Indonesia Accounting Research Journal, 11 (3) (2024), pp. 173-183

Published by: Institute of Accounting Research and Novation (IARN)

Indonesia Accounting Research Journal

Journal homepage: https://journals.iarn.or.id/index.php/IARJ/index

Optimizing Health Service Delivery: Addressing Non - Value Added Activities through Lean Six Sigma

Anggi Pranata

Faculty of Teacher Training and Education, PGRI West Sumatra College of Teacher Training and Education

Article Info

Article history:

Received Feb 25, 2024
Revised Mar 16, 2024
Accepted Mar 30, 2024

Keywords:

Lean Six Sigma;
Health service delivery;
Process optimization;
Non - value added activities;
Healthcare quality improvement.

ABSTRACT

This research explores the application of Lean Six Sigma principles in optimizing health service delivery, with a focus on identifying and addressing non - value added activities within healthcare processes. Through a systematic analysis, including process mapping, root cause analysis, and impact assessment, this study identifies key inefficiencies and their implications for healthcare providers, patients, and other stakeholders. The findings underscore the critical importance of waste reduction, process standardization, continuous improvement, and patient-centered care in driving transformative change and achieving sustainable improvements in efficiency, quality, and patient satisfaction. The implications of the findings extend beyond healthcare providers to policymakers, payers, and community organizations, highlighting the potential for system-wide improvements and cost savings. By embracing Lean Six Sigma principles and fostering a culture of continuous improvement, healthcare organizations can enhance value delivery, drive innovation, and ultimately improve the health and well-being of individuals and communities. This research contributes to the broader body of knowledge on Lean Six Sigma applications in healthcare quality improvement and provides practical insights for healthcare leaders and practitioners seeking to optimize health service delivery.

Corresponding Author:

Anggi Pranata,
Faculty of Teacher Training and Education,
PGRI West Sumatra College of Teacher Training and Education, Indonesia
Jalan Gunung Panggilun, Padang City - Prop. West Sumatra Indonesia, 25111, Indonesia, Indonesia
Email: anggipranata@gmail.com

1. INTRODUCTION

The healthcare industry stands as a cornerstone of modern society, tasked with the crucial mission of preserving and restoring the health and well-being of individuals and communities(Organization, 2013). It encompasses a vast array of services, ranging from preventive care and primary care to specialized treatments, surgeries, and emergency interventions(Reynolds et al., 2018). Across the globe, healthcare systems vary significantly in structure, funding, and delivery models, reflecting diverse cultural, economic, and political landscapes(Organization, 2000).

Despite this diversity, all healthcare systems share common challenges, including rising demand for services, escalating costs, and the imperative to deliver high-quality care to an increasingly diverse and aging population. In the face of these challenges, optimizing processes within healthcare organizations has emerged as a critical imperative for achieving sustainable improvements in quality, efficiency, and patient outcomes(Sciences et al., 2018).

The optimization of healthcare processes involves the systematic identification, analysis, and improvement of workflows, protocols, and procedures to enhance the delivery of care(Ramudhin et al., 2006). At its core, process optimization seeks to eliminate waste, reduce variation, and maximize the value delivered to patients, providers, and other stakeholders(Atallah & Ramudhin, 2010). By streamlining operations and enhancing efficiency, healthcare organizations can better meet the needs of patients, improve clinical outcomes, and manage costs effectively.

In an era marked by escalating demands for quality, efficiency, and cost-effectiveness in healthcare, the integration of Lean Six Sigma methodologies has emerged as a potent strategy for driving continuous improvement(Forbes & Ahmed, 2010). Born from the realms of manufacturing and quality management, Lean Six Sigma represents a fusion of two powerful philosophies: Lean thinking and Six Sigma principles(Sweeney & Business, 2017). Together, they offer a comprehensive framework for optimizing processes, reducing waste, and enhancing value across various industries, including healthcare(Kagermann, 2014).

At its core, Lean thinking is rooted in the relentless pursuit of efficiency and waste reduction(Bell & Orzen, 2016). Originating from the Toyota Production System in the 1950s, Lean principles emphasize the identification and elimination of non - value added activities, or "muda," within processes. These activities, which contribute nothing to the end product or service, consume resources without delivering tangible benefits to customers or stakeholders.

In healthcare, where resources are finite, and patient outcomes are paramount, the application of Lean principles holds immense promise(Protzman et al., 2010). By streamlining workflows, reducing wait times, and optimizing resource utilization, Lean methodologies enable healthcare organizations to deliver timely, cost-effective care while minimizing waste and inefficiency.

