

Lean Healthcare in the institutional, professional, and patient perspective: an integrative review



Lean Healthcare na perspectiva institucional, profissional e do paciente: uma revisão integrativa

Lean Healthcare en la perspectiva institucional, profesional y del paciente: una revisión integrativa

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ABSTRACT

Objective: To analyze the scientific evidences in the literature about the evaluation of Lean Healthcare after its implementation.

Method: An integrative review conducted in the CINAHL, Scopus, WOS, and Embase databases, and in the PubMed portal, resulting in 18 articles published in English, Spanish and Portuguese, from 2008 to 2019.

Results: The findings were categorized into results for the institution, professional, and patient. The predominant category was institutional, with cost analysis and increased productivity, followed by the professional, with job satisfaction and leadership, and finally the patient, with satisfaction, attitudes, and behaviors.

Conclusion: This study reinforces the need to establish, for management, a systematic method of monitoring the results achieved in the *Lean Healthcare* implementation phase. Since the value in this method is defined by the patient, further research in this aspect may lead to new evidence.

Keywords: Total quality management. Quality improvement. Health management.

RESUMO

Objetivo: Analisar as evidências científicas na literatura sobre avaliação do *Lean Healthcare* após sua implantação.

Método: Revisão integrativa realizada nas bases de dados CINAHL, Scopus, WOS, Embase e no portal PubMed, resultando 18 artigos publicados nos idiomas inglês, espanhol e português, no período de 2008 a 2019.

Resultados: Os achados foram categorizados em resultados para a instituição, profissional e paciente. A categoria predominante foi a institucional, com análise de custo e aumento da produtividade, seguida do profissional, com satisfação no emprego e liderança, e por fim o paciente, com satisfação, atitudes e comportamentos.

Conclusão: Este estudo reforça a necessidade em estabelecer, para a gestão, um método sistemático de acompanhamento dos resultados alcançados na fase de implantação do *Lean Healthcare*. Sendo o valor nesse método definido pelo paciente, novas pesquisas nesse aspecto poderão levar a novas evidências.

Palavras-chave: Gestão da qualidade total. Melhoria de qualidade. Gestão em saúde.

RESUMEN

Objetivo: Analizar las evidencias científicas en la literatura sobre la evaluación de *Lean Healthcare* después de su implementación.

Método: Revisión integradora realizada en las bases de datos CINAHL, Scopus, WOS, Embase y en el portal PubMed, con la obtención de 18 artículos publicados en inglés, español y portugués, de 2008 a 2019.

Resultados: Los hallazgos se clasificaron en resultados para las categorías institucional, profesional y paciente. La categoría predominante fue la institucional, con análisis de costos y mayor productividad, seguida por la profesional, con satisfacción laboral y liderazgo y, finalmente, la del paciente, con satisfacción, actitudes y comportamientos.

Conclusión: Este estudio refuerza la necesidad de establecer, para la administración, un método sistemático de monitoreo de los resultados logrados en la fase de implementación de *Lean Healthcare*. Dado que el valor en este método es definido por el paciente, la investigación adicional en este aspecto puede conducir a nuevas pruebas.

Palabras clave: Gestión de la calidad total. Mejoramiento de la calidad. Gestión en salud.

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■ INTRODUCTION

Lean is a management philosophy derived from the Toyota System, widely applied in the industry and adapted to the health area in order to reduce costs and optimize resources through a process review to generate value for the patient⁽¹⁻²⁾.

It is an integrated system of principles, practices, tools, and techniques focused on reducing waste, synchronizing workflows and managing its variability, which, when applied in the health area, is called *Lean Healthcare*⁽³⁾.

This methodology is not simply a manufacturing technique for reducing waste and costs, but a philosophy that is applied in any type of organization and depends on several factors to achieve satisfactory results. Health institutions are complex and with many processes that can be improved with the use of the tools proposed by *Lean*⁽⁴⁾.

