result aligns with previous Lean Hospital studies showing that process flow optimization is highly effective in reducing waiting time and enhancing operational efficiency in healthcare settings [16].

The functional impact of this improvement is also evident in service performance indicators. After the intervention, 21.61% of patients were discharged within the target time of under two hours, whereas previously none met the standard. This outcome confirms that Lean implementation not only improved internal efficiency metrics but also translated into measurable improvements in service responsiveness.

Improvement in value added ratio and quality target achievement

The increase in efficiency was also reflected in Lean's key performance indicator, the Value Added Ratio (VAR). The rise from 29.41% to 50.39% represents an improvement of more than 71%, demonstrating that the intervention successfully eliminated or reduced a substantial portion of non–value-added activities in the discharge workflow. This improvement indicates that the redesigned discharge process is structurally more efficient, with fewer redundant movements, reduced idle time, and a more balanced distribution of workload across units. From a quality management perspective, the increase in VAR signifies that the hospital has moved closer to a patient-centered and process-oriented service model, where most of the service duration contributes directly to patient value.

Improvement in claim administration efficiency (lead time and VAR)

Lean implementation targeting the digital transformation of the inpatient BPJS claim administration process also demonstrated a substantial positive effect. Before the intervention, the claim completion process was extremely inefficient. The average Lead Time reached 787 minutes, while the VAR (10.42%), indicating that almost the entire process consisted of non–value-added activities. Waiting time alone accounted for 621 minutes, reflecting severe process delays. These delays were primarily caused by batch processing, where documents were accumulated before being processed, and by extra processing activities, particularly photocopying, which added no value to claim approval. The manual, paper-based workflow also created vulnerabilities to defects, such as incomplete documentation, which required repeated corrections and rework. These findings are consistent with previous studies, which identified document incompleteness and administrative inefficiencies as key causes of claim returns [17-20].

The Lean intervention transformed the process by shifting from manual, photocopy-based administration to a digital workflow based on scanning and uploading documents. This digitalization fundamentally altered the process structure and eliminated several categories of waste simultaneously. Following implementation, the claim process experienced a dramatic efficiency improvement. The average Lead Time decreased

to 549.55 minutes, while the VAR rose sharply to approximately 47–49%. The large increase in VAR indicates that most previously redundant activities were successfully removed and replaced with more efficient digital operations.

Digitalization directly addressed multiple types of waste. It reduced Transportation waste by eliminating physical document movement between units, removed Extra Processing waste associated with photocopying and manual recapitulation, and minimized Inventory waste in the form of document accumulation. By strengthening information flow and enabling faster access to required documents, the hospital was able to accelerate claim processing and improve internal business performance.

Efficiency improvement through digitalization (VAR)

The most striking result of the intervention was the dramatic rise in VAR from 10.42% to about 47%, representing an increase exceeding 300%. This improvement confirms that Lean solutions successfully restructured the claim administration process into a more streamlined and value-oriented system. Activities that were previously classified as waste, such as physical copying and repetitive manual handling, were replaced by efficient digital processes including electronic scanning, uploading, and retrieval through the hospital information system. These activities are now categorized as value-added because they directly contribute to claim completeness and approval readiness.

The operational impact of digitalization is also visible in output indicators. The number of claim files completed within 24 hours increased substantially from 15 cases to 75 cases, demonstrating a clear improvement in administrative responsiveness. Overall, these findings confirm that lean-based digital transformation can significantly enhance both efficiency and service quality in hospital claim management systems [21].

CONCLUSION

Overall, lean management implemented through an action research approach significantly improved service performance in the inpatient unit of RSD dr. Soebandi Jember. Lean tools effectively eliminated critical waste—especially waiting, transportation, and excess processing—thereby improving operational efficiency and service quality in the hospital setting.

Ethical consideration, competing interest and source of funding

-This study adhered to ethical principles for health service research. Approval to conduct the study was obtained from hospital management prior to data collection. Participation of staff informants was voluntary, and all interview information was treated confidentially. Patient data used for process measurement were anonymized and analyzed in aggregate form to ensure privacy protection. The study was conducted in accordance with institutional ethical standards governing research in healthcare settings.
-There is no conflict of interest related to this publication.
-Source of funding is authors.