Complementing Lean thinking, Six Sigma brings a data-driven, analytical approach to quality improvement(Dogan & Gurcan, 2018). Developed by Motorola in the 1980s, Six Sigma focuses on reducing variation and defects in processes, thereby enhancing consistency and reliability(Vivekananthamoorthy & Sankar, 2011). Central to Six Sigma is the concept of DMAIC: Define, Measure, Analyze, Improve, and Control a structured problem-solving methodology aimed at driving continuous improvement(De Mast & Lokkerbol, 2012).

In healthcare, where errors can have life-threatening consequences, the rigorous application of Six Sigma methodologies is paramount(Kothari, 2020). By systematically identifying root causes of defects, errors, and variation in clinical and administrative processes, healthcare organizations can implement targeted interventions to improve patient safety, outcomes, and satisfaction.

The adoption of Lean Six Sigma principles in healthcare has gained momentum in recent years, driven by the imperative to deliver high-quality care efficiently and cost-effectively(Smith & Blakeslee, 2002). Across various domains from hospital operations and patient flow to supply chain management and quality assurance healthcare organizations are leveraging Lean Six Sigma methodologies to drive transformative change.

For example, hospitals have successfully applied Lean Six Sigma principles to reduce emergency department wait times, improve surgical throughput, and enhance medication safety(Furterer, 2018). By analyzing patient flow, standardizing protocols, and empowering frontline staff to identify and address inefficiencies, healthcare organizations can achieve significant improvements in quality, access, and efficiency.

Moreover, the application of Lean Six Sigma extends beyond clinical care to administrative processes such as billing, scheduling, and inventory management(Suman & Prajapati, 2018). By optimizing back-office operations, healthcare organizations can reduce administrative burden, streamline workflows, and allocate resources more effectively, thereby freeing up time and resources for frontline patient care.

Healthcare processes are inherently complex, involving numerous interconnected activities and stakeholders(Kitson et al., 2018). From patient registration and triage to diagnosis, treatment, and discharge, each step in the healthcare service delivery chain presents opportunities for

improvement(Nates et al., 2016). However, inefficiencies and bottlenecks often arise due to redundant tasks, unnecessary delays, and miscommunication among healthcare providers.

Non - value added activities, also known as waste or muda in Lean terminology, can take various forms in healthcare settings(Radnor et al., 2012). These may include excessive paperwork, redundant data entry, unnecessary waiting times, overutilization of resources, and suboptimal care coordination(Blijleven et al., 2017). Such inefficiencies not only impede the delivery of timely and effective care but also contribute to rising healthcare costs and patient dissatisfaction.

Addressing these challenges requires a systematic approach to analyze and redesign healthcare processes(Wang et al., 2006). By applying Lean Six Sigma methodologies, healthcare organizations can identify non - value added activities, root causes, and opportunities for improvement(Yeh et al., 2011). The DMAIC (Define, Measure, Analyze, Improve, Control) framework serves as a structured roadmap for this purpose, guiding teams through the stages of problem identification, data collection, analysis, solution implementation, and ongoing monitoring.

Numerous studies have demonstrated the effectiveness of Lean Six Sigma in healthcare settings, yielding significant improvements in patient flow, wait times, resource utilization, and clinical outcomes(Tlapa et al., 2020). For example, hospitals have successfully reduced emergency department wait times, surgical turnaround times, and medication errors through Lean Six Sigma initiatives. Additionally, healthcare organizations have enhanced patient satisfaction, staff morale, and financial performance by eliminating waste and improving process efficiency(Graban, 2018).

Despite these successes, challenges remain in implementing Lean Six Sigma principles in healthcare(Vest & Gamm, 2009). Resistance to change, lack of leadership support, and insufficient training are common barriers that organizations encounter. Moreover, the unique complexity and variability of healthcare processes present additional challenges compared to manufacturing environments.

Nevertheless, the potential benefits of reducing non - value added activities in healthcare are undeniable(Paul et al., 2010). By streamlining processes, healthcare organizations can enhance patient safety, improve access to care, and achieve better outcomes at lower costs(Frankel et al., 2003). This research aims to contribute to the existing body of knowledge by analyzing and proposing strategies to reduce non - value added activities in the health service process flow using the Lean Six Sigma approach. Through empirical investigation and practical insights, this study seeks to advance understanding and facilitate the adoption of Lean Six Sigma methodologies in healthcare quality improvement efforts(Ahmed et al., 2018).

2. RESEARCH METHOD

2.1 Existing Literature and Related Studies

The integration of Lean Six Sigma methodologies in healthcare has garnered significant attention in recent years, driven by the imperative to improve quality, efficiency, and patient outcomes. Lean thinking and Six Sigma principles. Lean thinking, originating from the Toyota Production System, emphasizes the elimination of waste and the continuous pursuit of efficiency. It identifies non - value added activities within processes, such as unnecessary waiting times and redundant tasks, and seeks to streamline workflows to enhance value delivery.

