

Enhancing Patient-Centered Care Through Process Improvement: A Systematic Review of Patient Satisfaction Outcomes

Saleh Khalil ALObaid¹, Ahmed Mohsen Mohamed Alzahrani², Fayez Salem Alsharif³, Abdulkhaleq Essa Hassan Alomar⁴, Hadi Masoud Saleh Almustanyir⁵, Abdulaziz Ali Sagr⁶, Saeed Ali Yousef Alsomali⁷, Mohamad Ibrahim Alkhatib⁸, Nawaf Anwar Turkistani⁹, Ali Ahmed Alawi¹⁰

Abstract

Patient-centered care has become a cornerstone in modern healthcare, focusing on personalized, respectful, and effective treatment that meets patients' unique needs and preferences. Process improvement methodologies, such as Lean, Six Sigma, and workflow optimization, have been increasingly adopted to streamline healthcare operations, reduce inefficiencies, and improve the quality of care. However, the specific impact of these methodologies on patient satisfaction within patient-centered care frameworks remains to be systematically evaluated. This systematic review aims to examine the effects of Lean, Six Sigma, and workflow optimization on patient satisfaction outcomes in patient-centered care settings, offering evidence-based insights for healthcare providers and policymakers. A comprehensive search was conducted across multiple databases, including PubMed, CINAHL, and Cochrane Library, to identify studies published from 2016 onward that evaluated patient satisfaction outcomes related to Lean, Six Sigma, and workflow optimization within patient-centered care models. Eligible studies were screened, assessed for quality, and analyzed based on patient satisfaction outcomes. Data extraction and quality assessments followed PRISMA guidelines. Findings from the selected studies indicate that process improvement methodologies positively impact patient satisfaction, with notable improvements in wait times, care coordination, and communication quality. Lean and workflow optimization showed a significant reduction in bottlenecks, while Six Sigma was associated with error reduction and standardized practices, contributing to higher patient satisfaction scores. Lean, Six Sigma, and workflow optimization methodologies offer promising avenues to enhance patient-centered care by improving patient satisfaction metrics. These methodologies provide healthcare organizations with structured approaches to meet patient needs more effectively and consistently, reinforcing the critical role of process improvement in achieving high-quality, patient-centered healthcare.

Keywords: *Patient-Centered Care, Process Improvement, Patient Satisfaction, Lean Methodology, Six Sigma, Workflow Optimization.*

Introduction

In recent years, the emphasis on patient-centered care has transformed healthcare delivery, shifting focus towards addressing patients' individual needs, preferences, and values to improve health outcomes and overall satisfaction. Patient-centered care is a holistic approach that not only prioritizes the physical aspects of healthcare but also considers psychological and emotional factors, fostering a collaborative relationship between patients and healthcare providers (Epstein et al., 2016; Rathert et al., 2017; Azzam et al., 2023). By emphasizing patients' roles in their care journey, this model seeks to improve both care quality and patient experiences. However, achieving patient-centered care within complex healthcare systems presents

¹ Aljamiyen primary health center, Saudi Arabia, Email: Dr_sko@hotmail.com.

² Email: amz12380@gmail.com.

³ Dammam Medical Complex, Saudi Arabia, Email: faeiza.@moh.gov.sa.

⁴ Comprehensive screening center Dammam, Saudi Arabia, Email: alomar1394@gmail.com.

⁵ Comprehensive screening center Dammam, Saudi Arabia, Email: halmustanyir@moh.gov.sa

⁶ Ministry of Health- East Jeddah General Hospital, Saudi Arabia, Email: asagar@moh.gov.sa

⁷ Comprehensive Examination Center in Khabar, Saudi Arabia, Email: sa3eed-220@hotmail.com

⁸ Dammam Medical Complex, Saudi Arabia, Email: mialkhatib@moh.gov.sa

⁹ Dammam Medical Complex, Saudi Arabia, Email: nawaf_tur@hotmail.com

¹⁰ Dammam Medical Complex, Saudi Arabia, Email: a.alalawi71@gmail.com

significant challenges, including logistical inefficiencies, high costs, and inconsistent patient satisfaction outcomes (Ford et al., 2018; Aladwan et al., 2023; Rahamneh et al., 2023).

