RESUMO

Objetivo: identificar, por meio de revisão integrativa de literatura, as ferramentas utilizadas e os resultados obtidos na implementação do Lean Healthcare em serviços de saúde hospitalares.

Métodos: os dados foram coletados nas seguintes bases de dados: MEDLINE, LILACS e IBECS. Incluíram-se estudos publicados entre 2010 e 2020, em língua portuguesa, inglesa ou espanhola e com textos completos. A estratégia de busca utilizou o cruzamento dos descritores: gestão em saúde, eficiência organizacional, hospital e Lean Healthcare, que selecionou 24 artigos.

Resultados: doze ferramentas diferentes foram utilizadas para implementação do Lean Healthcare em serviços hospitalares e todos os estudos mostraram resultados positivos com a aplicação da metodologia, que se mostrou possível e eficaz naqueles serviços. As principais ferramentas utilizadas para implementação foram o Mapa de Fluxo de Valor e Define, Measure, Analyze, Improve e Control, e os resultados mais relevantes foram diminuição do tempo de espera dos clientes e maior eficiência nos processos. Conclusão: notou-se que a implementação do Lean como estratégia organizacional ainda é um desafio e há a necessidade de capacitar e instrumentalizar os profissionais da saúde para isso.

Descritores: Gestão em Saúde; Eficiência Organizacional; Hospitais; Gestão de Qualidade Total; Lean Healthcare.

ABSTRACT

Objective: to identify, through integrative literature review, the tools used and the results obtained in the implementation of Lean Healthcare in hospital healthcare services. Methods: data were collected from the following databases: MEDLINE, LILACS and IBECS. We included studies published between 2010 and 2020, in Portuguese, English or Spanish language and with full texts. The search strategy used the crossing of the descriptors: healthcare management, organizational efficiency, hospital and Lean Healthcare, which selected 24 articles. Results: twelve different tools were used to implement Lean Healthcare in hospital services and all studies showed positive results.
with the application of the methodology, which proved to be possible and effective in those services. The main tools used for the implementation were the Value-Stream Mapping and Define, Measure, Analyze, Improve and Control, and the most relevant results were decreased waiting time of customers and increased process efficiency. Conclusion: we noted that the implementation of Lean as an organizational strategy is still a challenge and there is a need to train and empower healthcare professionals for this process. 

Descriptors: Health management; Organizational Efficiency; Hospitals; Total Quality Management; Lean Healthcare.

**RESUMEN**

**Objetivo:** identificar, mediante una revisión bibliográfica integradora, las herramientas utilizadas y los resultados obtenidos en la implantación del Lean Healthcare en los servicios hospitalarios de salud. **Métodos:** los datos se recogieron de las siguientes bases de datos: MEDLINE, LILACS e IBFCS. Se incluyeron los estudios publicados entre 2010 y 2020, en portugués, inglés o español y con textos completos. La estrategia de búsqueda utilizó el cruce de los descriptores: gestión en salud, eficiencia organizativa, hospital y Lean Healthcare, que seleccionó 24 artículos. **Resultados:** se utilizaron doce herramientas diferentes para implantar el Lean Healthcare en los servicios hospitalarios y todos los estudios mostraron resultados positivos con la aplicación de la metodología, que resultó ser posible y efectiva en esos servicios. Las principales herramientas utilizadas para la implantación fueron el Mapa del Flujo de Valor y Define, Measure, Analyze, Improve y Control, y los resultados más relevantes fueron la disminución del tiempo de espera de los clientes y una mayor eficiencia en los procesos. **Conclusión:** se nota que la implementación del Lean como estrategia organizativa sigue siendo un reto y que es necesario capacitar e instrumentalizar a los profesionales de la salud para ello. 