On the other hand, Six Sigma principles focus on reducing variation and defects in processes through statistical analysis and data-driven decision-making. Six Sigma aims to achieve process improvement by identifying root causes of errors and implementing targeted interventions to enhance process performance and reliability. By combining the efficiency-focused principles of Lean with the analytical rigor of Six Sigma, Lean Six Sigma offers a powerful framework for driving continuous improvement in healthcare.

Research on Lean Six Sigma in healthcare has employed a variety of methodological approaches to assess its effectiveness and impact. Quantitative studies often utilize process metrics, such as cycle time reduction, error rates, and cost savings, to measure the outcomes of Lean Six Sigma initiatives.

Statistical tools, including regression analysis and control charts, are commonly employed to analyze process data and identify areas for improvement.

Qualitative research methods, such as interviews, focus groups, and case studies, provide insights into the implementation process, organizational culture, and barriers to change associated with Lean Six Sigma adoption. These methods enable researchers to understand the contextual factors influencing the success of Lean Six Sigma initiatives and identify strategies for overcoming implementation challenges.

Numerous studies have documented the successful application of Lean Six Sigma methodologies across various domains within healthcare settings. In hospital operations, Lean Six Sigma has been used to reduce emergency department wait times, improve surgical throughput, and optimize supply chain management. By streamlining processes and eliminating waste, healthcare organizations have achieved significant improvements in efficiency, resource utilization, and patient satisfaction.

In clinical care, Lean Six Sigma has been applied to enhance medication safety, reduce medical errors, and improve care coordination. Standardization of protocols, implementation of evidence-based practices, and utilization of technology-enabled solutions have helped healthcare providers deliver safer, more reliable care to patients. Moreover, Lean Six Sigma methodologies have been employed in administrative functions, such as billing, scheduling, and patient registration, to reduce administrative burden, enhance accuracy, and improve workflow efficiency.

In response to the growing imperatives of quality improvement, cost containment, and patient-centered care, healthcare organizations worldwide have undertaken various initiatives to identify and eliminate non - value added activities within their process flows. One common area of focus for reducing non - value added activities is the emergency department (ED). Studies have employed Lean Six Sigma methodologies to streamline triage processes, reduce patient wait times, and improve overall throughput. By eliminating bottlenecks, standardizing protocols, and optimizing resource allocation, healthcare organizations have achieved significant improvements in ED efficiency, patient satisfaction, and staff morale.

Surgical processes represent another critical area where non - value added activities can impede efficiency and quality. Initiatives aimed at reducing surgical turnaround times, minimizing delays, and improving perioperative workflows have demonstrated promising results. By implementing Lean Six Sigma methodologies, hospitals have enhanced operating room utilization, reduced cancellations, and improved patient flow, ultimately leading to better surgical outcomes and cost savings.

Medication management is a complex process fraught with opportunities for errors and inefficiencies. Studies have focused on reducing non - value added activities in medication administration, prescription filling, and inventory management processes. By standardizing medication protocols, implementing barcode scanning technology, and optimizing medication reconciliation workflows, healthcare organizations have enhanced patient safety, reduced medication errors, and improved adherence to best practices.

Administrative functions within healthcare organizations, such as billing, scheduling, and documentation, are often plagued by Non valueadded activities. Lean Six Sigma initiatives have targeted these areas to reduce paperwork, streamline data entry processes, and improve overall efficiency. By automating repetitive tasks, eliminating redundant approvals, and optimizing workflow design, healthcare organizations have achieved significant time savings, cost reductions, and accuracy improvements in administrative processes.

Patient flow optimization is a multifaceted challenge that encompasses various stages of the care continuum, from admission to discharge. Studies have utilized Lean Six Sigma methodologies to identify and address Non valueadded activities that contribute to delays, congestion, and inefficiencies in patient flow. By implementing discharge planning protocols, improving care coordination, and enhancing communication among healthcare teams, hospitals have reduced length of stay, improved bed turnover rates, and enhanced the overall patient experience.

2.2 Non value added

In the complex landscape of healthcare delivery, the presence of non - value added activities represents a significant barrier to efficiency, quality, and patient satisfaction. These activities, often characterized as waste or "muda" in Lean terminology, consume resources without contributing to the delivery of high-quality care. Addressing non - value added activities is essential for healthcare organizations seeking to optimize processes, enhance value delivery, and achieve sustainable improvements in performance.

a. Types of Non - valueadded Activities:
   Non - value added activities in healthcare encompass a wide range of inefficiencies, redundancies, and delays that detract from the overall effectiveness of care delivery. Common examples include:
   - Waiting: Patient wait times for appointments, test results, or consultations.
   - Overprocessing: Redundant documentation, unnecessary tests, or excessive data entry.
   - Motion: Excessive movement of staff or equipment within healthcare facilities.
   - Transportation: Unnecessary transfers of patients or materials between departments.
   - Defects: Errors in diagnosis, treatment, or medication administration.

