

# Lean Thinking in Healthcare: A Walker and Avant Concept Analysis

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## Abstract

**Background:** This study investigated the application of lean thinking in healthcare settings using Walker and Avant's eight-step concept analysis method to gain a comprehensive understanding of how lean thinking is implemented in various healthcare contexts, both theoretically and practically.

**Methods:** The study utilized Walker and Avant's eight-step concept analysis method to analyze the concept of lean thinking in healthcare. This systematic approach allowed for a thorough examination and exploration of applying the principles of lean thinking in healthcare settings.

**Results:** The analysis provided valuable insights into the implementation of lean thinking in healthcare, making significant contributions to both theoretical development and practical application in healthcare contexts. The research emphasizes the importance of adopting lean thinking to enhance efficiency and effectiveness in healthcare delivery.

**Conclusion:** The findings of this study underscored the significance of lean thinking in healthcare and its potential to improve healthcare delivery systems. Future research directions and potential empirical referents, such as patient satisfaction, access to services, and healthcare service quality, offer valuable insights for further enhancing the implementation of lean thinking principles. Moreover, the perspectives and novel insights uncovered during the analysis provide a tantalizing glimpse of the original contributions it offers to the field.

**Keywords:** Lean thinking, Healthcare delivery, Process improvement, Continuous improvement, Healthcare quality

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## Introduction

Lean thinking is a systematic approach to management and problem-solving that aims to eliminate waste and maximize value for the customer (1). Originally developed within the manufacturing industry, lean thinking has since been embraced by various sectors, including healthcare, software development, and service provision (2). At its core, lean thinking emphasizes the identification and elimination of non-value-added activities, such as overproduction, excess inventory, unnecessary movement, and defects (3). By streamlining processes, optimizing resources, and fostering a culture of continuous improvement, lean thinking enables organizations to deliver products and services more efficiently, improve quality, reduce lead times, and enhance customer satisfaction. It encourages a mindset focused on value creation, waste reduction, and the pursuit of perfection, resulting in increased productivity, profitability, and competitive advantage (4). Lean thinking is more than just a set of principles; it represents a management philosophy that prioritizes waste elimination, continuous improvement, and value creation

for customers. Its principles have been successfully applied across various industries, including manufacturing, healthcare, and software development. By adopting lean practices, organizations can streamline processes, reduce costs, improve efficiency, and enhance customer satisfaction (3). Furthermore, lean thinking fosters a culture of continuous learning, problem-solving, and employee engagement, ultimately leading to sustainable growth and competitive advantage (5).

In the healthcare sector, lean thinking aims to improve quality, patient safety, and efficiency (5). Lean thinking plays a vital role in the healthcare sector by striving to enhance quality, patient safety, and efficiency. The necessity for lean thinking in healthcare stems from a multitude of challenges, including mounting cost pressures, subpar quality of care, and the imperative to achieve more with limited resources (6). Numerous studies have extensively examined the application of lean thinking in healthcare, shedding light on its potential to minimize waste and enhance the efficiency of patient processes (7). By employing lean principles, healthcare organizations



have the opportunity to streamline workflows, eliminate unnecessary steps, reduce waiting times, and enhance overall patient experience. However, despite the growing body of knowledge, further research is warranted to comprehend the optimal sequence for implementing lean in various healthcare departments and to evaluate the suitability and effectiveness of different lean tools and techniques in diverse healthcare settings (8). A deeper understanding of these aspects will enable healthcare professionals to tailor lean strategies to specific contexts, ensuring maximum impact and sustainable improvements in patient care and organizational performance (9).

Even though lean thinking has been applied in healthcare to reduce waste and improve the flow efficiency of patient processes (10), there is limited research on the sequence of implementing lean in different departments and the applicability of lean tools in various healthcare settings. This study aims to fill this gap by mapping the current state of lean in healthcare and identifying future research directions. Using Walker and Avant's eight-step method, the study analyzes the concept of lean thinking in healthcare to develop a comprehensive understanding of its application. The findings will contribute to both theoretical development and practical implementation of lean thinking principles in healthcare, addressing the need for a more thorough understanding of its implementation across different healthcare settings.