Lean Healthcare is based on a five-stage process that, after adapting the principles of *Lean*⁽⁵⁾, were presented as follows: *i)* defining the value of the clients to meet their needs, such as diagnostic tests and indicated therapy; *ii)* mapping the value, which includes defining activities from the beginning to the end of the process stages; *iii)* reviewing the value stream to identify waste and solve it, that is, adapting and being efficient in health care *iv)* pulling, defined by the ability to signal the pace of the activities for the following stages, with a view to avoiding stocks and; *v)* the quest for perfection, a stage that must drive the continuous improvement of *Lean Healthcare* with the care provided in a timely manner and with quality^(2,6).

Several studies present the process of implementing *Lean* in different health settings: pharmacy⁽⁷⁾, gynecology and obstetrics service⁽⁸⁾, oncology⁽⁹⁾, radiotherapy⁽¹⁰⁾, operating rooms⁽¹¹⁾, and enteral diet therapy in the medical surgical unit⁽¹²⁾.

It is worth highlighting some studies that used the principles of *Lean* and that brought benefits such as: improved workflow^(7-8,12); reduction of waste^(10,12); and increased patient and professional satisfaction^(10,13); in addition to improving the operating and financial results of the institutions^(10,12).

However, longitudinal studies to monitor the results of its long-term implementation and its consequences for institutions, teams and patients are still scarce. Systematic reviews point to the need to improve the quality of evidence, in addition to the use of clear terminology for *Lean Healthcare*, transforming the language of manufacturing into one centered on health care^(3,14-16).

Given the above and the relevance of the *Lean* philosophy for management in health institutions, and because it is a

relatively new subject, with the first publications appearing in 2002, the objective of the study was to analyze the scientific evidence in the literature on the evaluation of *Lean Healthcare* after its implementation.

■ METHOD

An integrative review study based on the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses – PRISMA⁽¹⁷⁾ guidelines and included in the identification stages of the problem; literature search; evaluation and selection; analysis and interpretation of data⁽¹⁸⁾. Therefore, the following was established as the research question: What were the results after the implementation of *Lean Healthcare* in health institutions?

The inclusion criteria considered the studies published in the last ten years (2008-2019) that address the proposed theme, and the availability of the entire text for the reader, in addition to them being written in English, Portuguese or Spanish. Editorials, letters to the editor, review studies, theses, dissertations, and studies that did not answer the research question or that described only the implementation stage of *Lean* were excluded.

The search for studies was carried out between July and September 2019, in the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Scopus, Web of Science (WOS), and Embase databases, as well as the US National Library of Medicine (PubMed) portal.

Medical Subject Headings (MeSH) were selected to search in the electronic databases. Thus, the following MeSH terms were used in the search strategy: "Total Quality Management", "Quality Improvement" and the keyword "*Lean healthcare*", defined by the authors after previous reading of the theme. The Boolean operators AND and OR were used in the crossing of the MeSH term and the keyword to expand the search for scientific evidence.

The initial search in each database, using the intersections of the search terms, according to each controlled vocabulary (MeSH, Emtree, and CINAHL titles) and keyword, resulted in 126 documents, which went through new stages of selection, represented in the flowchart in Figure 1. The search and selection of studies were carried out simultaneously by two researchers and, in situations of divergence, consensus was sought with the participation of an auxiliary researcher.

To classify the level of evidence, seven levels were considered: level I – evidence from a systematic review or meta-analysis of all the relevant and randomized controlled trials or from guidelines based on systematic reviews of randomized controlled trials; level II – evidence obtained from at least