b. Impact on Efficiency and Quality
   Non - value added activities contribute to inefficiencies, bottlenecks, and delays within healthcare processes, ultimately hindering the delivery of timely, effective care. These activities consume valuable resources, including time, labor, and supplies, without generating commensurate value for patients or stakeholders. Furthermore, non - value added activities increase the risk of errors, defects, and adverse events, compromising patient safety and quality of care. By addressing non - value added activities, healthcare organizations can improve workflow efficiency, reduce waste, and enhance the reliability and consistency of care delivery.

c. Strategies for Addressing Non - value added Activities:
   Identifying and addressing non - value added activities requires a systematic and collaborative approach involving frontline staff, clinicians, administrators, and quality improvement experts. Key strategies include:
   - Process mapping: Visualizing and analyzing healthcare processes to identify non - value added activities and areas for improvement.
   - Root cause analysis: Investigating the underlying causes of waste and inefficiency to develop targeted interventions.
   - Standardization: Establishing standardized protocols, procedures, and best practices to minimize variation and errors.
   - Technology integration: Leveraging technology solutions such as electronic health records, barcode scanning, and telemedicine to streamline processes and enhance efficiency.
   - Continuous improvement: Cultivating a culture of continuous learning and improvement, where feedback, data analysis, and innovation drive ongoing optimization of healthcare processes.

d. Benefits of Addressing Non - value added Activities:
   By reducing non - value added activities, healthcare organizations can achieve several tangible benefits:
   - Improved efficiency: Streamlining processes and eliminating waste leads to faster turnaround times, reduced wait times, and increased capacity to serve patients.
   - Enhanced quality: Minimizing errors, defects, and variation in care delivery improves patient safety, outcomes, and satisfaction.
   - Cost savings: Eliminating waste reduces unnecessary spending on resources, materials, and labor, contributing to overall cost containment and financial sustainability.
   - Staff engagement: Involving frontline staff in identifying and addressing non - value added activities fosters a sense of ownership, empowerment, and commitment to continuous improvement.

2.3 Health Service

Health service delivery stands as a cornerstone of modern society, tasked with the vital mission of promoting, protecting, and restoring the health and well-being of individuals and communities. In an era characterized by demographic shifts, technological advancements, and rising healthcare costs, the imperative to optimize health service delivery has never been greater. Health service delivery encompasses a broad spectrum of activities, ranging from preventive care and primary care to specialized treatments, surgeries, and rehabilitation services. The delivery of healthcare involves numerous stakeholders, including healthcare providers, patients, insurers, policymakers, and community organizations. Moreover, healthcare systems vary significantly in structure, funding mechanisms, and delivery models, reflecting diverse cultural, economic, and political contexts.

Despite significant advancements in medical science and technology, healthcare systems face numerous challenges in delivering high-quality, accessible, and cost-effective care. Common challenges include.

- Access barriers: Disparities in access to care based on socioeconomic status, geographic location, and insurance coverage.
- Fragmentation: Fragmentation of care across multiple providers and settings, leading to inefficiencies, gaps in communication, and duplication of services.
- Cost pressures: Escalating healthcare costs driven by factors such as advances in medical technology, aging populations, and chronic disease prevalence.
- Quality variations: Variations in care quality, safety, and outcomes across healthcare providers and regions, posing risks to patient safety and satisfaction.

Addressing the challenges of health service delivery requires a multifaceted approach that encompasses various dimensions of healthcare provision. Key strategies include:

- Integration of care: Promoting care integration and care coordination to ensure seamless transitions across different levels of care and healthcare settings.
- Embracing technology: Leveraging digital health solutions, telemedicine, and health information systems to improve access, efficiency, and communication in healthcare delivery.
- Patient-centered care: Adopting a patient-centered approach that prioritizes the preferences, needs, and values of patients and engages them as active partners in their care.
- Value-based care: Shifting towards value-based payment models that incentivize quality, outcomes, and efficiency rather than volume of services provided.
- Continuous improvement: Cultivating a culture of continuous learning, innovation, and quality improvement where feedback, data analysis, and best practices drive ongoing optimization of health service delivery.

Optimizing health service delivery requires collaboration and partnership among various stakeholders, including healthcare providers, policymakers, payers, patients, and community organizations. Each stakeholder has a unique role to play in contributing to a more efficient, equitable, and patient-centered healthcare system. Collaboration and information sharing among stakeholders can facilitate the alignment of incentives, the development of innovative solutions, and the implementation of evidence-based practices to address healthcare challenges effectively.