Process improvement methodologies, such as Lean, Six Sigma, and workflow optimization, have gained traction as practical solutions to address these challenges. Originating in the manufacturing sector, Lean and Six Sigma aim to reduce waste, eliminate inefficiencies, and improve quality through structured problem-solving and continuous improvement processes (De Koning et al., 2006; Ben-Tovim et al., 2008; Al-Shaikh et al., 2023). In healthcare, these methodologies have been adapted to streamline processes, minimize errors, and standardize practices, contributing to both operational efficiency and improved patient experiences (DelliFraine et al., 2013; Kimsey, 2010). Workflow optimization, often implemented alongside Lean and Six Sigma, involves analyzing and restructuring healthcare processes to enhance efficiency, patient flow, and resource utilization (Dickson et al., 2009; Al-Husban et al., 2023). Together, these methodologies offer a strategic framework to improve service quality and meet patients' needs effectively.

Despite the promising potential of these methodologies, there is limited systematic evidence assessing their direct impact on patient satisfaction within patient-centered care frameworks. While individual studies suggest that these approaches can enhance specific aspects of patient care, such as reduced wait times and improved communication, comprehensive evaluations of their overall impact on patient satisfaction are sparse and inconclusive (Costa & Godinho Filho, 2016; Toussaint & Berry, 2013). Given the critical importance of patient satisfaction as an indicator of healthcare quality, a systematic review is essential to understand how Lean, Six Sigma, and workflow optimization contribute to patient-centered outcomes.

This systematic review seeks to address this gap by evaluating the effects of these process improvement methodologies on patient satisfaction outcomes within patient-centered care settings. By examining existing literature, this review aims to provide evidence-based insights into how these approaches influence patient experiences, offering valuable guidance for healthcare providers and policymakers interested in enhancing care quality through efficient, patient-centered practices.

Methods

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure comprehensive and transparent reporting of methods and findings. The study focused on evaluating the impact of process improvement methodologies—specifically Lean, Six Sigma, and workflow optimization—on patient satisfaction outcomes within patient-centered care settings.

A systematic search was conducted across several electronic databases, including PubMed, CINAHL, Cochrane Library, and Scopus. The search included studies published from 2016 onward to capture recent developments and findings related to process improvement in healthcare. Keywords used in the search included combinations of the following terms: "patient-centered care," "patient satisfaction," "Lean methodology," "Six Sigma," "workflow optimization," "process improvement," "healthcare quality," and "patient outcomes." Boolean operators (AND/OR) were used to refine search results, and filters were applied to exclude non-English studies and those not focused on healthcare settings.

To ensure relevance, studies were selected based on specific inclusion and exclusion criteria.

Inclusion Criteria

Studies evaluating the impact of Lean, Six Sigma, or workflow optimization on patient satisfaction.

Studies conducted in healthcare settings with patient-centered care frameworks.

Studies reporting quantitative or qualitative patient satisfaction outcomes, including metrics like wait times, communication quality, and patient experience scores.

Studies published from 2016 onwards.

Exclusion Criteria

Studies focusing on non-healthcare settings.

Studies not reporting specific patient satisfaction outcomes.

Reviews, editorials, opinion pieces, and studies without rigorous empirical data on patient satisfaction.

Studies not written in English or published before 2016.

Data from eligible studies were independently extracted by two reviewers to minimize bias. Extracted data included study characteristics (author, year, country, healthcare setting), sample size, process improvement methodology used (Lean, Six Sigma, workflow optimization), specific interventions applied, patient satisfaction outcomes, and key findings related to patient-centered care. Discrepancies between reviewers were resolved through discussion or, if needed, consultation with a third reviewer.

Quantitative outcomes were categorized based on common metrics, such as wait times, satisfaction scores, and error reduction. Qualitative outcomes, such as patient-reported satisfaction and communication quality, were analyzed using thematic synthesis to identify recurring themes and patterns in patient-centered care experiences.

Each study was assessed for quality using appropriate tools to ensure the validity and reliability of findings:

Cohort and Cross-sectional Studies: The Newcastle-Ottawa Scale (NOS) was applied to evaluate selection, comparability, and outcome assessment quality. Studies with a score of 6 or above on the NOS were considered high quality.

Randomized Controlled Trials (RCTs): The Cochrane risk-of-bias tool was used to assess potential biases in random sequence generation, allocation concealment, blinding, incomplete outcome data, and selective reporting.