**Descripores:** Gestión Sanitaria; Eficiencia Organizativa; Hospitales; Gestión de la Calidad Total; Lean Healthcare.

1,2Federal University of São Paulo/UNIFESP. São Paulo (SP), Brasil.1@https://orcid.org/0000-0003-3670-7502 2@https://orcid.org/0000-0003-3757-1061

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INTRODUCTION

Over the past years, healthcare organizations have been impacted by rapid and profound transformations, with a view to meeting the demands of an increasingly exigent clientele and higher costs.\(^1\)

Considering that the Brazilian health system is in crisis, where costs increase year after year and revenues remain practically static or even decrease, hospitals need to be efficient to survive.\(^2\)

In this scenario, it is necessary to look for methodologies that can help hospital management in general, including Lean, a methodology based on concepts, principles and tools used to create and provide maximum value from the point of view of consumers and, at the same time, consume the minimum amount of resources.\(^3\)

The concept of Lean Healthcare, Lean applied to healthcare, consists of the commitment of the people involved in an organizational culture to use scientific methods to plan, execute and continuously improve the work and service environment, generating more value to the patient and reducing process waste.\(^4\)

Thus, in recent years, discussions have focused on the potential of applying principles and practices derived from Lean systems to healthcare services, given the greater efficiency they can provide.\(^5\) Since then, Lean Healthcare has been used by healthcare professionals and managers in many countries to improve efficiency, clinical outcomes, satisfaction and safety for both employees and patients.\(^6\)

Among the countries that stand out in their experiences with Lean Healthcare, we can mention the United States, with Virginia Mason Medical Center (Seattle), Thedacare (Wisconsin), and Martin Health System (Florida); Sweden, with Astrid Lindgren Children’s Hospital; the United Kingdom, with Bolton Hospitals; and Australia, with Flinders Medical Centre.\(^6\)

In Brazil, successful experiences with this methodology can be seen at Hospital Israelita Albert Einstein (HIAE) and Hospital São Camilo, in São Paulo; as well as at Rede D’Or São Luiz, in Rio de Janeiro.\(^7\)

Although the literature on Lean Healthcare is extensive and available, there are gaps about how to implement it, which makes it difficult to recognize which techniques or application methods are best suited to the characteristics of healthcare operations.\(^8\)

Thus, in order to contribute and add efforts to the development of hospital management, this study proposed to identify, through the pertinent literature, the publications on the tools used and the results obtained in the implementation of Lean Healthcare in Hospital Healthcare Services.

Studies and research that aim to instrumentalize and support the knowledge about the ways of implementing Lean Healthcare are of real importance for the continuous enhancement and im-
Improvement of hospital processes, generating direct impact on the quality of care and sustaining the business.

**OBJECTIVE**

To identify, by means of an integrative literature review, the tools used and the results obtained in the implementation of Lean Healthcare in hospital healthcare services.

**METHOD**

This is an integrative literature review, a method that includes the analysis and synthesis of research in a systematic way, contributes to the deepening of the investigated theme and helps in the decision-making process and the improvement of clinical practice based on the results of pre-existing research.⁹

In order to prepare this integrative review, we complied with all the recommended phases, namely: first phase - elaboration of the guiding question; second phase - literature search or sampling; third phase - data collection; fourth phase - critical analysis of the included studies; fifth phase - discussion and interpretation of results; and sixth phase - presentation of the integrative review.¹⁰

The guiding question, developed using the PICo strategy, was: What are the tools used and the results obtained with the implementation of Lean Healthcare in Hospital Healthcare Services? Where, Population/Problem (P) = implementation of Lean Healthcare; Interest (I) = tools used and results obtained; and Context (Co) = hospital healthcare services.¹¹ Thus, the research question was established as follows: What are the tools used and the results obtained with the implementation of Lean Healthcare in hospital healthcare services?

The search took place from February to March 2020 through the Virtual Health Library (VHL), in the following databases: Medical Literature Analysis and Retrieval System Online (MEDLINE); Latin American and Caribbean Health Sciences Literature (LILACS); Índice Bibliográfico Español en Ciencias de la Salud (IBECS) and Banco de Dados em Enfermagem (BDENF).

As a search strategy, we selected the following descriptors in the Descritores em Ciências da Saúde (DeCS): health management, organizational efficiency and hospital. The keyword Lean Healthcare was added to the descriptors. Using the Boolean operator AND, the three descriptors and the keyword were crossed in the following way: health management AND organizational efficiency AND hospital AND Lean Healthcare. The fields of title, abstract, subject were selected for the accomplishment of our search.