Despite the challenges inherent in health service delivery, there are numerous opportunities for improvement and innovation. Advancements in digital health technologies, data analytics, and precision medicine offer promising avenues for enhancing efficiency, personalizing care, and improving health outcomes. Moreover, initiatives aimed at promoting health equity, addressing social determinants of health, and fostering community partnerships can help reduce disparities in access and outcomes and promote health and well-being for all.

2.4 Lean Six Sigma

In the pursuit of delivering high-quality care efficiently, healthcare organizations are increasingly turning to Lean Six Sigma methodologies as a transformative approach. Originating from the realms of manufacturing and quality management, Lean Six Sigma offers a comprehensive framework for identifying inefficiencies, reducing waste, and improving processes.

Lean Six Sigma combines two powerful methodologies Lean thinking and Six Sigma principles to achieve operational excellence and quality improvement. Rooted in the Toyota Production System, Lean thinking emphasizes the elimination of waste and the optimization of value streams. It identifies and eliminates non - value added activities, such as unnecessary waiting times and redundant tasks, to streamline workflows and enhance efficiency. Six Sigma focuses on reducing variation and defects in processes through data-driven analysis and problem-solving. It aims to achieve process improvement by identifying root causes of errors and implementing targeted interventions to enhance process performance and reliability.

Lean Six Sigma methodologies have found wide-ranging applications across various domains within healthcare settings. In hospital operations, Lean Six Sigma initiatives have been used to reduce emergency department wait times, improve surgical throughput, and optimize supply chain management. By streamlining processes and eliminating waste, healthcare organizations have achieved significant improvements in efficiency, resource utilization, and patient satisfaction. Lean Six Sigma has been applied to enhance medication safety, reduce medical errors, and improve care coordination. By standardizing protocols, implementing technology-enabled solutions, and optimizing workflows, healthcare providers have delivered safer, more reliable care to patients. Administrative functions within healthcare organizations, such as billing, scheduling, and documentation, have also benefited from Lean Six Sigma initiatives. By reducing paperwork, streamlining data entry processes, and optimizing workflow design, healthcare organizations have achieved time savings, cost reductions, and accuracy improvements in administrative processes.

The adoption of Lean Six Sigma methodologies in healthcare offers several tangible benefits. By eliminating waste and streamlining processes, healthcare organizations can achieve faster turnaround times, reduced wait times, and increased capacity to serve patients.

Minimizing errors, defects, and variation in care delivery improves patient safety, outcomes, and satisfaction. Eliminating waste reduces unnecessary spending on resources, materials, and labor, contributing to overall cost containment and financial sustainability. Involving frontline staff in identifying and addressing waste fosters a sense of ownership, empowerment, and commitment to continuous improvement.

While Lean Six Sigma holds great promise for healthcare improvement, challenges remain in its implementation. Resistance to change, lack of leadership support, and insufficient training are common barriers that organizations encounter. Moreover, the unique complexity and variability of healthcare processes present additional challenges compared to manufacturing environments.

2.5 *Research Method*

The methodology employed in this research aims to provide a structured and systematic approach to applying Lean Six Sigma principles in healthcare settings, with the overarching goal of optimizing health service efficiency. The methodology encompasses several key steps, from problem identification to solution implementation and evaluation, ensuring a comprehensive and data-driven approach to process improvement.

The first step in the methodology involves identifying specific areas within health service delivery where inefficiencies and non - value added activities are prevalent. Through stakeholder consultations, literature review, and data analysis, the research team defines the scope of the study and identifies key performance metrics for evaluation. This initial phase lays the foundation for subsequent steps by establishing clear objectives and priorities for process improvement.

Once the problem areas are identified, the research proceeds to conduct process mapping exercises and collect relevant data on the identified healthcare processes. Process mapping involves visualizing and documenting the current state of processes, including workflow, resource utilization, and key performance indicators. Data collection methods may include direct observation, interviews with stakeholders, review of electronic health records, and utilization of process improvement tools such as value stream mapping.

With the data collected, the research team conducts a comprehensive analysis of the identified healthcare processes using Lean Six Sigma methodologies. Statistical tools, process capability analysis,

and root cause analysis techniques are employed to identify patterns, trends, and underlying causes of inefficiencies. By identifying root causes of waste and non - value added activities, the research team gains insights into opportunities for improvement and develops targeted interventions.

Based on the findings of the analysis phase, the research team collaborates with stakeholders to design and implement solutions aimed at reducing non - value added activities and enhancing efficiency. Lean Six Sigma principles guide the development of solutions focused on streamlining workflows, eliminating waste, and improving resource utilization. Solutions may include process redesign, standardization of protocols, implementation of technology-enabled solutions, and staff training initiatives.

Following the implementation of solutions, the research conducts a thorough evaluation of their effectiveness in improving health service efficiency. Key performance indicators such as process cycle time, resource utilization, and staff satisfaction are monitored to assess the impact of the interventions. Feedback from stakeholders is solicited to identify further opportunities for improvement and refinement. This iterative process of evaluation and continuous improvement ensures that the research generates tangible results and fosters a culture of ongoing excellence within the healthcare organization.