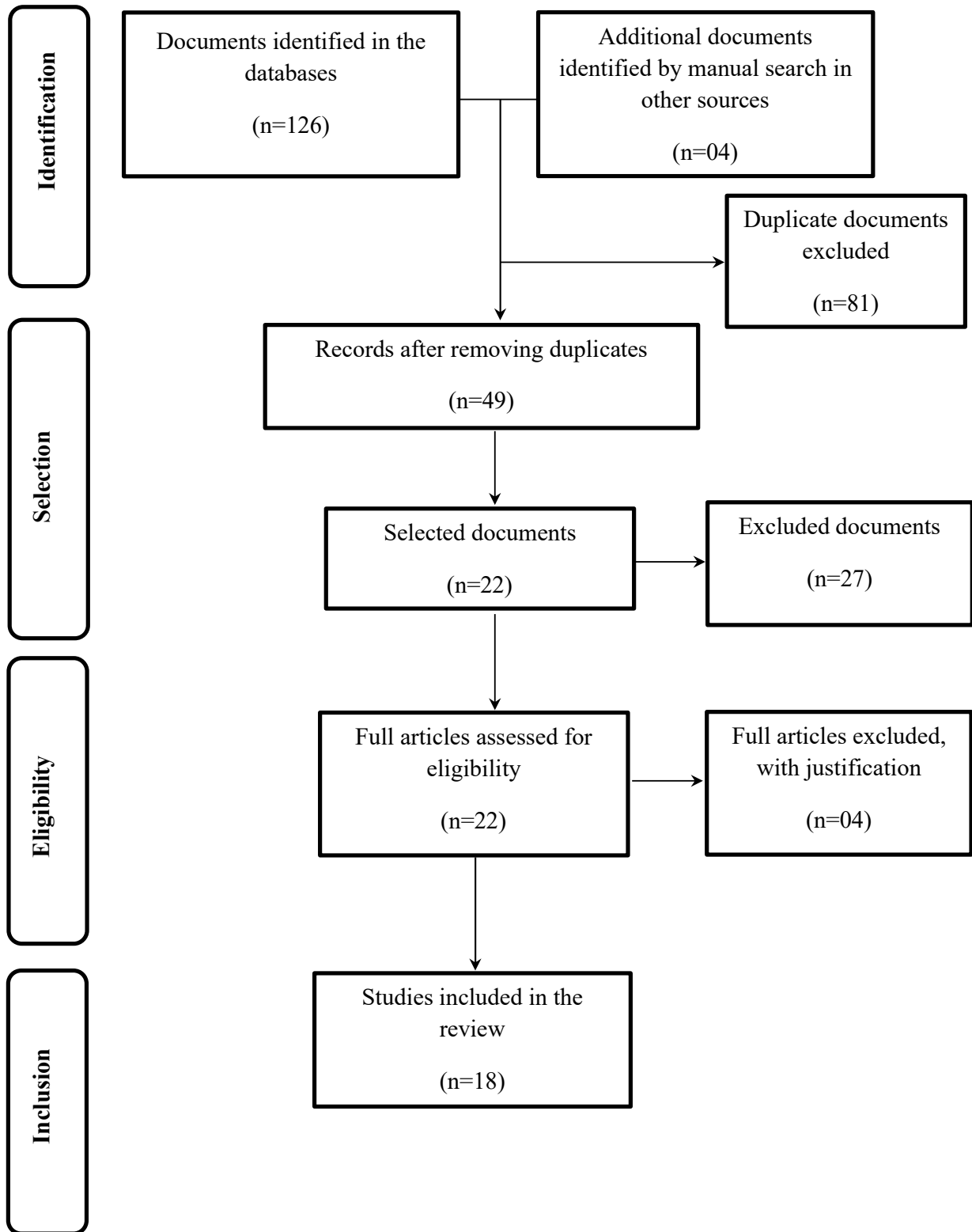


Figure 1 – Flowchart prepared in accordance with the PRISMA recommendations for the process of identification, selection, and inclusion of articles. Campinas, SP, Brazil, 2019
Source: The authors.

one randomized, controlled and well-designed clinical trial; level III – evidence of a well-designed and controlled study, without randomization; level IV – evidence from cohort or case-control studies; level V – evidence of a systematic review of descriptive and qualitative studies; level VI – evidence derived from a single descriptive or qualitative study; and level VII – evidence from the opinion of authorities and/or experts/expert committee reports⁽¹⁹⁾.