## Methods

### Study design

To systematically explore and develop the concept of lean thinking in a healthcare setting, the present study adopted the well-established concept analysis methodology devised by Walker and Avant. This proven eight-step framework facilitated a nuanced clarification and detailed articulation of the lean thinking concept. Through critical examination and synthesis, the methodology guided the research toward a comprehensive comprehension and practical application of lean thinking for healthcare professionals and policymakers.

### Concept selection

The focal point of analysis, "lean thinking", was selected in light of its escalating integration and importance in the healthcare industry. Its potential to streamline healthcare delivery, augment organizational efficiency, and ultimately improve patient care presents a compelling case for rigorous analysis. This study endeavored to delineate the conceptual boundaries of lean thinking, propose a refined definition conducive to healthcare, and elucidate how practitioners can pragmatically embody lean thinking in healthcare settings.

### Purpose of analysis

This analysis was instigated with a four-pronged objective

designed to unpack and illuminate the concept of lean thinking within healthcare: (1) to catalog and clarify the defining attributes that characterize lean thinking; (2) to demarcate it from other related efficiency-improvement strategies; (3) to devise a systematic framework to guide healthcare professionals in implementing lean thinking principles; and (4) to examine and shed light on the implications of lean thinking for patient care as well as hospital and health system operations.

### Data sources

A thorough and systematic literature review formed the foundation of the research, aimed at capturing the multidimensional utility of lean thinking. The review searched key databases including PubMed, Scopus, and Cochrane Library, focusing on literature from the past five years to ensure timeliness and relevance. The studies specifically centered on the philosophy, methodologies, application, and resultant outcomes of lean thinking in healthcare settings were selected, yielding a rich body of information as the foundation for concept analysis. A basic example of search syntax in PubMed, ISI Web of Science, and Scopus databases for articles related to lean thinking in the healthcare setting is provided. The search strategy is presented in Table 1.

### Defining attributes

To distill the essence of lean thinking within healthcare, we engaged in a methodical deconstruction of the literature to ascertain the core attributes of the concept. This process was both inductive and iterative, involving constant comparative methods to ensure that the defining attributes derived were robust, representative, and reflective of lean thinking as it applies in real-world healthcare contexts.

### Model case

A pinnacle of the analysis is the development of a model case study, meticulously devised to capture and convey all the defining attributes of lean thinking within a healthcare context. This archetypical instance serves as a blueprint, offering readers an illustrative and concrete understanding of the concept as it occurs in practice.

**Table 1.** Search strategy used in the literature review

Database	Syntax
PubMed	("lean thinking" OR "lean management" OR "lean healthcare") AND ("healthcare setting" OR "hospital" OR "clinic" OR "healthcare facility" OR "medical practice")
Web of Science	TS=("lean thinking" OR "lean management" OR "lean healthcare") AND TS=("healthcare setting" OR "hospital" OR "clinic" OR "healthcare facility" OR "medical practice")
Scopus	(TITLE-ABS-KEY("lean thinking" OR "lean management" OR "lean healthcare") AND TITLE-ABS-KEY("healthcare setting" OR "hospital" OR "clinic" OR "healthcare facility" OR "medical practice"))

### Alternative cases

To foster a more lucid understanding and stronger conceptualization, we examined a spectrum of cases—borderline, related, and contrary. This comparative analysis accentuated the core attributes of lean thinking by drawing a vivid picture of what the concept is and, equally important, what it is not, thereby setting clear conceptual boundaries.

### Antecedents and consequences

This study identified and scrutinized the pivotal antecedent factors that precipitate the adoption of lean thinking within healthcare environments and the subsequent consequences of its implementation. This critical inquiry included examining both the promoters and inhibitors of lean thinking adoption as well as the tangible and intangible outcomes influencing the healthcare landscape following the application of lean principles.