Throughout the research process, meticulous documentation of methodologies, findings, and outcomes is maintained to facilitate knowledge sharing and dissemination. Research reports, presentations, and publications serve as valuable resources for sharing insights, lessons learned, and best practices with other healthcare organizations and stakeholders. By documenting and sharing the research findings, the methodology contributes to the broader body of knowledge on Lean Six Sigma applications in healthcare quality improvement.

3. RESULTS AND DISCUSSIONS

3.1 Result

Through a comprehensive analysis of healthcare processes, including extensive data collection, root cause identification, and impact assessment, several non - value added activities have been identified, shedding light on their underlying causes and their significant impact on healthcare processes. Non - value added activities identified through the analysis encompass a wide range of inefficiencies, redundancies, and delays that detract from the overall effectiveness of care delivery.

Redundant documentation requirements, multiple data entry points, and paper-based processes contribute to administrative burden and waste valuable time and resources. Lack of standardized communication protocols, reliance on outdated communication technologies, and poor coordination among healthcare teams lead to delays, errors, and inefficiencies in care delivery. Patient wait times for appointments, test results, or consultations due to inefficient scheduling, inadequate resource allocation, and lack of capacity management. Duplication of efforts, unnecessary handoffs, and overutilization of resources contribute to inefficiencies and waste within healthcare processes.

The root causes of non - value added activities are multifaceted and often stem from organizational, cultural, and systemic factors within healthcare organizations. Siloed organizational structures, lack of interdisciplinary collaboration, and disjointed care processes impede communication, coordination, and efficiency. Outdated technology infrastructure, resistance to change, and entrenched cultural norms perpetuate inefficient practices and hinder innovation and improvement efforts. Overly burdensome documentation requirements, complex regulatory frameworks, and compliance-driven practices contribute to administrative overhead and detract from direct patient care.

The impact of non - value added activities on healthcare processes is profound and far-reaching, affecting efficiency, quality, and patient outcomes. Non - value added activities consume valuable resources, including time, labor, and supplies, without generating commensurate value for patients or stakeholders, leading to increased operational costs and financial strain on healthcare organizations. Excessive paperwork, fragmented communication, and redundant tasks divert healthcare providers' time and attention away from direct patient care, reducing productivity and contributing to burnout

and dissatisfaction. Non - value added activities introduce opportunities for errors, defects, and adverse events, compromising patient safety, outcomes, and satisfaction. Fragmented communication, delays in care, and redundant tasks increase the risk of medical errors and adverse outcomes.

3.2 *Discussion*

3.2.1 Results in the context of Lean Six Sigma principles and healthcare quality improvement

The findings of the analysis, viewed through the principles of Lean Six Sigma, offer valuable insights into opportunities for healthcare quality improvement. Lean Six Sigma principles emphasize the elimination of waste, or "muda," in processes. The identified non - value added activities, such as excessive paperwork, fragmented communication, and unnecessary waiting, represent forms of waste that detract from the efficiency and effectiveness of healthcare processes. By targeting these areas for improvement, healthcare organizations can streamline workflows, reduce cycle times, and optimize resource utilization, leading to significant gains in efficiency and productivity.

Standardization is a core tenet of both Lean and Six Sigma methodologies. Standardizing processes helps reduce variation, improve consistency, and enhance reliability in care delivery. The root causes of non - value added activities, such as fragmented workflows and legacy systems, underscore the importance of standardizing protocols, procedures, and workflows to minimize errors and ensure predictable outcomes. By implementing standardized practices and protocols, healthcare organizations can achieve greater uniformity, efficiency, and quality in care delivery.

Continuous improvement lies at the heart of Lean Six Sigma philosophy. The identification of non - value added activities and their root causes provides a foundation for ongoing improvement efforts. By fostering a culture of continuous learning, innovation, and data-driven decision-making, healthcare organizations can systematically identify opportunities for improvement, implement targeted interventions, and monitor the impact of changes over time. Through iterative cycles of improvement, healthcare organizations can achieve sustainable gains in efficiency, quality, and patient satisfaction.

Lean Six Sigma principles align closely with the concept of patient-centered care, which emphasizes the importance of meeting patients' needs, preferences, and expectations. The impact of non - value added activities on healthcare processes, such as increased wait times and compromised quality, directly affects patient experience and satisfaction. By addressing these inefficiencies, healthcare organizations can enhance patient access, responsiveness, and satisfaction, ultimately improving patient outcomes and loyalty.

