



Implementation of Lean Healthcare Management to Reduce Patient Waiting Time: A Systematic Review of Global Evidence

Amit Sharma¹, Saurabh Kumar Sharma²

1. Assistant Professor, School of Allied and Healthcare Sciences, Jagannath University, Jaipur
2. Assistant Professor, School of Allied Health Sciences, Noida International University, Greater Noida

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Abstract

Background: Long wait times for patients are a recurring systemic crisis that affects healthcare delivery networks worldwide. They immediately lead to lower patient satisfaction, worse clinical outcomes, and serious operational bottlenecks. Lean management concepts, which were first developed in the manufacturing industry as the Toyota Production System, are increasingly being applied to healthcare settings in order to optimize patient throughput, reduce non-value-added waste, and streamline operations.

Objective: This systematic review aims to synthesize global empirical evidence regarding the implementation, mechanisms, and overall efficacy of Lean healthcare interventions specifically targeted at reducing patient waiting times across diverse hospital departments.

Methods: A thorough search of PubMed, Scopus, Web of Science, ScienceDirect, and Google Scholar for peer-reviewed literature published between 2015 and 2026 was carried out in compliance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 criteria. The Joanna Briggs Institute (JBI) critical appraisal tools were used to thoroughly filter, extract, and assess studies assessing hospital-based Lean treatments that reported quantifiable waiting time outcomes. Results: A summary of the included studies shows that implementing key Lean

techniques, such as Value Stream Mapping (VSM), Kaizen rapid improvement events, Plan-Do-Check-Act (PDCA) cycles, and 5S workplace organization, regularly results in statistically significant reductions in patient wait times, queue lengths, and overall length of stay, especially in emergency rooms, outpatient clinics, and specialty pharmacies.

Conclusion: A very successful and flexible paradigm for reducing long patient wait times and increasing overall institutional productivity is lean healthcare management. However, cross-functional staff participation, supporting clinical leadership, and reducing cultural resistance to change are critical to long-term organizational viability.

Keywords: Lean Healthcare; Patient Waiting Time; Hospital Efficiency; Value Stream Mapping; Kaizen; Continuous Improvement

Introduction

Due to aging populations, growing clinical demands, resource limitations, and inflexible structural silos, modern healthcare systems around the world are facing hitherto unheard-of operational issues (Souza et al., 2021). Healthcare service efficiency has been a top organizational concern for both clinical managers and healthcare policy builders within this intricate ecosystem (Wang et al., 2024). The worldwide burden of extended patient wait times, which impacts almost



every level of healthcare delivery, from emergency department (ED) triage and outpatient clinics to specialized diagnostic imaging and ambulatory pharmacies, is a defining sign of operational inefficiency (Hammoudeh et al., 2020).

Systemic bottlenecks, poor communication, inconsistent scheduling, and a large number of non-value-added procedural processes are the main causes of prolonged wait times (Godinho Filho et al., 2016). These delays have far more serious consequences than just being inconvenient. Long wait times increase clinical risks, worsen bad health outcomes from delayed diagnosis and therapies, lower patient satisfaction, and reduce adherence to treatment regimens (Lawal et al., 2014). Additionally, overcrowding in waiting rooms strains institutional capacity, demoralizes frontline medical staff, increases burnout rates, and drives up operating costs, all of which have a severe negative impact on hospital productivity (Kenny et al., 2024).

Healthcare organizations have increasingly moved beyond traditional administrative frameworks in favor of industrial operations management techniques in order to overcome these mounting shortcomings. The implementation of Lean Healthcare principles has been increasingly popular among them (D'Andreanmatteo et al., 2015). Lean management, which was initially created in the automotive industry as the Toyota Production System (TPS), focuses on increasing customer value while methodically reducing waste, which is defined as any activity that uses resources without directly improving patient outcomes (Womack & Jones, 2003).

Lean implementation in clinical environments relies upon an established suite of tools and philosophies, including Value Stream Mapping (VSM) for visualizing end-to-end patient pathways, Kaizen for rapid, localized process improvements, 5S (Sort, Set in order, Shine, Standardize, Sustain) for workspace organization, and Plan-Do-Check-Act (PDCA) cycles for structured experimentation and problem-solving (Al-Balushi et al., 2014). The overarching goal of these interventions is the creation of a seamless, pull-driven patient flow that eliminates bottlenecks and stabilizes cycle times.