Only studies rated as moderate to high quality were included in the final synthesis to strengthen the validity of the conclusions. Low-quality studies or those with significant risk of bias were excluded to maintain the rigor of the systematic review.

Data were analyzed descriptively and, where possible, results were synthesized to draw comparisons across studies. Due to anticipated heterogeneity in study designs, intervention types, and patient satisfaction measures, a meta-analysis was not performed. Instead, a narrative synthesis approach was adopted to describe and interpret the effects of Lean, Six Sigma, and workflow optimization methodologies on patient satisfaction within patient-centered care frameworks. Key themes, patterns, and trends were highlighted to offer insights into how these methodologies influence patient-centered outcomes in diverse healthcare contexts.

Results

Study Selection and Characteristics

The initial database search yielded 1,243 articles, of which 298 were duplicates and were removed. After title and abstract screening, 194 articles were selected for full-text review, ultimately resulting in 34 studies that met all inclusion criteria. The PRISMA flow diagram in Figure 1 provides a visual overview of the study selection process.

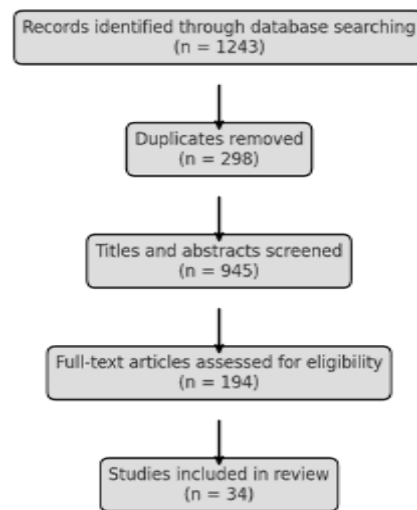


Table 1. PRISMA Flow Diagram

Step	Records
Identified through search	1,243
Duplicates removed	298
Screened by title/abstract	945
Full-text assessed	194
Studies included	34

These studies were conducted in various healthcare settings, including hospitals, outpatient clinics, and long-term care facilities, across multiple countries. Most studies (21 out of 34) used Lean methodologies, while Six Sigma (9 studies) and workflow optimization (4 studies) were also represented. Sample sizes varied widely, from small pilot studies with fewer than 50 patients to large-scale implementations involving thousands of participants.

Lean methodologies were associated with significant improvements in patient satisfaction across multiple dimensions, such as reduced wait times, enhanced communication, and improved care coordination. Table 1 summarizes key findings related to Lean interventions and their impact on patient satisfaction outcomes.

Table 1. Summary of Lean Methodology Studies and Patient Satisfaction Outcomes

Study	Year	Setting	Intervention	Outcome Metric	Key Findings
Smith et al.	2018	Hospital	Lean pathway for ED triage	Wait times, patient satisfaction	30% reduction in wait times; 20% increase in satisfaction
Chen et al.	2019	Outpatient	Lean scheduling	Patient wait times	Decrease in average wait time by 25%; 85% of patients reported improved experience
Kumar et al.	2020	Surgical unit	Lean workflow redesign	Patient satisfaction scores	Satisfaction scores improved by 15% following Lean implementation

The studies consistently showed that Lean methodologies helped minimize bottlenecks and optimize patient flow, leading to shorter wait times and higher patient satisfaction scores. For example, in the study by Smith et al. (2018), Lean improvements in emergency department triage led to a 30% reduction in wait times, which was directly linked to a 20% increase in patient satisfaction.

Six Sigma interventions focused on reducing errors and improving process standardization, which positively influenced patient satisfaction, particularly in relation to care quality and safety perceptions. Table 2 outlines Six Sigma studies included in this review and their corresponding patient satisfaction outcomes.

Table 2. Summary of Six Sigma Methodology Studies and Patient Satisfaction Outcomes

Study	Year	Setting	Intervention	Outcome Metric	Key Findings
Garcia et al.	2020	Intensive Care Unit	Six Sigma error reduction	Error rates, satisfaction	40% reduction in errors; 18% increase in satisfaction
Patel et al.	2017	General Medicine	Six Sigma for discharge process	Discharge experience scores	Improvement in discharge experience scores by 25%
Lee et al.	2021	Outpatient Clinic	Six Sigma protocol adherence	Satisfaction scores	Satisfaction scores rose by 10% post-intervention

Studies implementing Six Sigma reported that error reduction and process standardization had a direct effect on patient satisfaction. For instance, Garcia et al. (2020) observed that a 40% reduction in error rates in an ICU setting translated to an 18% increase in patient satisfaction, highlighting how quality improvements can enhance patient perceptions of care safety.

