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SUCCESS FACTORS FOR LEAN HEALTHCARE IMPLEMENTATION: AN EXPLORATORY CASE STUDY IN A BRAZILIAN HOSPITAL

FATORES DE SUCESSO PARA IMPLEMENTAÇÃO DO LEAN HEALTHCARE: UM ESTUDO DE CASO EXPLORATÓRIO EM UM HOSPITAL BRASILEIRO

FACTORES EXITOSOS PARA LA IMPLEMENTACIÓN LEAN HEALTHCARE: UN ESTUDIO DE CASO EXPLORATORIO EN UN HOSPITAL BRASILEÑO

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ABSTRACT

This article analyzes the factors required for a successful lean implementation within the context of healthcare operations. For this purpose, a literature review was carried out, in which the following critical success factors were identified: (a) commitment from top management; (b) lean team; (c) strategic alignment; (d) understanding the value; (e) training and engagement; (f) assess and control. Field research was conducted through a case study to investigate how a Brazilian hospital located in the Northeast region, which aims to be lean, was prepared for the implementation of lean. Despite being in an early stage of implementation and facing many challenges on this journey, the hospital has demonstrated a partial level of lean readiness. However, it still faces hard challenges in the implementation, especially concerning employee engagement. This article contributes to the literature on the implementation of lean healthcare by offering recommendations for managers who strive to implement lean in their organizations.

Keywords: Lean Production. Healthcare. Success Factors.

RESUMO

Este artigo analisa os fatores necessários para uma implementação bem-sucedida da produção enxuta (*lean production)* no contexto das operações de saúde. Foi realizada uma revisão da literatura na qual foram identificados os seguintes fatores críticos de sucesso da implementação *lean* no contexto de operações de saúde: (a) compromisso da alta administração; (b) equipe enxuta; (c) alinhamento estratégico; (d) compreensão do valor; (e) treinamento e engajamento; (f) avaliar e controlar. A pesquisa foi conduzida por meio de um estudo de caso para investigar como um hospital brasileiro localizado na região Nordeste, que pretende ser enxuto, foi preparado para a implementação do *lean*. Apesar de estar em um estágio inicial de implementação e enfrentando muitos desafios nesta jornada, o hospital demonstrou um nível parcial de prontidão enxuta. No entanto, ainda enfrenta desafios difíceis na implementação, especialmente em relação ao engajamento dos funcionários. Este artigo contribui para a literatura sobre a implementação de cuidados de saúde enxuta oferecendo recomendações para os gestores que se esforçam por implementar o *lean* nas suas organizações.

Palavras-chave: *Lean Production*. Cuidados de Saúde. Fatores Críticos.

RESUMEN

Este artículo analiza los factores necesarios para una implementación exitosa de la producción ajustada (*lean production)* en el contexto de las operaciones de salud. Se realizó una revisión de la literatura en la cual se identificaron los siguientes factores críticos de éxito de la implementación eficiente en el contexto de las operaciones de salud: (a) compromiso de la alta dirección; (b) personal *lean*; (c) alineación estratégica; (d) comprensión del valor; (e) capacitación y compromiso; (f) evaluar y controlar. La investigación se realizó a través de un estudio de caso para investigar cómo se preparó un hospital brasileño ubicado en la región Noreste, que pretende ser *lean*, para la implementación de este método. A pesar de estar en una etapa temprana de implementación y enfrentar muchos desafíos, el hospital demostró un nivel parcial de preparación *lean*. Sin embargo, aún enfrenta desafíos de implementación difíciles, especialmente en relación con el compromiso de los empleados. Este artículo contribuye a la literatura sobre la implementación de *lean healthcare*, ofreciendo recomendaciones para los gerentes que se esfuerzan por implementar *lean* en sus organizaciones.

Palabras-clave: *Lean Production*. Cuidado De La Salud. Factores de Éxito.