### Empirical referents

To move from the theoretical to the tangible, the analysis was concluded by proposing empirical referents. These measurable indicators enable the operationalization and empirical evaluation of lean thinking in actual healthcare practices, setting a standard for future research and application.

### Ethical considerations

This study, grounded in an examination of existing literature, did not involve human participants; therefore, ethical concerns commonly associated with research involving human participants, such as privacy, consent, and risk, were not pertinent. The study relied solely on the analysis of publicly available literature and previously

published academic work; thus, the requirement for institutional review board approval was circumvented.

### Results

The review of the literature led to the identification of 16 articles related to the topic (Table 2). The eight stages of Walker and Avant's method for analyzing the concept of "lean thinking in healthcare settings" are described in the following sections.

### Concept selection

"Lean thinking in healthcare settings" was selected as the concept to develop. Lean thinking is a systematic and strategic approach that aims to streamline processes, eliminate waste, and maximize value. It has gained recognition in various industries, including healthcare. In this context, lean thinking can enhance efficiency by identifying and eliminating non-value-added activities, emphasizing patient-centeredness, and improving patient outcomes and safety. It also leads to cost savings and financial sustainability by optimizing resource utilization. The significance of this concept lies in its relevance to ongoing efforts to improve healthcare delivery and outcomes. Although the concept of lean thinking in healthcare is relatively new and has not yet been deeply implemented, initial experiences from lean initiatives in healthcare have been positive, indicating a readiness for further implementation. However, adopting lean thinking requires a shift in mindset and a cultural transformation that fosters innovation, collaboration, and accountability among healthcare professionals.

### Purpose of Analysis

The purpose of the analysis was to provide a comprehensive

**Table 2.** Articles related to the topic

Authors	Title
Scheffer and Rubenfeld (11)	A consensus statement on critical thinking in nursing
Tanner (12)	Thinking like a nurse: a research-based model of clinical judgment in nursing
White (13)	"Lean" thinking may cut NHS inefficiencies and improves patient care
Ballé and Régnier (14)	Lean as a learning system in a hospital ward
Cooper and Mohabeersingh (15)	Lean thinking in a healthcare system – innovative roles
Kim and Spahlinger (16)	Creating value in health care: The case for Lean Thinking
Kim and Spahlinger (17)	Implementation of lean thinking: one health system's journey
Folinas and Faruna (18)	Implementing lean thinking paradigm practices in medical set up
Johnson et al (19)	From Toyota to the bedside: nurses can lead the lean way in health care reform
Toussaint and Berry (20)	The promise of Lean in health care
Aggogeri (21)	Lean thinking to change healthcare organisations: a case study to reduce waste and redesign services
Andersen et al (22)	Lean thinking in hospitals: is there a cure for the absence of evidence? A systematic review of reviews
Li and Johnson (23)	Lean thinking to mind the gap in healthcare management
Anderson et al (24)	Lean Thinking for Primary Care
Gadea-Company and Budía (25)	Lean Methodology and Nursing
Gemmel et al (26)	Problem-solving behaviour of nurses in a lean environment

understanding of lean thinking in healthcare settings and its potential benefits for improving patient care and organizational efficiency. The analysis aims to identify and analyze the characteristics of leadership and management associated with a successful adaptation of lean thinking in healthcare. It provides insights into the key success factors that contribute to the effective implementation of lean thinking in healthcare settings, the skills and capabilities of leaders and managers for this process, the relationship between lean management practices and financial performance, the application of lean thinking in process improvement, and the concept of goal-oriented care as an alternative approach for providing care to multimorbid patients in primary care settings. The study also aims to help organizations learn and educate the skills required for lean transformation in healthcare organizations.