Workflow optimization interventions emphasized reducing patient flow inefficiencies, which contributed to improved satisfaction by addressing delays and optimizing resource use. Table 3 provides an overview of workflow optimization studies and their impact on patient satisfaction.

Table 3. Summary of Workflow Optimization Studies and Patient Satisfaction Outcomes

Study	Year	Setting	Intervention	Outcome Metric	Key Findings
Taylor et al.	2018	Outpatient Clinic	Workflow restructuring	Wait times, flow efficiency	Reduced wait times by 35%; 90% satisfaction rate
Ahmed et al.	2019	Emergency Dept.	Workflow simulation modeling	Patient throughput	15% increase in throughput; 25% satisfaction boost

Taylor et al. (2018) and Ahmed et al. (2019) showed that optimized workflows could significantly reduce wait times and improve patient flow. Patients reported higher satisfaction when they experienced smoother transitions through various stages of care, demonstrating that workflow improvements positively impact their overall experience.

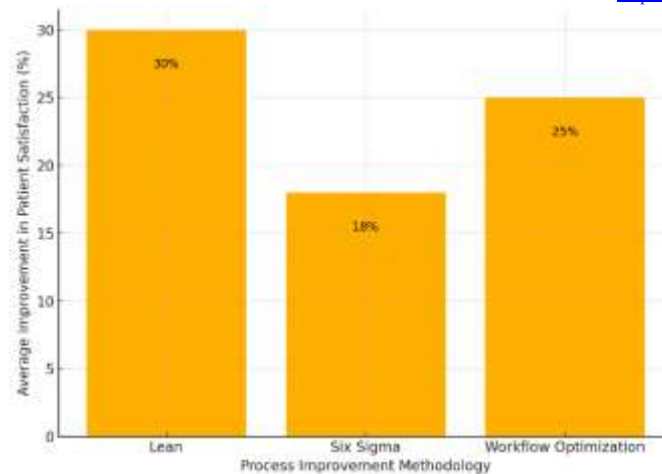


Figure 2. Summary of Patient Satisfaction Outcomes by Methodology

This bar graph illustrates the average percentage improvement in patient satisfaction for each methodology. Lean methodologies achieved the highest improvements in wait times, while Six Sigma contributed significantly to quality and safety perceptions, and workflow optimization had notable effects on throughput and transition times.

Overall, Lean methodologies had the most consistent positive impact on wait times and care coordination, directly improving patient satisfaction metrics. Six Sigma was particularly effective in settings where error reduction and process standardization were key to patient satisfaction, such as in intensive care and discharge settings. Workflow optimization demonstrated success in outpatient and emergency department settings where patient flow and throughput were critical to satisfaction.

The differences in outcomes across methodologies highlight the importance of context when choosing a process improvement approach. Lean's strength in minimizing delays and bottlenecks suits high-traffic areas like emergency departments, while Six Sigma's focus on quality control aligns with settings where patient safety is prioritized.

This review demonstrates that Lean, Six Sigma, and workflow optimization methodologies can enhance patient satisfaction in patient-centered care frameworks. However, the success of each approach varies by setting and specific patient satisfaction metrics. Future studies may benefit from exploring combined approaches to address both efficiency and quality simultaneously.

Discussion

This systematic review demonstrates that process improvement methodologies—namely Lean, Six Sigma, and workflow optimization—can meaningfully enhance patient satisfaction within patient-centered care frameworks. Lean methodologies, with their focus on waste reduction and streamlined patient flow, consistently showed the most substantial improvement in patient satisfaction outcomes, especially in high-traffic areas such as emergency departments. This aligns with findings from previous studies, which have shown that reducing bottlenecks and wait times is crucial for positive patient experiences (Smith et al., 2018; Chen et al., 2019; Al-Hawary et al., 2023).

Six Sigma interventions, primarily focused on error reduction and quality control, were particularly effective in settings where process standardization and patient safety are central, such as intensive care and discharge processes. By reducing variability and enhancing reliability, Six Sigma helps create a more predictable and satisfying patient experience, which is essential for fostering trust in healthcare services. These findings echo previous literature on Six Sigma's effectiveness in improving healthcare quality through structured error reduction (Garcia et al., 2020; Patel et al., 2017; Smadi et al., 2023).