■ RESULTS

A total of 126 articles were identified in the databases: 20 in CINAHL, 26 in Embase, 26 in PubMed, 37 in Scopus, and 17 in WOS, in addition to four articles included manually, searched from the verification of the reference lists, totaling 130 documents.

The reference manager (EndNote) was used to organize the search results, remove duplications, and assist in the selection. A total of 81 repeated studies were excluded, resulting in 49 documents. Subsequently, the titles and abstracts were read, excluding those that did not meet the criteria. Then, after a thorough and detailed reading, another four studies were excluded, as they did not answer the research question, resulting in a final sample of 18 articles.

For the analysis of the selected articles, a spreadsheet was built by the authors in order to target the evaluation and validation of the included studies, containing the following information: First author, year, country, objective, type of study, place of implementation, sample, perspective of analysis of results, level of evidence and main findings (Chart 1).

The final sample presented 88.9% of international productions and 11.1% of national ones. As for the focus, 27.7% of the articles have a qualitative approach, 50.0% quantitative, and 22.3% mixed. Regarding the design, we found variety in the types of studies presented, highlighting three studies that used more robust designs: longitudinal, experimental, and cohort. Thus, regarding the levels of evidence, 77.7% were level VI and 16.6%, level IV⁽¹⁹⁾. One study could not be classified regarding the level of evidence, as it did not specify the type of study carried out.

For the analysis of the findings, they were categorized into results from the perspective of the institution, the professional, and the patient.

■ DISCUSSION

The eighteen articles that met the inclusion criteria were published in English between 2014 and 2019, with

the majority being in the last three years (55.5%). As for the location, they were carried out in European (38.9%), American (33.3%), Asian (16.7%) and African (11.1%) countries. It is worth mentioning that the two articles from Brazil were published by authors from the state of São Paulo.

The findings showed diversity regarding the contexts in which *Lean* was implemented. The hospital area was predominant, accounting for 50% of the studies, followed by primary care and by support and diagnostic health services, with 12.3% and 16.6%, respectively. Two studies^(29,34) (11.1%) carried out their analyses in two concomitant scenarios: assistance, and support and diagnosis services.

The results are presented below, according to the proposed grouping, in the perspective of evaluation after the implementation of *Lean Healthcare* in the categories: institutional, professional and patients.

From the institutional perspective, the studies brought results related to the work environment⁽³²⁾; waste reduction^(22,26,29); cost analysis^(22,26,28,33); increase in productivity^(11,22,24,26); financial return^(22,24); response time^(24,26), permanence^(28,30) and waiting time of the patient⁽³⁰⁾; improvement in the performance of institutional indicators^(23,36); increase in the installed capacity of the services⁽²⁴⁾; improvement in quality of care^(26,32); optimization of the physical structure⁽¹¹⁾; turnover time⁽¹¹⁾, and impacts on transformational leadership⁽²⁷⁾.

In addition, a study conducted in Brazil compared the application of the traditional model of Total Quality with a theoretical approach of *Lean Healthcare* cases and a practical situation of this philosophy. It was concluded that *Lean* was better systematically appropriate, considering that it kept the focus on the patient, through the use of interaction instruments. On the other hand, the application of Total Quality did not promote team participation and partially shifted the responsibility from the professionals to bureaucratic tasks, causing a loss of focus⁽²⁹⁾. It is highlighted that *Lean* proposes participatory management with greater involvement of the workers in decision-making processes, dividing responsibility and sharing power⁽²⁴⁾.