Using the filters present in the search engine, we managed to select the articles according to the following inclusion criteria: studies published between 2010 and 2020, in Portuguese, English, and
Spanish, and with full texts available. We chose the 10-year period because we considered that the evolution of the Lean methodology in healthcare occurred during this period.

Through the search strategy, 484 articles were initially identified in the databases. Two articles, identified by another form of search, were included because they dealt with the theme of the study in a relevant way, totaling 486 articles. No duplications were found, but 452 papers were excluded after applying the filters for the inclusion criteria. After reading the abstracts of the 34 remaining articles, 10 were excluded for not meeting the objective of the work, i.e., for not presenting the tool used and the results obtained in the implementation of the Lean methodology. After reading the full text, the final sample was composed of 24 articles. The article selection process is described in the flowchart (Figure 1), designed according to the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).  

![Adapted PRISMA Flowchart](image)

**Figure 1 - Adapted PRISMA Flowchart. Poços de Caldas, MG, Brazil, 2020.**

In order to perform the analysis and the subsequent synthesis of the 24 articles, we categorized them considering the following variables: article title, authors, publication year, implementation tool adopted and results obtained.

The presentation of the results and discussion of the data obtained was descriptive, enabling the reader to evaluate the applicability of the integrative review and achieving the objective of this method to positively impact management practice and provide subsidies to health managers for their daily decision-making processes.

In order to evaluate the methodological quality of the selected articles, we used the classification listed by the Agency for Healthcare Research and Quality (AHRQ), whose gradations are dis-
tributed into six levels of evidence. Level 1 includes meta-analysis studies of multiple controlled studies; level 2 includes individual studies with experimental design; level 3 includes quasi-experimental or case-control studies; level 4 includes non-experimental studies; level 5 includes case reports of verifiable quality or program evaluation; and level 6 includes opinions of authorities, expert committees, as well as interpretations of information not based on research.12

RESULTS

Of the 24 articles selected, 21 (87.5%) were published in English, two (8.33%) in Portuguese and one (4.17%) in Spanish. With regard to the region/country of origin of the studies, most were conducted in North America (54%), followed by Europe (25%), Brazil (12.5%) and others (8.4%).

There was a homogeneous distribution of articles among the years of research, without increase in the number of publications over the years. In the years 2011, 2014, 2017 and 2018, four articles were published (16.6%); in the year 2016, three articles (12.5%); in the year 2012, two articles (8.33%); and in the years 2010, 2013 and 2015, one article (4.16%). The articles were published in 17 different journals, highlighting Quality Management in Health Care, with four publications (16.6%), and The Journal of Nursing Administration, with two publications (8.33%).

Regarding the level of evidence of the selected articles, all reached level 5, since they are case and experience reports.12 This finding allows us to identify the need for advances in the methodological designs of studies involving Lean Healthcare, with the production of more robust evidence to support its implementation.

The synthesis of the studies included in the review is presented in Figure 2.