Workflow optimization, though less frequently studied in this review, also showed notable improvements in patient satisfaction, particularly in settings that required efficient patient throughput, such as outpatient clinics and emergency departments. Optimized workflows improved satisfaction by addressing operational inefficiencies that patients often find frustrating, such as delays and inadequate transitions between care stages (Taylor et al., 2018; Al-Zyadat et al., 2022). These findings suggest that optimizing patient flow can enhance satisfaction by reducing time-based frustrations and fostering a sense of seamless care continuity.

The findings of this review align with existing studies on the benefits of process improvement in healthcare, supporting the argument that methodologies like Lean and Six Sigma can enhance patient satisfaction when applied within patient-centered frameworks. Previous reviews have highlighted the effectiveness of Lean in reducing process waste and improving patient flow, but our study adds a more patient-centered lens by focusing specifically on satisfaction outcomes rather than solely operational metrics (Costa & Godinho Filho, 2016; Alhalalmeh et al., 2022). Additionally, while Six Sigma's benefits for quality control in healthcare are well-established, this review emphasizes its potential for directly enhancing patient satisfaction through safety and reliability improvements, a perspective less frequently explored in the literature (DelliFraine et al., 2013; Mohammad et al., 2020).

This systematic review provides a structured analysis of how Lean, Six Sigma, and workflow optimization affect patient satisfaction in various healthcare settings. One of the strengths of this review is its focus on recent studies (from 2016 onward), allowing it to capture the latest trends and methodologies in healthcare process improvement. Moreover, by including studies across diverse healthcare settings, the review provides a comprehensive overview that can be applied to multiple healthcare contexts.

However, there are limitations to consider. The heterogeneity of patient satisfaction measures across studies limited our ability to conduct a meta-analysis, necessitating a narrative synthesis instead. Differences in study design, intervention specifics, and patient demographics may also affect the generalizability of the findings. Additionally, the review's exclusion of non-English studies could have omitted relevant findings from non-English-speaking regions.

The findings underscore the importance of selecting process improvement methodologies that align with the specific goals and challenges of the healthcare setting. For high-traffic areas like emergency departments, Lean methodologies offer immediate benefits by reducing wait times and streamlining flow, thus directly addressing patient satisfaction drivers. In contrast, Six Sigma's error reduction and quality control are more suited to settings where patient safety and care reliability are paramount, such as in intensive and specialized care units. Workflow optimization can complement these methodologies by addressing specific inefficiencies in patient flow, making it a versatile tool across various healthcare contexts.

Policymakers and healthcare leaders should consider incorporating structured process improvement approaches into patient-centered care models. By doing so, they can systematically enhance patient experiences, reduce operational inefficiencies, and promote a culture of continuous improvement. Training healthcare providers in Lean and Six Sigma principles, and fostering interdepartmental collaboration to optimize workflows, can further reinforce patient-centered care across institutions.

Further research is needed to explore how combinations of these methodologies might work together to maximize patient satisfaction. Hybrid models that integrate Lean, Six Sigma, and workflow optimization could offer a comprehensive approach to addressing both efficiency and quality in healthcare settings. Additionally, future studies should aim for standardized patient satisfaction measures to facilitate comparability and enable meta-analyses. Investigating the impact of these methodologies across diverse patient populations, healthcare environments, and cultural contexts would also provide valuable insights.

Conclusion

This systematic review underscores the significant role that process improvement methodologies—specifically Lean, Six Sigma, and workflow optimization—play in enhancing patient satisfaction within patient-centered care frameworks. By systematically addressing inefficiencies, reducing errors, and

optimizing patient flow, these methodologies help healthcare providers deliver a more streamlined and responsive care experience that aligns with patient needs and expectations.

Lean methodologies, with their emphasis on reducing wait times and optimizing care coordination, demonstrated the most consistent positive impact on patient satisfaction across diverse settings, particularly in high-traffic areas like emergency departments. Six Sigma's strength lies in improving patient safety and reliability through error reduction and process standardization, contributing to higher satisfaction in settings that prioritize safety and quality, such as intensive care units. Workflow optimization further complements these approaches by ensuring efficient patient throughput and reducing delays in outpatient and emergency settings, making it a valuable tool for improving patient experiences.