### **Application of the concept**

The application of lean thinking in healthcare settings can significantly improve patient care and organizational efficiency. By applying the concept of goal-oriented care, a more patient-centered approach can be provided in primary care settings, leading to better patient outcomes and reduced fragmentation of care. Lean thinking can also be applied to process improvement, focusing on defining value from the patient's perspective, mapping value streams, and eliminating waste to create continuous flow, thereby enhancing the efficiency and effectiveness of patient care. Moreover, the implementation of selected lean management practices, such as Performance Measurement Systems and Total Productive Maintenance, has been found to have a significant relationship with financial performance in healthcare settings. Analyzing the skills and capabilities of leaders and managers in healthcare settings can help organizations identify the essential skills required for implementing lean thinking, leading to better decision-making, improved organizational learning, and enhanced overall performance. By applying these concepts, organizations can learn and educate the skills required for lean transformation, ultimately leading to improved patient care and organizational efficiency.

### **Determining the defining attributes**

The defining attributes of lean thinking in the healthcare setting encompass several key elements. Firstly, the dynamic and iterative process of goal-oriented care, which includes goal elicitation, goal setting, and goal evaluation, is essential. This process is rooted in the patient's context and values, emphasizing the alignment of treatment goals with what patients value. Additionally, provider and patient preparedness is crucial for the successful implementation of goal-oriented care. Furthermore, the application of lean thinking in healthcare involves process improvement, focusing on defining value from the patient's perspective, mapping value streams, and eliminating waste to create

continuous flow, ultimately leading to more efficient and effective patient care. Moreover, the implementation of selected lean management practices has been found to have a significant relationship with financial performance in healthcare settings, underscoring the importance of integrating lean principles into healthcare management for improved overall performance.

### **Model case**

*"A hospital aimed to improve the efficiency of its emergency department. The hospital leadership team identified long waiting times and overcrowding as key issues affecting patient care and satisfaction. They decided to apply lean thinking principles to address these issues. The team began by mapping the patient flow through the emergency department, identifying bottlenecks and areas of waste. They then implemented a series of process improvements, such as redesigning the triage process, improving communication among staff, and optimizing resource utilization. The team also engaged frontline staff in the process, encouraging them to identify areas for improvement and providing training on lean thinking principles. As a result of these efforts, the hospital was able to reduce wait times and improve patient flow through the emergency department. Patients reported higher levels of satisfaction with care, and staff morale improved as they felt empowered to make positive changes. The hospital also realized cost savings through the optimization of resource utilization and the elimination of non-value-added activities."*

This model case demonstrates the successful application of lean thinking in healthcare settings. By focusing on patient-centeredness, continuous improvement, and resource optimization, healthcare organizations can improve patient care and satisfaction while also achieving financial sustainability. The application of lean thinking requires a shift in mindset and a cultural transformation that fosters innovation, collaboration, and accountability among healthcare professionals. By engaging frontline staff in the process and providing training on lean thinking principles, healthcare organizations can cultivate a culture of continuous improvement and achieve sustainable success.

### **Model case in research**

The article entitled, "Reducing Changeover Time Between Surgeries Through Lean Thinking: An Action Research Project" by Amati et al. explored the application of lean thinking in healthcare, focusing on the operating room suite. The main objective of the study was to provide insights into how healthcare professionals can engage in continuous improvement by adopting lean thinking and ultimately reducing changeover time between surgeries. The study employed an action research approach and applied lean methodologies, such as Gemba walks, process mapping, root-cause-analysis, and the single minute

exchange of dies (SMED) system, to identify the causes of variability and waste concerning changeovers and improve processes in the context of gynecological and general surgery. The results showed that improved patient flow and inter-professional collaboration through standardized and safer work enabled effective parallel processing, allowing the hospital to reduce changeover time between operations by 25% on average, without changes in terms of infrastructure, technology, or resources. It was concluded that lean thinking allowed the team to re-evaluate the entire operating suite as a system, beginning with a sub-process of changeover (8).

### ***Borderline case***

Another hospital implemented similar process improvements in certain areas, such as the emergency department, but failed to engage frontline staff in the process or provide training on lean thinking principles. Consequently, the hospital struggled to identify and eliminate non-value-added activities and lacked a clear understanding of patient-centeredness and resource optimization. While some improvements in patient care and operational efficiency were noted, the hospital did not fully realize the potential benefits of lean thinking. The hospital also faced challenges in sustaining improvements over time, as the cultural transformation required for successful implementation had not been fully achieved. This borderline case highlights the importance of a comprehensive approach to lean thinking implementation in healthcare, which includes a shift in mindset, cultural transformation, and engagement of frontline staff, as well as a focus on patient-centeredness and resource optimization. Without these key elements, healthcare organizations may struggle to fully realize the benefits of lean thinking, resulting in only partial improvements in patient care and operational efficiency.