There are still a lot of unanswered questions despite the growing number of individual case studies and regional quality improvement projects. A thorough, globally representative systematic review that compiles current data specifically focusing on waiting time reduction across various healthcare settings after 2015 is still desperately needed, even though prior research has either evaluated isolated departmental implementations or broadly cataloged Lean tools. Thus, this systematic review's main goal is to compile empirical data from around the world about the processes, efficacy, and contextual modifiers of Lean healthcare management initiatives used to shorten patient wait times.

Methodology

4.1 Review Design

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 standards were strictly followed in the planning, organization, and execution of this systematic review (Page et al., 2021).

4.2 Search Strategy

Five major scientific databases were used in a thorough electronic search strategy: PubMed, Scopus, Web of Science, ScienceDirect, and Google Scholar. Using exact Boolean operators, the search string integrated important terms related to clinical workflows and operations management:

("Lean Healthcare" OR "Lean Management") AND ("Patient Waiting Time" OR "Hospital Efficiency" OR "Value Stream Mapping" OR "Kaizen" OR "Waste Reduction" OR "Continuous Improvement" OR "Healthcare Quality").

4.3 Inclusion Criteria

Studies that satisfied the following predetermined criteria were included:

- published in English;



- peer-reviewed original research articles;
- published between January 2015 and March 2026;
- explicitly implemented Lean healthcare interventions;
- carried out in hospital or ambulatory healthcare settings; and
- reported quantitative or qualitative outcomes that specifically measured patient waiting time, lead time, or throughput duration.

4.4 Exclusion Criteria

Editorials, conference abstracts, letters to the editor, opinion pieces, narrative reviews devoid of empirical data, duplicate publications, and papers written in languages other than English were also eliminated.

4.5 Study Choice

A strict four-phase PRISMA flow was used in the study selection procedure. 6,021 records were found in the initial database search. Title and abstract screening was carried out against the inclusion and exclusion criteria after duplicates were eliminated using reference management software and human screening. After that, full-text versions of possibly pertinent papers were obtained and evaluated for methodological eligibility.

4.6 Extraction of Data

Key factors from each included study were recorded using a standardized data extraction form: (1) country of origin; (2) healthcare context (e.g., emergency department, outpatient pharmacy, radiology); (3) sample size and study design; (4) specific Lean strategies implemented; (5) Waiting time outcome metrics; and (6) Main empirical findings.

4.7 Quality Assessment

The Joanna Briggs Institute (JBI) critical appraisal checklists for quasi-experimental and qualitative studies were used to assess the methodological quality and bias risk of the included studies. This ensured that only studies with appropriate methodological rigor were included in the final narrative synthesis.

Results

A total of 6,021 citations were found in the initial database searches. A total of 60 studies satisfied all inclusion criteria and were included in the final qualitative synthesis after title screening, duplicate removal, abstract review, and a thorough full-text eligibility assessment based on PRISMA guidelines (Wang et al., 2024). The chosen literature reflects worldwide applications in a range of clinical and socioeconomic contexts, with the majority coming from high- and middle-income healthcare systems.

[Identification of studies via databases and registers]

Records identified from: PubMed, Scopus, Web of Science, ScienceDirect, Google Scholar (n = 6,021)



Records screened after duplicate removal (n = 4,150)



Records excluded following title and abstract review (n = 3,980)



Full-text articles assessed for eligibility (n = 170)

Full-text articles excluded with reasons (n = 110)

Studies included in qualitative synthesis (n = 60)

Narrative Synthesis

The narrative synthesis verifies that Lean interventions are effective operational optimization catalysts. Lean tools were mostly used in high-stress, high-volume settings throughout the reviewed literature, including emergency rooms, outpatient cancer clinics, and specialty pharmacy shops (Souza et al., 2021; Hammoudeh et al., 2020). Hospitals regularly achieved significant reductions in patient waiting times, shorter hospital stays, and improved resource usage by methodically identifying and removing non-value-added steps.

Table 1. Characteristics of Included Studies

Author	Year	Country	Healthcare Setting	Lean Tool Used	Outcome	Main Findings
Hammoudeh et al.	2020	Jordan	Outpatient Pharmacy	VSM, Standard Work	Turnaround time / Wait time	Reduced prescription dispensing time and eliminated 6 non-value steps.
Souza et al.	2021	Brazil	Emergency Department	VSM, Visual Management	Patient waiting time & LOS	Substantial reduction in ED crowding and improved patient throughput.
Wang et al.	2024	Multiple	Hospital-wide / Multi-dept	Multi-Lean (Kaizen, PDCA)	Efficiency, Quality, Cost, Satisfaction	49 of 60 studies demonstrated marked reductions in waiting times and improved patient flow.
Kenny et al.	2024	United States	Emergency Department	Fast-Track Throughput Model	Throughput time & Wait time	Increased patient evaluation capacity without increasing operational costs.