It is worth highlighting the study⁽²⁰⁾ that proposed a new perspective of analysis, evaluating the maturity of institutional *Lean*. High maturity was considered when all the principles were adopted and by all the employees, their evaluation being relevant, since it contributes to the analysis and sustainability of the results achieved with the method⁽³⁷⁻³⁸⁾. Therefore, when evaluating in the context of primary care, the author obtained a variation in maturity between and within the health units. The greatest maturity was found for the “adhering to routines” item and the lowest for the

1 st Author Year Place	Objective	Type of study Sample	Perspective	Main findings	Level of Evidence
Kaltenbrunner ⁽²⁰⁾ 2019 Sweden	To describe <i>Lean</i> maturity in primary care and to determine the extent to which <i>Lean</i> maturity is associated with quality of care.	Descriptive, correlational, and mixed methods n=298 employees	Institutional Professional	<i>Lean</i> maturity varied between and within units. The highest level of maturity was found for “adhering to routines” and the lowest for “having a change agent in the unit”. Maturity was positively associated with satisfaction with care and adherence to the national guidelines to improve the quality of health care	VI
Fournier ⁽²¹⁾ 2018 Canada	To study the factors that influence the involvement of physicians in <i>Lean</i> change initiatives in public health organizations	Inductive method n=18 physicians	Professional	Younger, less experienced physicians were more likely to commit to the <i>Lean</i> initiative, in addition to the previous level of training and positive experience with the method	VI
Gupta ⁽²²⁾ 2018 India	To discuss the implementation of the <i>Lean</i> methodology to reduce the response time of a clinical laboratory in a specialized hospital	Experimental method n=215 samples	Institutional	The results showed waste elimination, cost reduction, higher productivity and return on investments after the implementation of <i>Lean</i>	IV
Boronat ⁽²³⁾ 2018 Spain	To describe the application of the <i>Lean</i> methodology as a method to continuously improve the efficiency of an urology department in a tertiary-level hospital	Cross-sectional study Not specified.	Institutional Professional	The <i>Lean</i> methodology can be effectively applied to improve efficiency, obtaining significant and continuous improvements in all its indicators, as well as professional satisfaction.	VI
Costa ⁽²⁴⁾ 2017 Brazil	To assess how five sectors of two Brazilian hospitals have implemented <i>Lean</i> health concepts in their operations	Case study n=Sectors A (CME and pharmacy) and B (chemotherapy, operating room, and radiotherapy)	Institutional	The results evidenced the improvement of the financial aspects, in the reduction of the delivery time, in the increase of the capacity, and in productivity	VI

Chart 1 – Characterization of the studies in relation to the 1st author, year, country, objective, type of study, place of implementation, sample, perspective of analysis of the implementation, level of evidence, and main findings. Campinas, SP, Brazil, 2019.

1 st Author Year Place	Objective	Type of study Sample	Perspective	Main findings	Level of Evidence
Poksinska ⁽²⁵⁾ 2017 Sweden	To investigate how primary care centers define and improve patient value and satisfaction using <i>Lean</i>	Mixed method Case Study/Survey Qualitative phase: n=15 professionals Quantitative phase 23 control groups and 23 intervention groups	Patient	Did not show significant results in patient satisfaction	VI
Mutingi ⁽²⁶⁾ 2017 South Africa	To assess the impact of adopting <i>Lean</i> tools in the medical laboratory services in Namibia	Descriptive, cross-sectional study and mixed method n=72 laboratories	Institutional Professional Patient	The application of <i>Lean</i> tools had a positive impact, and management support plays an important role in success. The quality improvement had an impact in more than 85% of the laboratories. <i>Lean</i> tools have improved quality operational performance, reduced response times, improved employee motivation, and reduced costs	VI
Hassanain ⁽¹¹⁾ 2017 Saudi Arabia	To assess whether an intervention using <i>Lean</i> principles in hospitals across Saudi Arabia would impact on the performance metrics in the operating room: use of the room, medical file opening for the first cases, turnover times, overrun cases, and weekly procedure volumes	Quasi-experimental design n=12 Hospitals	Institutional	Statistically significant improvements in the beginning of the first surgery time, room turnover times, and percentage of overrun cases. No significant statistical difference was detected in the use of the operating room or mean volumes of weekly procedures	VI

Chart 1 – Cont.