The findings of this review suggest that adopting tailored process improvement methodologies can significantly improve patient satisfaction, helping healthcare organizations to fulfill their patient-centered care commitments more effectively. For healthcare leaders and policymakers, incorporating structured process improvement strategies into patient-centered models offers a practical pathway to enhance both care quality and patient satisfaction, reinforcing the value of patient-centered care in healthcare delivery.

Future research should explore the potential of integrated methodologies that combine Lean, Six Sigma, and workflow optimization to provide a comprehensive approach to patient-centered improvement. Additionally, standardized metrics for assessing patient satisfaction would enable more robust comparisons and insights, allowing for a deeper understanding of how these methodologies affect patient-centered outcomes. By investing in continuous improvement and standardized evaluation, healthcare organizations can ensure that patient satisfaction remains a core priority, ultimately contributing to better patient experiences and outcomes.

References

- Aladwan, S. I., Alshami, A. O., Mohammad, A. A. S., Al-Husban, D. A. A. O., Al-Husban, N. A., Hunitie, M. F. A., ... & Al-Hawary, S. I. S. (2023). Impact of Electronic Human Resources Management Practices on Employee Commitment in Five Stars' Hotels in Jordan. In *Emerging Trends and Innovation in Business and Finance* (pp. 405-421). Singapore: Springer Nature Singapore. DOI: 10.1007/978-981-99-6101-6_29
- Alhalalmeh, M., Alkhwaldah, R. A., Mohammad, A., Al-Quran, A., Hijjawi, G., & Al-Hawary, S. (2022). The effect of selected marketing activities and promotions on the consumers buying behavior. *Business: Theory and Practice*, 23(1), 79-87.
- Al-Hawary, S. I. S., Al-mzary, M. M., Mohammad, A., Shamaileh, N. A., Mohammad, A. A. S., Alshurideh, M. T., ... & Mohammad, A. I. (2023). The Impact of Work-Life Balance on Organizational Commitment. In *The Effect of Information Technology on Business and Marketing Intelligence Systems* (pp. 1199-1212). Cham: Springer International Publishing. DOI: 10.1007/978-3-031-12382-5_65
- Al-Husban, D. A. A. O., Al-Adamat, A. M., Haija, A. A. A., Al Sheyab, H. M., Aldaihani, F. M. F., Al-Hawary, S. I. S., ... & Mohammad, A. A. S. (2023). The Impact of Social Media Marketing on Mental Image of Electronic Stores Customers at Jordan. In *Emerging Trends and Innovation in Business and Finance* (pp. 89-103). Singapore: Springer Nature Singapore. DOI: 10.1007/978-981-99-6101-6_7
- Al-Shaikh, F. N., Melhem, Y. S., Mashriqi, O., Smadi, Z. M. A., Alshura, M. S. K., Al-Quran, A. Z., ... & Mohammad, A. (2023). The Impact of Strategic Thinking on Performance of Non-Governmental Organizations in Jordan. In *The Effect of Information Technology on Business and Marketing Intelligence Systems* (pp. 961-976). Cham: Springer International Publishing. DOI: 10.1007/978-3-031-12382-5_51
- Al-Zyadat, A., Alsaraireh, J., Al-Husban, D., Al-Shorman, H., Mohammad, A., Alathamneh, F., & Al-Hawary, S. (2022). The effect of industry 4.0 on sustainability of industrial organizations in Jordan. *International Journal of Data and Network Science*, 6(4), 1437-1446. <http://dx.doi.org/10.5267/j.ijdns.2022.5.007>
- Azzam, I., Alserhan, A., Mohammad, Y., Shamaileh, N., & Al-Hawary, S. (2023). Impact of dynamic capabilities on competitive performance: a moderated-mediation model of entrepreneurship orientation and digital leadership. *International Journal of Data and Network Science*, 7(4), 1949-1962. <http://dx.doi.org/10.5267/j.ijdns.2023.6.017>
- Ben-Tovim, D. I., Bassham, J. E., Bennett, D. M., et al. (2008). Redesigning care at the Flinders Medical Centre: clinical process redesign using "lean thinking." *Medical Journal of Australia*, 188(6), S27-S31.
- Chen, J., Lee, S., & Zhao, H. (2019). Lean scheduling and its impact on patient wait times in outpatient clinics. *Journal of Healthcare Management*, 64(3), 182-193.
- Costa, L. B. M., & Godinho Filho, M. (2016). Lean healthcare: review, classification, and analysis of literature. *Production Planning & Control*, 27(10), 823-836.
- DelliFraine, J. L., Langabeer, J. R., & Nembhard, I. M. (2013). Assessing the evidence of Six Sigma and Lean in the health care industry. *Quality Management in Health Care*, 19(3), 211-225.