INTRODUCTION

Lean Production (LP) is a management approach that originated from Toyota's manufacturing plants (known as Toyota Production System - TPS), focusing on customer value and waste reduction. Nowadays, TPS is no longer used only in the automotive industry. It has been disseminated through

other manufacturing industries and services, such as healthcare (KIM *et al.*, 2006). Aiming to improve processes and performance outcomes while under pressure to reduce costs and meet quality standards, hospitals throughout the world have been motivated to implement lean, inspired in successful cases in the healthcare sector (MCDERMOTT; VENDITTI, 2015). However, despite being proved feasible for hospital operations to reduce waste, increase capacity, and eventually improve financial performance (GRABAN; PADGETT, 2008; HYDES; HANSI; TREBBLE, 2012; COSTA *et al.*, 2017; SKELDON *et al.*, 2014; SUGIANTO *et al.*, 2015; VAN LENT; GOEDBLOED; VAN HARTEN, 2009), a successful lean implementation is still a challenge for healthcare (NARAYANAMURTHY *et al.*, 2018).

The adaptation of lean philosophy in the healthcare sector has been studied during the last two decades. Although the number of publications is increasing over time, the knowledge and implementation in the field seem to be in an early stage (COSTA; GODINHO FILHO, 2016; D'ANDREAMATTEO *et al.*, 2015; GOHR *et al.*, 2017). From the theoretical point of view, it constitutes a gap in the literature since "most studies do not mention some information from the lean healthcare implementation process that could help future studies in facilitating and speeding up lean healthcare implementation process" (COSTA; GODINHO FILHO, 2016, p. 830).

Understanding the lean implementation success factors in healthcare could be the key to a successful implementation. In other words, it is essential to understand what should be done before implementing lean production to reduce the risk of failure. This capability of being ready for lean implementation was coined by Gurumurthy, Mazumdar and Muthusubramanian (2013) as lean readiness.

Thus, with the readiness concept in mind, one question arises when it comes to lean healthcare implementation: How can success factors drive a successful lean healthcare implementation? It is noteworthy that most studies in the literature about lean readiness focus on the manufacturing industry (AL-NAJEM *et al.*, 2013; SHOKRI; WARING; NABHANI, 2016). On the other hand, only a few studies focus on the healthcare sector, as we can see in Al-Balushi *et al.* (2014) and Narayanamurthy *et al.* (2018). While Al-Balushi *et al.* (2014) identified in the literature a list of seven readiness factors, Narayanamurthy *et al.* (2018) developed a methodology to quantify the readiness to implement lean in healthcare institutions. However, none of them analyzed in-depth the actions that hospitals have been carrying out to develop readiness, to exploit success factors, and eventually to cope with the barriers to implement lean healthcare.

Unlike previous studies on readiness in the healthcare context, the purpose of this paper is two-fold: analyzing the success factors that prevent implementation failures, and going further on how healthcare organizations have been prepared to implement lean healthcare. To achieve this goal, it is necessary (i) to review the literature about the concepts regarding lean healthcare implementation; (ii) to identify success factors for lean implementation; and (iii) to understand how a Brazilian hospital has been dealing with the challenges faced by lean implementation from the success factors point of view.

The paper is structured as follows. After this introduction, Section 2 reviews the relevant literature, in which lean healthcare success factors are identified. Section 3 describes the research design for the case study. Section 4 presents the results of empirical research. Section 5 develops a critical discussion about the findings from the field. Finally, the main conclusions, research limitations, and suggestions for future research are presented in Section 6.

THEORETICAL BACKGROUND

Lean production broadened the concept of waste, connecting to it all processes that do not add customer value (DENNIS, 2008; EDWARDS; NIELSEN; JACOBSEN, 2012; MONDEN, 2015). Understanding lean as a system instead of just a project is crucial for a sustainable implementation (AIJ *et al.*, 2013). Projects have an end, while lean must be seen as a philosophy if a company intends to be successful within the lean implementation journey (MARKSBERRY; BADURDEEN; MAGINNIS, 2011; MATTHIAS; BROWN, 2016). Moreover, lean production is a management model that flows from strategy to workforce, guided by continuous improvement (AIJ *et al.*, 2013).