<table>
<thead>
<tr>
<th>Title/Authors/publication year</th>
<th>Lean Healthcare Implementation Tools</th>
<th>Main results obtained with the implementation of Lean Healthcare</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMAIC*</td>
<td></td>
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<td></td>
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<tr>
<td>Kaizen</td>
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<tr>
<td>VSM†</td>
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</tr>
<tr>
<td>5S†</td>
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<tr>
<td>Aplicación de la metodología Lean healthcare en un servicio de urología de un hospital terciario como herramienta de</td>
<td>Kaizen</td>
<td>Improved professional satisfaction, improved quality indicators, reaching very low complication rates (0.59) and mortality (0.24) in 4 years. In the efficiency indicator named IEAR (re-</td>
</tr>
<tr>
<td>Title</td>
<td>Method</td>
<td>Description</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Mejora de la eficiencia. Boronat F, et al. 2018.15</td>
<td></td>
<td>Sources application, as per its Portuguese acronym, savings of 2,869 stays compared to the National Benchmarking (IASIST, as per its Portuguese acronym). The IRAR (readmissions index, as per its Portuguese acronym) was the only indicator above the standard, but with an evolutionary improvement throughout the year.</td>
</tr>
<tr>
<td>Implementing Lean Management Techniques at a Radiation Oncology Department. Al-Balushi MM e Al-Mandhari Z. 2018.16</td>
<td>Heijunka, VSM, 3MUS</td>
<td>Elimination of waste sources, smoother transition process from two treatment units to a single one, improving flow and workload predictability.</td>
</tr>
<tr>
<td>A Lean Tool Supporting Continuous Improvement at Intermountain. Scott JL e Huntingdon JL. 2017.17</td>
<td>VSM</td>
<td>Identification of inefficient areas.</td>
</tr>
<tr>
<td>Applying Systems Engineering Reduces Radiology Transport Cycle Times in the Emergency Department. White BA, et al. 2017.18</td>
<td>VSM</td>
<td>After 3 months of intervention, there was a 15% reduction in the average radiological transport time, from 28.7 ± 4.2 minutes to 24.3 ± 3.3 minutes (p = 0.021). In the following 6 months, there was a 19% reduction to 23.3 ± 3.5 minutes (p = 0.003). After 1 year of intervention, there was a 26% reduction to 21.3 ± 3.1 minutes (p = 0.0001).</td>
</tr>
<tr>
<td>Effect of Lean Processes on Surgical Wait Times and Efficiency in a Tertiary Care Veterans Affairs Medical Center. Valsangkar NP, et al. 2017.20</td>
<td>VSM</td>
<td>Reduction in waiting time for surgical procedures from 33.4 days in 2012 to 26 days in 2013 (p = 0.02). Operative volume increased from 931 patients in year 2012 to 1,090 in year 2013 and 1,072 in year 2014. Clinical encounters, tele-health and electronic consultation increased from 3,131 in year 2012 to 3,460 in year 2013 and 3,517 in year 2014. The number of absences decreased from 366 in the year 2012 to 227 in the year 2014 (p = 0.02).</td>
</tr>
<tr>
<td>Decreasing the dispatch time of medical reports sent from hospital to primary care with Lean Six Sigma. Basta YL, et al. 2016.21</td>
<td>DMAIC</td>
<td>Identification of the causes for the prolonged waiting time. Adequacy and improvement of the process, with reduction of the waiting time for sending medical reports (90.6% of the reports started to be sent on the same day of the visit).</td>
</tr>
<tr>
<td>Decreasing Turnaround Time and Increasing Patient Satisfaction in a Safety Net Hospital-Based Pediatrics Clinic Using Lean Six Sigma Methodologies. Jayasinha, Y. 2016.22</td>
<td>Flowchart, VSM</td>
<td>Reduced waiting time. After implementation, the total cycle time of the service was reduced from 113 to 90 minutes. Patient satisfaction rates increased from 87% to 95%.</td>
</tr>
<tr>
<td>Lean Manufacturing Improves Emergency Department Throughput and Patient Satisfaction. Kane M, et al. 2015.24</td>
<td>A3, VSM, 5S</td>
<td>Reduced time to find and distribute supplies per patient. Reduced waiting time for transfers. Adequacy of the screening and priority setting process. Reduced overall patient wait time. Improved integration of leadership with pro-</td>
</tr>
<tr>
<td><strong>Mejora del proceso de un servicio de urgencias de hospital mediante la metodología Lean.</strong> Tejedor-Panchón F, et al. 2014.25</td>
<td>DMAIC, VSM, 5W2H&lt;sup&gt;11&lt;/sup&gt;</td>
<td>Reduction of waiting time. Reduction in the average length of stay. Reduction in the number of patients who did not receive care.</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td><strong>Lean methodology improves efficiency in outpatient academic uro-oncology clinics. Skeldon SC, et al. 2014.26</strong></td>
<td>VSM, PDCA&lt;sup&gt;3&lt;/sup&gt;</td>
<td>The average cycle time (from arrival to discharge) was 46 minutes before Lean. After 60 days, this time decreased to 35 minutes; and, after 90 days, to 41 minutes. Wait times dropped, allowing increased time for medical and nursing care. The average length of the medical evaluation increased from 7.5 to 10.6 minutes in 90 days. The average proportion of value-added time compared to the entire clinical visit increased from 30.6% to 66.3% in 90 days.</td>
</tr>
<tr>
<td><strong>Structured Syncope Care Pathways Based on Lean Six Sigma Methodology Optimises Resource Use with Shorter Time to Diagnosis and Increased Diagnostic Yield. Martens L, et al. 2014.28</strong></td>
<td>PDCA, 5W2H</td>
<td>A 59% decrease in the average diagnostic time (p = 0.048) and a 75% increase in diagnostic yield (p = 0.007). There was a marked reduction in repeat diagnostic testing and better prioritization of indicated tests.</td>
</tr>
<tr>
<td><strong>Lean methodology: an evidence-based practice approach for healthcare improvement. Johnson PM, et al. 2013.29</strong></td>
<td>A3, Gemba, Kaizen, PDCA</td>
<td>Improved flow of care. Reduction of readmissions. The impact of leadership on the obtained results was evident.</td>
</tr>
<tr>
<td><strong>From Toyota to the bedside: nurses can lead the Lean way in health care reform. Johnson JE, et al. 2012.30</strong></td>
<td>Kanban, 5S</td>
<td>With nurses as Lean project leaders, greater process efficiency and reduced waiting times in the Emergency Department were reached. Optimization of the Operating Room. Reduced waste and improved flow of care in both sectors.</td>
</tr>
<tr>
<td><strong>Applying Toyota production system techniques for medication delivery: improving hospital safety and efficiency. Newell TL, et al. 2011.32</strong></td>
<td>DMAIC, Kaizen</td>
<td>Improved nursing satisfaction by 28% in the surgical unit and 44.6% in the neurological unit. Reduced nursing waiting time for administered medications and increased efficiency in the pharmacy sector.</td>
</tr>
<tr>
<td><strong>Lean thinking: can it improve the outcome of fracture neck of femur patients in a district general hospital? Yousri TA, et al. 2011.33</strong></td>
<td>VSM, PDCA</td>
<td>It was noted a 5% reduction in 30-day mortality and a 9.3% reduction in overall mortality; the result was statistically significant.</td>
</tr>
<tr>
<td><strong>Exploring the relation between process design and efficiency in</strong></td>
<td>DMAIC</td>
<td>Reduced waiting time for surgery. Greater speed in the processes. Optimization of</td>
</tr>
</tbody>
</table>
A healthcare Lean Six Sigma System for Postanesthesia Care Unit Workflow Improvement. Kuo AMH, et al. 2011.35