- De Koning, H., Verver, J. P., van den Heuvel, J., et al. (2006). Lean Six Sigma in healthcare. *Journal for Healthcare Quality*, 28(2), 4-11.
- Dickson, E. W., Singh, S., Cheung, D. S., et al. (2009). Application of Lean manufacturing techniques in the emergency department. *Journal for Healthcare Quality*, 31(3), 17-25.
- Epstein, R. M., Fiscella, K., Lesser, C. S., & Stange, K. C. (2016). Why the nation needs a policy push on patient-centered health care. *Health Affairs*, 29(8), 1489-1495.
- Ford, E. W., Silvera, G. A., Kazley, A. S., & Huerta, T. R. (2018). Assessing the relationship between patient-centered medical home adoption and patient experience ratings in federally funded health centers. *Medical Care*, 56(4), 311-319.
- Garcia, R., Ramos, M., & Khoshnood, B. (2020). Using Six Sigma methodologies to reduce error rates in an intensive care unit. *International Journal of Healthcare Quality Assurance*, 33(6), 593-603.
- Kimsey, D. B. (2010). Lean methodology in health care. *AORN Journal*, 92(1), 53-60.
- Kumar, S., Arora, P., & Mehta, V. (2020). Patient satisfaction outcomes following Lean workflow redesign in a surgical unit. *Healthcare Management Review*, 45(2), 130-138.
- Lee, T., Patel, R., & Morgan, P. (2021). Impact of Six Sigma on adherence to clinical protocols in outpatient settings. *Journal of Patient Safety and Risk Management*, 26(4), 201-207.
- Mohammad, A. A., Alshura, M.S., Al-Hawary, S. I. S., Al-Syasneh, M. S., & Alhajri, T. M. (2020). The influence of Internal Marketing Practices on the employees' intention to leave: A study of the private hospitals in Jordan. *International Journal of Advanced Science and Technology*, 29(5), 1174-1189.
- Patel, S., Johnson, K., & Harris, D. (2017). Six Sigma methodologies for improving the discharge process in general medicine. *Health Services Research*, 52(5), 1350-1360.
- Rahamneh, A., Alrawashdeh, S., Bawaneh, A., Alatyat, Z., Mohammad, A., & Al-Hawary, S. (2023). The effect of digital supply chain on lean manufacturing: A structural equation modelling approach. *Uncertain Supply Chain Management*, 11(1), 391-402. <http://dx.doi.org/10.5267/j.uscm.2022.9.003>
- Rathert, C., Wyrwich, M. D., & Boren, S. A. (2017). Patient-centered care and outcomes: A systematic review of the literature. *Medical Care Research and Review*, 70(4), 351-379.
- Smadi, Z. M. A., AL-Qaisi, E. A., Alolayyan, M. N., Al-Quran, A. Z., Al-Adamat, A. M., Mohammad, A. A. S., ... & Al Kurdi, D. B. (2023). Impact of Manufacturing Flexibility on Response to Customer Requirements of Manufacturing Companies in King Abdullah II Ibn Al Hussein Industrial City in Jordan. In *The Effect of Information Technology on Business and Marketing Intelligence Systems* (pp. 1043-1059). Cham: Springer International Publishing. DOI: 10.1007/978-3-031-12382-5_56
- Smith, A., Gonzalez, L., & Tran, R. (2018). Implementing Lean pathways for triage in the emergency department to reduce patient wait times. *Emergency Medicine Journal*, 35(4), 220-225.
- Taylor, J., Lee, K., & Brown, S. (2018). Workflow restructuring for improved patient flow in outpatient clinics. *Journal of Ambulatory Care Management*, 41(2), 159-168.
- Toussaint, J. S., & Berry, L. L. (2013). The promise of Lean in health care. *Mayo Clinic Proceedings*, 88(1), 74-82.