Data-driven decision-making is a fundamental aspect of both Lean Six Sigma and healthcare quality improvement. The analysis of non - value added activities and their impact on healthcare processes provides valuable data and insights for decision-making. By leveraging data analytics, performance metrics, and key performance indicators, healthcare organizations can prioritize improvement opportunities, track progress, and measure the impact of interventions on efficiency, quality, and patient outcomes.

3.2.2 Implications of Findings for Healthcare Providers, Patients, and Stakeholders

The findings of the analysis hold significant implications for healthcare providers, patients, and other stakeholders, offering insights into opportunities for improvement and optimization in healthcare delivery. For healthcare providers, the findings underscore the importance of streamlining workflows, reducing administrative burden, and optimizing resource utilization. By addressing non - value added activities, such as excessive paperwork and fragmented communication, healthcare providers can reclaim valuable time and focus on delivering high-quality, patient-centered care. Moreover, by fostering a culture of continuous improvement and innovation, healthcare providers can engage frontline staff in identifying opportunities for improvement and implementing targeted interventions to enhance efficiency and effectiveness in care delivery.

For patients, the implications of the findings are profound, as they directly impact access to care, quality of care, and overall patient experience. Non - value added activities, such as unnecessary waiting and compromised quality, contribute to delays, dissatisfaction, and suboptimal outcomes for patients. By addressing these inefficiencies, healthcare organizations can improve patient access,

responsiveness, and satisfaction, ultimately enhancing patient outcomes and loyalty. Moreover, by prioritizing patient-centered care and engaging patients as partners in their care, healthcare organizations can ensure that services are tailored to meet patients' needs, preferences, and expectations.

In addition to healthcare providers and patients, other stakeholders, such as policymakers, payers, and community organizations, also stand to benefit from the implications of the findings. By optimizing healthcare delivery and improving efficiency, healthcare organizations can achieve cost savings, enhance resource allocation, and improve overall system performance. Moreover, by fostering collaboration and partnership among stakeholders, healthcare organizations can leverage collective expertise and resources to address systemic challenges, reduce disparities in access and outcomes, and promote health equity and social justice.

4 CONCLUSION

This research has provided valuable insights into the application of Lean Six Sigma principles in optimizing health service delivery. Through a systematic analysis of healthcare processes, including the identification of non - value added activities, root cause analysis, and impact assessment, significant opportunities for improvement have been identified. The findings underscore the critical importance of addressing inefficiencies, streamlining workflows, and enhancing quality and patient satisfaction in healthcare delivery. By aligning with Lean Six Sigma principles, healthcare organizations can drive transformative change and achieve sustainable improvements in efficiency, effectiveness, and patient outcomes. The principles of waste reduction, process standardization, continuous improvement, and patient-centered care provide a framework for guiding improvement efforts and achieving tangible results. Furthermore, the implications of the findings extend beyond healthcare providers to patients, policymakers, payers, and other stakeholders. By optimizing healthcare delivery and improving efficiency, healthcare organizations can enhance access, quality, and value for patients while achieving cost savings and system-wide improvements. Through collaboration, innovation, and a commitment to excellence, stakeholders can work together to build a healthcare system that is responsive, equitable, and patient-centered. As healthcare continues to evolve in response to changing demographics, technological advancements, and societal needs, the integration of Lean Six Sigma principles offers a pathway to achieving the goals of quality improvement, cost containment, and patient satisfaction. By embracing these principles and fostering a culture of continuous improvement, healthcare organizations can drive innovation, enhance value delivery, and ultimately improve the health and well-being of individuals and communities.

REFERENCES

Ahmed, S., Abd Manaf, N. H., & Islam, R. (2018). Effect of Lean Six Sigma on quality performance in Malaysian hospitals. *International Journal of Health Care Quality Assurance*, *31*(8), 973–987.

Atallah, Z. Ben, & Ramudhin, A. (2010). Improving healthcare reliability by integrating Six-sigma in a business process modeling and analysis strategy. *2010 IEEE International Conference on Industrial Engineering and Engineering Management*, 2234–2238.

Bell, S. C., & Orzen, M. A. (2016). *Lean IT: Enabling and sustaining your lean transformation*. CRC Press.

Blijleven, V., Koelemeijer, K., Wetzels, M., & Jaspers, M. (2017). Workarounds emerging from electronic health record system usage: consequences for patient safety, effectiveness of care, and efficiency of care. *JMIR Human Factors*, *4*(4), e7978.

De Mast, J., & Lokkerbol, J. (2012). An analysis of the Six Sigma DMAIC method from the perspective of problem solving. *International Journal of Production Economics*, *139*(2), 604–614.

Dogan, O., & Gurcan, O. F. (2018). Data perspective of lean six sigma in industry 4.0 era: A guide to improve quality. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 943–953.

Forbes, L. H., & Ahmed, S. M. (2010). *Modern construction: lean project delivery and integrated practices*. CRC press.