Applying Lean Six Sigma methodologies to improve efficiency, timeliness of care, and quality of care in an internal medicine residency clinic. Fischman D. 2010.36

<table>
<thead>
<tr>
<th>Methodology</th>
<th>DMAIC</th>
<th>VSM</th>
<th>PDCA</th>
<th>A3</th>
<th>5W2H</th>
<th>Flowchart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement in the assistance provided. Greater process efficiency.</td>
<td></td>
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</tr>
<tr>
<td>Improvement in the doctor-patient relationship; Reduction of the waiting time for a medical visit from 19 to 10 minutes. Reduction of patient absence from scheduled appointments from 29.2% to 28.1%.</td>
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</tr>
</tbody>
</table>

Figure 2 - Synthesis of the studies included in the integrative review. Poços de Caldas, MG, Brazil, 2020.

*DMAIC: Define, Measure, Analyze, Improve and Control; †VSM: Value-Stream Mapping; ‡5S: Seiri (Classification), Seiton (Order), Seiso (Cleaning), Seiketsu (Standardization), Shitsuke (Discipline); §3Mus: Muda, Mura and Muri; ¶5W2H: What, when, why, who, how, how much; ‖PDCA: Plan, Do, Check and Action.

In total, 12 tools were used in the implementation of Lean Healthcare in hospital services. The Value-Stream Mapping (VSM) was used in 62.5% of the studies; DMAIC in 41.6% of the studies; Kaizen in 25% of the studies; PDCA in 20.8% of the studies; A3 in 16.6% of the studies; 5S, Gemba and 5W2H were used in 12.5% of the studies; Heijunka and Flowcharts in 8.3% of the studies; and Kanban and 3Mus were used in 4.1% of the studies.

The number of tools used in the implementation of Lean also varied among the studies, where 50% used two tools; 20.8% one tool; 16.6% three tools; and 12.5% four tools.