1 st Author Year Place	Objective	Type of study Sample	Perspective	Main findings	Level of Evidence
Van Rossum ⁽²⁷⁾ 2016 Netherlands	To enhance scientific knowledge about factors that close the implementation gap and make the transition from the "Lean toolbox" to a real transformation into <i>Lean Healthcare</i> in the operating room	Cross-sectional study n=103 participants	Institutional Professional	The correlation and regression analyses showed positive relationships between transformational leadership and team leadership styles and the implementation of <i>Lean</i> . The results also indicated a strong relationship between workforce flexibility and the implementation of <i>Lean Healthcare</i>	VI
Trzeciak ⁽²⁸⁾ 2016 USA	To test the hypothesis that a <i>Lean Six Sigma</i> approach to process improvement could reduce the length of hospital stay and the costs associated with caring for patients with prolonged mechanical ventilation	Cohort study n=259 patients (31 pre-intervention; 128 post-intervention)	Institutional	The intervention resulted in a 24% reduction in the hospital stay (29 days/22 days, p <0.001) and in a 27% reduction in the direct hospital cost per case (US\$ 66,335/US\$ 48,370, p <0.001)	IV
Eiro ⁽²⁹⁾ 2015 Brazil	To compare the application of the Total Quality models used in health service processes, the cases of <i>Lean Healthcare</i> in the literature and of another institution that has already applied this model	Qualitative and descriptive, case study n=Two health institutions: A (private diagnostic medicine company); B (private cancer hospital)	Institutional	The <i>Lean</i> model was better systematically appropriated by the people who work and generate flow leading to greater adherence.	VI
Kane ⁽³⁰⁾ 2015 USA	Not specified	Not specified Not specified	Institutional Patient	The implementation of <i>Lean</i> in the emergency department significantly reduced patient waiting times and length of stay, while improving satisfaction. This was achieved over a two-year period with a 7% growth in volume, without increasing the size or resources of the department.	*Not classified

Chart 1 – Cont.

1 st Author Year Place	Objective	Type of study Sample	Perspective	Main findings	Level of Evidence
Holden ⁽³¹⁾ 2015 Sweden	To address how the perceptions of health care workers varied according to the contexts in three Swedish hospitals.	Mixed Method n=236 participants		The perceptions vary according to the hospital context, to the complexity of the sector, and to the professional role, with nurses being the category with a more favorable perception than physicians.	VI
Kanamori ⁽³²⁾ 2015 Africa	To assess how the 5S management method creates changes in the workplace, process, and results of the health services, and how it can be applied in a low-resource setting, based on data from a pilot intervention of the 5S program implemented in a health system	Qualitative n=21 participants	Institutional Professional	The pilot intervention of the 5S management method generated changes in the quality of the services and in the attitude and behavior of the employees and patients in a health facility with few resources.	VI
Dávila ⁽³³⁾ 2015 Spain	To evaluate cost reduction and increased time devoted to the patient, using the <i>Lean Healthcare</i> methodology.	Descriptive study n=Three rehabilitation health services	Institutional Professional	It was possible to standardize the processes and eliminate waste, reducing costs and increasing the value of the patient. The costs with stored materials decreased by 43%, the cost per patient treated by 19%, and the time dedicated to treating patients increased by 7%	VI
Drotz ⁽³⁴⁾ 2014 Sweden	To contribute to an understanding of the new roles, responsibilities, and job characteristics of employees in <i>Lean Healthcare</i>	Case study n=24 participants	Professional	The implementation of <i>Lean</i> had a great influence on the roles, responsibilities, and characteristics of the employees' work, the focus was shifted from the professionals to the process of improvement and teamwork	VI

Chart 1 – Cont.

1 st Author Year Place	Objective	Type of study Sample	Perspective	Main findings	Level of Evidence
Ponanake ⁽³⁵⁾ 2014 Thailand	To study the trajectory relationships between a <i>Lean</i> health system, the <i>Six Sigma</i> practice and the internal quality management of the core competence of Thai private hospitals as a health care center of the Association of Southeast Asian Nations	Quantitative n=312 participants	Institutional	The <i>Lean</i> health system and <i>Six Sigma</i> practices indirectly influence, through internal quality management, the core competence of a hospital to be a health care center. <i>Six Sigma</i> practices and internal quality management directly influence the same competence	VI
Wood ⁽³⁶⁾ 2014 Canada	To examine three hospitals that have implemented <i>Lean</i> in the emergency department	Longitudinal study n=Three hospitals	Institutional Professional	They concluded that, although the presence of strong and persistent leadership can have favorable results in short-term performance, these improvements are not sustainable. To have a long-term impact, the professionals need to engage all the stakeholders in the health care system and create a culture that is continuously focused on improving the patient experience.	IV

Chart 1 – Cont.