Frankel, A., Gandhi, T. K., & Bates, D. W. (2003). Improving patient safety across a large integrated health care delivery system. *International Journal for Quality in Health Care*, *15*(suppl_1), i31–i40.

Furterer, S. L. (2018). Applying Lean Six Sigma methods to reduce length of stay in a hospital's emergency department. *Quality Engineering*, *30*(3), 389–404.

Graban, M. (2018). *Lean hospitals: improving quality, patient safety, and employee engagement*. Productivity Press.

Kagermann, H. (2014). Change through digitization—Value creation in the age of Industry 4.0. In *Management of permanent change* (pp. 23–45). Springer.

Kitson, A., Brook, A., Harvey, G., Jordan, Z., Marshall, R., O'Shea, R., & Wilson, D. (2018). Using complexity and network concepts to inform healthcare knowledge translation. *International Journal of Health Policy and Management*, *7*(3), 231.

Kothari, M. (2020). *Using Six Sigma DMAIC Methodology to enhance medicines management within UK care homes: improving the 28-day supply of medicines cycle for resident repeat medications*. Aston University.

Nates, J. L., Nunnally, M., Kleinpell, R., Blosser, S., Goldner, J., Birriel, B., Fowler, C. S., Byrum, D., Miles, W. S., & Bailey, H. (2016). ICU admission, discharge, and triage guidelines: a framework to enhance clinical operations, development of institutional policies, and further research. *Critical Care Medicine*, *44*(8), 1553–1602.

Organization, W. H. (2000). *The world health report 2000: health systems: improving performance*. World Health Organization.

Organization, W. H. (2013). *Health 2020: A European policy framework and strategy for the 21st century*. World Health Organization. Regional Office for Europe.

Paul, S. M., Mytelka, D. S., Dunwiddie, C. T., Persinger, C. C., Munos, B. H., Lindborg, S. R., & Schacht, A. L. (2010). How to improve R&D productivity: the pharmaceutical industry's grand challenge. *Nature Reviews Drug Discovery*, *9*(3), 203–214.

Protzman, C., Mayzell, G., & Kerpchar, J. (2010). *Leveraging lean in healthcare: Transforming your enterprise into a high quality patient care delivery system*. CRC Press.

Radnor, Z. J., Holweg, M., & Waring, J. (2012). Lean in healthcare: the unfilled promise? *Social Science & Medicine*, *74*(3), 364–371.

Ramudhin, A., Chan, E., & Mokadem, A. (2006). A framework for the modelling, analysis and optimization of pathways in healthcare. *2006 International Conference on Service Systems and Service Management*, *1*, 698–702.

Reynolds, T. A., Sawe, H., Rubiano, A. M., Shin, S. Do, Wallis, L., & Mock, C. N. (2018). *Strengthening health systems to provide emergency care*.

Sciences, N. A. of, Division, M., Services, B. on H. C., Health, B. on G., & Globally, C. on I. the Q. of H. C. (2018). *Crossing the global quality chasm: improving health care worldwide*.

Smith, D., & Blakeslee, J. (2002). *Strategic Six Sigma: Best practices from the executive suite*. John Wiley & Sons.

Suman, G., & Prajapati, D. R. (2018). Statistical analysis of the researches carried out on Lean and Six Sigma applications in healthcare industry. *International Journal of Quality Engineering and Technology*, *7*(1), 1–38.

Sweeney, B., & Business, C. (2017). *Lean Six Sigma QuickStart Guide: The Simplified Beginner's Guide to Lean Six Sigma*. ClydeBank Media LLC.

Tlapa, D., Zepeda-Lugo, C. A., Tortorella, G. L., Baez-Lopez, Y. A., Limon-Romero, J., Alvarado-Iniesta, A., & Rodriguez-Borbon, M. I. (2020). Effects of lean healthcare on patient flow: a systematic review. *Value in Health*, *23*(2), 260–273.

Vest, J. R., & Gamm, L. D. (2009). A critical review of the research literature on Six Sigma, Lean and StuderGroup's Hardwiring Excellence in the United States: the need to demonstrate and communicate the effectiveness of transformation strategies in healthcare. *Implementation Science*, *4*, 1–9.

Vivekananthamoorthy, N., & Sankar, S. (2011). Lean six sigma. In *Six Sigma Projects and Personal Experiences*. IntechOpen.

Wang, M. C., Hyun, J. K., Harrison, M. I., Shortell, S. M., & Fraser, I. (2006). Redesigning health systems for quality: lessons from emerging practices. *The Joint Commission Journal on Quality and Patient Safety*, *32*(11), 599–611.

Yeh, H.-L., Lin, C.-S., Su, C.-T., & Wang, P.-C. (2011). Applying lean six sigma to improve healthcare: An empirical study. *African Journal of Business Management*, *5*(31), 12356.