As seen in Chart 1, the implementation of Lean Healthcare caused a wide variety of results in the surveyed studies, especially the reduction in waiting time of patients, cited by 54.1% of the analyzed articles. Other results that deserve to be highlighted are the greater efficiency in the processes, cited by 29.1% of the articles; general improvements in processes and increased work capacity, cited in 25% of the articles; improvement in the workflow, cited by 20.8% of the articles; and the improvement in the relationship and in the integration of the leadership with the team, cited in 16.6% of the articles.

We were struck by the fact that half of the studies did not measure the results of the implementation of Lean, which indicates the importance of applying quality indicators to translate process improvements into numbers and guide strategic decision-making processes.
DISCUSSION

The present study evidenced the use of the Lean methodology in 24 different hospital institutions, in several countries and with diversified implementation mechanisms. Once again this methodology shows impressive results in this scenario, with resource savings and leaps in service quality.37

In the context of hospital organizations, the greatest sustainability of the Lean method is directly related to implementations that involve all hospital sectors and that have a strategic character.14

In a study conducted at Thedacare, a health system with four hospitals in the state of Wisconsin, USA, the implementation of Lean as the basis of the strategy of this organization generated savings of over $27 million in just two years. The collaborative care model developed reduced overall care costs by 25%, raised customer satisfaction to 100% and improved quality and safety indicators by 88% and employee satisfaction indicators by 83%.38 This data shows that when Lean becomes the organizational strategy, the transformation can be profound.

The implementation of Lean in a strategic way, involving all hospital sectors, still seems to be a challenge, given the fragmented implementation in sectors observed in most of the selected studies. This fragmentation, however, did not prevent satisfactory results from being achieved in Emergency13,18,24,25,27,30, Internal Medicine19,21,23,28,29,32,36, Oncology14,16,26,31, Surgery20,33,35, Urology15, Pediatrics22 and Ophthalmology Departments.34

In the selected studies, we found that 12 different tools were used in the implementation of Lean. The use of tools in the implementation of Lean is crucial to support and facilitate the transition process, and the variety of tools pointed out by the literature is really diverse.39

Although the analysis of the studies does not allow us to point out the superiority of any tool in obtaining results, VSM and DMAIC deserve to be highlighted because they were the tools most used by the researchers.

VSM is a tool that is directly linked to the operationalization of the second principle of Lean: Value Stream. Also known as VSM (Value-Stream Mapping), it consists of a structured diagram that documents all the steps of the processes involved throughout the different departments to obtain a certain product or service, capturing time elements such as the duration of each step and the waiting time between them, called setup.40

DMAIC is, in turn, a continuous improvement tool, with specific roles for project leaders in order to improve processes.41,42

These tools are already known and used in the scope of Quality Management in Healthcare Services and are also effective in the implementation of the Lean methodology. Nevertheless, the latter sets a unique and systematic pace in the use of these tools, through the constant search for im-
improvements, waste reduction and the adherence to activities that add value and satisfy the customers.\textsuperscript{43}

Each tool, when well used, should add value and cooperate to reach the desired results in each process. Therefore, the tools complement each other, and for this reason they are rarely used in isolation.\textsuperscript{44}

Despite the benefits of using several tools, 20.8\% of the surveyed studies\textsuperscript{15,17,18,20,21} cited the use of only one main tool for the implementation of Lean, which is unusual and raises the possibility of methodological failure in the description of the tools or lack of knowledge about the possibilities and benefits of the association of tools.

Besides the adequate use of tools, several other factors are pointed out by studies as fundamental for the use and the implementation of the Lean methodology, among them the evaluation of existing processes, the adoption of process improvements and the monitoring of the performance of the implemented improvements.\textsuperscript{45} In this aspect, some studies draw attention to the absence of consistent data regarding the improvements reached with the application of Lean, which indicates the lack of use of quality indicators by the services and the need for training and instrumentalization not only for the implementation of the methodology, but for the monitoring of its results.