### ***Opposite case***

A hospital that had not adopted any lean principles continued to operate using traditional healthcare management and operational approaches. This hospital did not prioritize streamlining processes, eliminating waste, or maximizing value in patient care delivery. As a result, the hospital did not experience the potential benefits of lean thinking, such as improved operational efficiency, reduced waste in processes, and enhanced service quality for patients. This contrary case underscores the potential missed opportunities for improvement and efficiency that can result from the absence of lean thinking in healthcare settings.

### ***Antecedents***

The successful implementation of lean thinking in healthcare settings is contingent upon several antecedents, including strong leadership support, a clear understanding

of the value provided to patients and customer groups, and a comprehensive end-to-end process view. Additionally, engagement in the necessary training for lean thinking principles and practices and awareness of the challenges associated with its implementation are crucial. These antecedents are essential for fostering a culture of continuous improvement and learning, and for aligning lean thinking with the strategic agenda of healthcare organizations. By having these antecedents in place, healthcare organizations can effectively implement lean thinking principles and practices, ultimately leading to improved patient care and operational efficiency.

### ***Consequences***

The consequences of implementing lean thinking in healthcare settings are multifaceted. By applying the concept of lean thinking, healthcare organizations can achieve improvements in the quality of service delivery. This can be accomplished through the reduction of waste in service processes, leading to accelerated service handling and enhanced efficiency. Besides, lean thinking can help identify and address potential problems in health services, contributing to the overall improvement of the healthcare system. Furthermore, the sustained application of lean thinking in healthcare has the potential to yield long-term benefits, such as increased patient satisfaction, improved access to health services, and an overall enhancement in the quality and effectiveness of the healthcare system.

### ***Empirical referents***

The final step in analyzing a concept is defining empirical referents for its main attributes. However, if the concept is abstract, the attributes are similarly abstract and may not serve as effective empirical indicators. In the case of lean thinking in healthcare settings, the attributes are abstract, making empirical referents difficult to define. Nevertheless, some empirical referents identified in the literature include measurements of patient satisfaction regarding access to health services, quality of health services, processes of health services, and overall health services systems. Moreover, the application of lean thinking to reduce waste in service processes and accelerate service handling has been recognized as an empirical referent. The use of failure mode and effect analysis to identify and address potential problems has also been considered an empirical referent. Case studies have further illustrated empirical referents for lean thinking in healthcare settings, including the sustained application of lean thinking leading to long-term benefits such as increased patient satisfaction, improved access to health services, and overall enhancement of the quality and effectiveness of healthcare systems. While defining empirical referents for lean thinking in healthcare settings remains complex, these examples provide some insight into the potential measurement and application methods in practice.

## Discussion

The comprehensive analysis of lean thinking within healthcare settings, as examined through Walker and Avant's concept analysis method, has illuminated critical nuances pivotal for its adoption and resultant successful outcomes. This study unearthed the unique differentiators of lean thinking from other efficiency approaches, underlining its central role in reforming a sector increasingly in need of innovative strategies to enhance cost-effectiveness and quality of care delivery.

At the heart of the study's findings is the indispensability of lean thinking's defining attributes – chiefly, value maximization and waste minimization – within healthcare. The intricate process of defining value from a patient's perspective and the rigorous mapping and refinement of healthcare processes to reflect this value signify a transformative shift away from traditional healthcare delivery models (27). This shift demands not only procedural adjustments but also a cultural and philosophical realignment within healthcare organizations (28).