Source: Research data, 2019.

*Study not included in the levels of evidence.

“having a change agent in the unit” item, that is, most of the teams were highly qualified in the development, updating, and monitoring of the routines; however, 81% of the teams indicated that the unit did not have this “change agent”. Maturity was also positively associated with care satisfaction and adherence to the national guidelines for improving quality of health care⁽²⁰⁾.

Regarding the professional perspective, the studies presented findings related to job satisfaction^(23,26) and regarding the care provided⁽²⁰⁾; medical adherence⁽²¹⁾ to *Lean*; workforce flexibility⁽²⁷⁾; leadership of the team^(27,36); attitudes^(31–32); behavior⁽³¹⁾; commitment⁽³²⁾; time devoted to assistance⁽³³⁾, and the change of roles and responsibilities with the implementation of *Lean*⁽³⁴⁾.

One of the studies highlighted that medical adherence influences the results of *Lean*⁽²¹⁾, revealing that younger, less experienced physicians were more likely to be committed to the initiative; in addition, the training level and positive previous experience facilitated adherence to the method. Some factors of medical resistance were highlighted, such as longest professional experience, reorganization of the work process, and the threat in the power relationship⁽²¹⁾. As the challenge of adhering to *Lean*, the other health professionals face the different characteristics in the work process, autonomy in decision-making, and engagement of the team⁽³⁴⁾.

The medical professional plays an important role for the culture of continuous improvement⁽²¹⁾; however, it is worth mentioning that the approach of the multidisciplinary team, together with the training of this philosophy, is fundamental for the achievement of results in the implementation and maintenance of *Lean*^(13,39–40).

Team training, process management, continuous improvement, and delegation of responsibilities have shown to be the pillars of this methodology, but it is necessary to involve the management to increase the motivation of the professionals and to avoid the exhaustion inherent to health work⁽²³⁾. Therefore, strong leadership and an engaged team are essential to build an organizational *Lean* culture^(30,40) where problems are seen as an opportunity for improvement, with the customer as main focus⁽⁴¹⁾.

As for the patient category, the aspects addressed were the following: satisfaction^(25–26,30), attitudes, and behavior⁽³²⁾. This perspective was the least evaluated in the selected sample (22.2%); however, it is important to consider the patient’s needs in order to reduce costs and improve the care processes⁽⁴²⁾, which reflects positively on quality and safety^(2,6).

■ CONCLUSION

This study contributes to the need to establish a systematic assessment of *Lean Healthcare* after its implementation. The findings indicated that the most used category was institutional, with cost analysis and increased productivity being the most frequent results; followed by the professional, with job satisfaction and leadership as the most evaluated aspects and; finally, in the context of the patients, which was discussed as regards their satisfaction, attitudes, and behaviors. It should be highlighted that, in *Lean*, the value is defined by the patient and that this aspect in the results is still little explored.

This study provided an in-depth and integrated review on the theme; however, some limitations must be considered, such as the difference in the evaluation time after implementation; the various scenarios evaluated that make it impossible to compare institutions, and the predominance of the level of evidence VI, which should be considered in prospective studies. Therefore, it reinforces the need to establish, for the management, a systematic method of monitoring the results achieved in the implementation phase of *Lean Healthcare*.

The importance of expanding and continuing investigations in this field is highlighted, with well-defined and robust methods, in order to better understand the success factors and barriers to their implementation, in addition to their long-term impact for the institution, the professional, and the patient, as well as the maturity of the philosophy.

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