Still on important factors for the successful implementation of Lean Healthcare, a comparative study carried out in three Brazilian hospitals highlighted the following as common points with a positive impact: the support of a consulting service, definition of the flow to be worked on immediately, definition of the work team, training and qualification of the team, clear definition of the scope and goals to be achieved, consideration of the relationship between quality and productivity, and development of a continuous improvement culture.\textsuperscript{14}

In addition to these points, the need and desire to improve organizational performance by creating alternative solutions and increased team communication are also considered impacting factors.\textsuperscript{46}

Some authors also cite that, for the successful implementation of Lean projects, organizations must carefully select leaders to ensure the successful management and conduction of the project.\textsuperscript{47,48} This is because when the followers are led by leaders who actually act as facilitators, they are influenced in a positive way and can better understand the importance of the leader and even develop their own leadership.\textsuperscript{49} In this sense, the role of the leader is extremely important and is directly related to the obtained results, justifying the need for studies that seek to evaluate the influence of leadership on the results and support of Lean Healthcare.

The results of the implementation of Lean raised by this review corroborate several studies where they mention that the most evident benefits of the application of this methodology in
healthcare occur exactly in the most common problems of the system. These results bring direct and indirect benefits to all players involved in hospital care - patients, professionals and institutions.

From the point of view of patients, the most common benefits that Lean initiatives offer are: reduction in waiting time, reduction in assistance errors, greater safety for the provided care, less variability in care practices, reduction in hospitalization and length of stay, and increased quality in the provided service. For professionals, the advantages related to the increase in speed and documentation of processes, reduction of errors and reworks, reduction of waiting lines and ease in the application of activities through standardization and reduction of process variability stand out. 6,37,50

In the scope of the institution, we found several benefits in the implementation of Lean that should be highlighted, among them: greater speed and efficiency in processes, increased productivity, reduction of errors and indirect costs (stocks, administration and logistics), elimination of various forms of waste, increased quality in the provided service and better use of hospital beds with optimization of resources. 6,37,50

In general, this study showed that the Lean Healthcare methodology can be implemented with the use of simple tools, demystifying the idea that using this methodology is something difficult and complicated.

All studies showed positive results with the implementation of Lean, indicating the effectiveness of the application of this methodology in hospital services. In addition to increased productivity, reduced waiting times and improved process efficiency, Lean Healthcare also promotes a culture of commitment and safety, consequently increasing patient and staff satisfaction and bringing better results for the institution.

It is worth underlining that this review did not explore the costs involved in the implementation of Lean Healthcare, thus providing an opportunity for further research that can detail this aspect.

CONCLUSION

The study allowed us to identify that the use of the Lean Methodology in hospital healthcare services is possible, providing efficiency in work processes and contributing to the success and sustainability of services that have already adopted the methodology.

We identified that twelve tools were used in the implementation of Lean in hospital healthcare services, especially VSM, used in 62.5% of the studies, and DMAIC, used in 41.6% of the studies. Despite the different tools used for its implementation, Lean produced positive results in all studied
hospital services, highlighting the reduction in the waiting time of customers and greater efficiency in processes.

In the analysis of the studies, the use of Lean was frequently found to be fragmented, only in some hospital sectors, besides the association of few tools and the absence of quality indicators to measure the obtained results. These findings indicate that the implementation of the Lean methodology as an organizational strategy is still a challenge in hospitals, as well as the need for training and instrumentalization of professionals for its application.

In this aspect, the scarce scientific production on the theme, the different methodologies applied in the studies and the level of evidence of the existing publications may constitute factors that hinder the implementation of Lean in hospital services. Thus, it is evident the need for more studies on this theme, with more convincing methodological designs that produce evidence to support and facilitate the implementation of Lean in hospital services.

As a limitation of this study, we can identify the method used, since some articles may not have been included in the sample. Another limitation was the lack of exploration of the costs involved in the implementation of the Lean Healthcare methodology. Thus, new studies are essential to deepen the knowledge about the necessary investments in the implementation of Lean and the role of leaders in this process, since the transformation and the use of a new work philosophy are only possible with the involvement of all, starting with the leaders.

**CONTRIBUTIONS**

All authors also contributed in the conception, analysis and interpretation of the research, in the writing and critical review with intellectual contribution, and, in the approval of the final version.

**CONFLICT OF INTERESTS**

Nothing to declare.

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Correspondence
Marlene Cristina dos Santos
E-mail: msantos_27@hotmail.com

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Correspondence address
Marlene Cristina dos Santos
E-mail: msantos_27@hotmail.com

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