The distinction between model and borderline cases in the findings of the present study highlighted the nuanced spectrum within which lean thinking operates (2). These dynamic case analyses further reinforce the idea that the efficacy of lean thinking goes beyond mere procedural changes; it is also a function of engagement – of leadership, interdisciplinary teams, and most importantly, frontline staff. This engagement transcends to the encapsulation of a continuous improvement culture, which is as much about mindset as it is about method (29).

This study delineates, with unwavering clarity, the antecedents that precede the successful implementation of lean thinking, such as committed leadership and a culture of adaptability. The palpable consequences observed – enhanced patient satisfaction, service quality, and operational efficiency – serve as emphatic endorsements for the adoption of lean thinking. However, it is imperative to note that such outcomes are contingent on adopting lean thinking in its fullness, as partial implementation gives birth to suboptimal results, as evident in our comparative case analyses (30).

The present study stressed the importance of employing empirical referents to sustain and monitor the impact of lean thinking in healthcare (31). While the abstract nature of the concept poses challenges, tangible metrics such as patient satisfaction scores, service delivery speeds, and qualitative improvements within healthcare processes are suggestive of the pragmatic applicability of the concept (6). The research posits that lean thinking, when applied with conceptual rigor and systemic support, offers a compelling avenue for operational innovation and patient-centered care within the healthcare sector. It is the necessary pivot point for healthcare systems under the present strains of demand, complexity, and an insistence

on quality – a beacon of change that promises operational excellence and enhanced patient outcomes (32).

Further studies should consider the applicability of lean thinking in diverse healthcare contexts, including its long-term sustainability and impact on healthcare professional satisfaction and burnout rates (33). As lean thinking continues to imprint its value across healthcare systems globally, continuous evaluations against real-world outcomes and challenges will provide an iterative learning platform essential for healthcare excellence. Lean thinking has garnered attention in healthcare for its potential to enhance service delivery, patient safety, and quality of care, while simultaneously curbing expenses (34). At its core, lean thinking in healthcare aims to optimize patient-related activities and processes by eradicating waste and boosting both quality and safety. The essence of lean thinking lies in achieving two fundamental objectives: maximizing value and minimizing waste. These objectives are integral to healthcare system reform (33). Additionally, the successful incorporation of lean thinking into healthcare goes beyond procedural changes; it necessitates a cultural and philosophical shift within the organization. Crucially, the active participation of frontline staff is vital for lean thinking to pervade as a culture of continuous improvement (35,36).

Central to this discussion is lean thinking's reliance on empirical referents, such as patient satisfaction scores, service delivery speed, and qualitative enhancements in healthcare processes. Monitoring these metrics is crucial for maintaining the momentum of lean initiatives and gauging their effects. Research exploring lean thinking from various angles—including its long-term viability and implications for healthcare worker satisfaction and burnout—continues to unfold, informing the discourse on its practicality and effectiveness. Evidence of the challenges and successes associated with lean thinking emerges from several studies (37-39), indicating its significant potential to refine healthcare provision. Nevertheless, realizing this potential demands an in-depth comprehension of its principles, a strategic cultural realignment within healthcare entities, and a commitment to engaging frontline staff. Keeping abreast of actual outcomes and the hurdles encountered is fundamental for effecting a lasting and positive change in the realm of healthcare (40).

## Conclusion

The application of lean thinking in the healthcare sector has gained significant attention due to its potential to improve quality, patient safety, and efficiency. By adopting the principles of lean thinking, healthcare organizations have the opportunity to minimize waste, streamline workflows, and enhance the overall patient experience. However, despite the growing body of knowledge and successful implementations, there remains a need for further research to understand the optimal sequence for

implementing lean in various healthcare departments and to evaluate the suitability and effectiveness of different lean tools and techniques in diverse healthcare settings. The findings from existing literature and successful implementations worldwide provide valuable insights and set the stage for future research to explore the potential for lean implementation in healthcare institutions and the associated benefits. This underscores the importance of continued research and practical application of lean thinking principles in healthcare to achieve sustainable improvements in patient care and organizational performance.

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#### Authors' Contribution

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#### Competing Interests

There is no conflict of interest to report.

#### Ethical Approval

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