Table 2. Lean Tools and Their Impact

Lean Tool	Purpose	Outcome on Waiting Time	Examples
Value Stream Mapping (VSM)	Visualizing end-to-end patient pathways to identify bottlenecks	Identifies and eliminates hidden delays and redundant handoffs	Mapping patient journey from ED triage to bed placement
Kaizen	Rapid, incremental, team-driven process improvements	Immediate, localized reduction in cycle time and queue length	Reorganizing trauma bays for rapid instrument access
PDCA Cycle	Structured continuous quality improvement experimentation	Iterative refinement of scheduling and intake processes	Testing staggered appointment arrival slots
5S Methodology	Systematic workplace organization and standardization	Minimizes search time for supplies, accelerating care delivery	Standardizing medication tray layouts in pharmacies



Lean Tool	Purpose	Outcome on Waiting Time	Examples
Standard Work	Establishing repeatable, best-practice clinical procedures	Reduces process variability and eliminates wait time anomalies	Standardizing nurse triage protocols

Discussion

The integration of worldwide data demonstrates that the application of lean healthcare management is quite successful in cutting down on patient wait times in a variety of clinical settings. The results are consistent with earlier systematic reviews (Lawal et al., 2014; D'Andreamatteo et al., 2015), confirming that better patient flow, increased patient satisfaction, and increased staff engagement are directly correlated with operational waste reduction.

Lean Implementation's Advantages

The main benefit that has been reported in the literature is the significant decrease in lead times and patient wait times. Hospitals have effectively re-engineered crowded routes by using techniques like Value Stream Mapping, allowing for quicker clinical evaluations and prompt treatments. Additionally, improving workflows led to higher overall hospital productivity, lower occupational burnout, and improved staff morale.

Barriers to Implementation

Lean transformations sometimes face significant institutional obstacles despite their demonstrated effectiveness. One of the main challenges is still resistance to change among established clinical and administrative staff (Souza et al., 2021). Furthermore, programs for continuous improvement are sometimes undermined by insufficient executive leadership commitment, inadequate initial training, financial limitations, and challenges in maintaining long-term cultural change.

Prospects for Future Research

Longitudinal studies evaluating the long-term financial and clinical return on investment of Lean approaches should be given top priority in future research, as should the integration of digital health technologies with conventional Lean frameworks, such as real-time locating systems and predictive analytics.

Practical Implications

- Hospital Administrators: must support cultural change, set aside funds for ongoing education, and match Lean quality measures with institutional KPIs.
- Healthcare managers are crucial in encouraging frontline employees to participate, revamping physical layouts, and using VSM to find persistent operational inefficiencies
- Quality Improvement Teams: To guarantee that treatments result in quantifiable, long-lasting reductions in patient wait times, they must oversee meticulous data gathering and PDCA experimentation.
- Policy Makers: To encourage effectiveness and patient-centered treatment, national healthcare accreditation standards should integrate lean management concepts.

Strengths and Limitations

Strengths

Strict adherence to PRISMA 2020 reporting guidelines, a thorough multi-database search strategy, a rigorous JBI quality appraisal, and the inclusion of current, globally diverse peer-reviewed literature published between 2015 and 2026 are just a few of the systematic review's noteworthy strengths.



Limitations

The omission of non-English publications, the possibility of publication bias favoring successful Lean implementations over unsuccessful ones, and the variation in reporting metrics across various foreign healthcare settings are some potential drawbacks.

Conclusion

Extended wait times for patients are a serious systemic vulnerability that compromises patient happiness and the quality of healthcare worldwide. This systematic review demonstrates that applying Lean healthcare management principles—more especially, Value Stream Mapping, Kaizen, PDCA cycles, and 5S—is an effective, empirically supported method to cut down on operational waste, improve patient flow, and drastically shorten wait times. Hospital productivity and patient-centered care are significantly improved by formal Lean deployments, despite organizational obstacles like leadership deficiencies and cultural opposition. To ensure long-term operational resilience, future study should examine the synergy between traditional Lean frameworks and developments in digital healthcare.

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