REFERENCES

1. Asamoah D. The role of health services regulation in healthcare delivery. Electr J Med Dent Stud. 2025;14(1):42-48.
2. Elendu C, Elendu TC, Elendu ID. 5G-enabled smart hospitals: Innovations in patient care and facility management. Medicine. 2024;103(20):e38239.
3. Firoozi AA, Firoozi AA. Navigating the complex landscape of healthcare innovation: strategies for overcoming design and implementation challenges. Transformative Design in Healthcare. 2025;11(19):379-439.
4. Asamoah D. The role of health services regulation in healthcare delivery. Electr J Med Dent Stud. 2025;14(1):42-48.
5. Kruk ME, Gage AD, Arsenault C, Jordan K, Leslie HH, Roder-DeWan S, Adeyi O, Barker P, Daelmans B, Doubova SV, English M. High-quality health systems in the Sustainable Development Goals era: time for a revolution. The Lancet Global Health. 2018 Nov 1;6(11):e1196-252.
6. Andrieiev I, Trehub D, Khatsko K, Sokolovska I, Ganzhiy I. Strategic decisions in healthcare: Impact on goals and enhancing service quality for organizational success. Amazonia Investiga. 2023 Sep 30;12(69):325-35.
7. Mahmud A. Analisis kepuasan pasien rawat inap peserta BPJS kesehatan di RSI Ar-Rasyid Palembang. J Ilmu Adm & Stud Kebij. 2022;5(1):23–36.
8. Paramita R. Penerapan lean pada redesain proses pelayanan rawat jalan rumah sakit mata. J Manajerial. 2020;19(1):31–41.
9. Третяк В. Implementing lean management principles to optimize healthcare facility operations. Економіка та Суспільство. 2024 Apr 29(62).
10. Ike PN, Ogbuefi E, Nnabueze SB, Olatunde-Thorpe J, Aifuwa SE, Oshoba TO, Akokodaripon D. Lean supply chain practices improving operational efficiency, reducing waste, and enhancing organizational competitiveness globally. Journal of Frontiers in Multidisciplinary Research. 2022 Jul;3(2):182-92.
11. Pranata A. Optimizing health service delivery: addressing non-value added activities through Lean Six Sigma. Indonesia Accounting Research Journal. 2024 Mar 30;11(3):173-83.
12. Dewi PK. Analisis alur proses penerimaan pasien rawat inap di Rumah Sakit "X" tahun 2015 dengan pendekatan lean hospital. J Adm Rumah Sakit Indones. 2015;2(1):1–16.
13. Nugroho HS, Jeniawaty S, Karno K, Badiah A, Susilaningrum R, Al Mamun A. Action research as an ideal method for introducing research products in the field of public health. Health Notions. 2024 Feb 28;8(2):49-50.
14. Nugroho HS, Ibrahim I, Suparji S, Sunarto S, Hardjito K, Sillehu S, Selasa P, Budiono A, Badiah A, Irianti E, Suiraoka IP. Action research sebagai pendekatan untuk meningkatkan kualitas program kesehatan. Global Health Science. 2021 Jun 30;6(2):67-74.
15. Ratnaningrum A, Imronudin, Sutrisna E. Pengaruh implementasi lean management terhadap kepuasan pasien di IGD RSX. 2023;17(4):2533–48.
16. Safitri D, Rahmadani R, Hartono B. Penerapan lean management di rumah sakit dalam meningkatkan efisiensi dan kualitas layanan: literature review. J Ilmu Kesehat Umum. 2025;3(2018):183–95.
17. Donneli E. Insurance claim settlement delays and their consequences for service quality and financial management. Journal of Economic, Business & Accounting Research. 2026 Jan 26;3(2):131-46.
18. Shahbodaghi A, Moghaddasi H, Asadi F, Hosseini A. Documentation errors and deficiencies in medical records: a systematic review. Journal of Health Management. 2024 Apr;26(2):351-68.
19. Friskasari EL, Suryawati C, Setyawan H. The implementation of lean management in accelerating health insurance claim process at hospitals. JMMR (Jurnal Medicoeticolegal dan Manajemen Rumah Sakit). 2019 Dec 6;8(3):198-209.
20. Septian IW, Nurjayanti D. Factors Causing Delays in BPJS Health Inpatient Claims at Dr. Harjono S Regional General Hospital in Ponorogo Regency. Jurnal Rekam Medis dan Informasi Kesehatan Indonesia. 2025 Jun 30;4(2):46-54.
21. Wang J, Lv H, Chen M, Liu C, Ren W, Jiang H, Zhang L. A systematic review of Lean implementation in hospitals: Impact on efficiency, quality, cost, and satisfaction. International Journal of Health Policy and Management. 2025 Aug 26;14:8974.