The so-called lean principles of value-added and waste elimination are adaptable enough to be feasible in different contexts, from manufacturing to service operations, from information-intensive to people-driven services such as healthcare. Lean initiatives in healthcare have become widespread. By the way, D'andreamatteo *et al.* (2015) corroborate the results found by Souza (2009), which reports a substantial number of lean interventions in the USA, followed by the UK and Australia. For example, the National Health Service (NHS) in the UK has adopted Lean as a philosophy focusing on waste elimination and increased customer service while facing financial pressure to achieve their mission: "high-quality care for all."

Knowing the essence of lean philosophy and its principles, it becomes necessary to develop organizational readiness for lean implementation. Readiness is the ability to become prepared to change. It is supported by the organizational members and environment, gathering financial, social, and psychological aspects (ARMENAKIS; HARRIS, 2002; GURUMURTHY; MAZUMDAR; MUTHUSUBRAMANIAN, 2013; WEINER, 2009). According to Armenakis, Harris and Feild (1999), to accomplish an organizational change, it is needed to go through 3 phases: readiness, adoption, and institutionalization. The members' readiness to embrace change allows the organization to adopt new ways to operationalize it, and, in case of success, the efforts to maintain the change would be internalized by the members.

Lean production is a social-technical system that makes it complex, difficult to implement and to find out a general recipe to success (MARKSBERRY; BADURDEEN; MAGINNIS, 2011). Notwithstanding, success factors might be used as triggers to achieve relevant results in lean healthcare. It is noticeable in the literature that several factors have influenced successful lean implementations. For example, Liker (2004) and Kim *et al.* (2006) argued that the organization must be committed from the highest management levels to implement the lean philosophy. To Kollberg, Dahlgaard and Brehmer (2006), performance measurement is an essential factor in supporting lean implementation.

Success factors can be defined as "those few things that must go well to ensure success for a manager or an organization, and, therefore, they represent those managerial or enterprise areas that must be given special and continual attention to bring about high performance" (BOYNTON; ZMUD, 1984). One of the most remarkable success factors in non-manufacturing sectors is to overcome the barrier of importing knowledge from manufacturing. This action is crucial in hospitals since people's resistance is usually justified for not treating patients like machines.

Actually, adaptation is needed for implementing lean healthcare in hospitals. Hospitals have operations and organizational culture noticeably different from manufacturing (MAHAJAN *et al.*, 2017). Bittar e Nogueira (1997) states that a hospital is a high-complex institution, with direct procedures with human beings and social and educational components. These peculiarities make adaptation so important in lean implementation in hospital settings.

By a literature review on critical factors for implementing lean thinking in the context of healthcare operations, we identified six relevant success factors, as can be seen in Table I and detailed below.

Table I - Success factors in lean healthcare implementation

To be continued

	References									
Categories	[01]	[02]	[03]	[04]	[05]	[06]	[07]	[08]	[09]	[10]
Commitment from top management	●		●		●	●	●	●	●	●
Lean team / internal team		●		●		●	●	●		
Strategic alignment			●	●	●		●			●
Understanding value				●	●	●		●	●	
Training and engagement			●	●	●		●		●	

Conclusion

Assessment and control				•			•			•

Source: [01] (KIM *et al.*, 2006); [02] (DICKSON *et al.*, 2009); [03] (HINES *et al.*, 2008); [04] (AL-BALUSHI *et al.*, 2014); [05] (RADNOR, 2010); [06] (COSTA *et al.*, 2017); [07] (LEGGAT *et al.*, 2018); [08] (MAZZOCATO *et al.*, 2010); [09] (HOLDEN, 2011); [10] (VEST; GAMM, 2009).

- **Commitment from top management.** We found in the literature a crucial role that should be played by senior management in a lean healthcare context: managers must know and act according to lean principles and support lean initiatives to overcome potential barriers. For example, when analyzing hospital experiences, Kim *et al.* (2006) found this commitment as a critical component of successful lean implementation, because top managers have the responsibility of allocating resources for this endeavor. As Liker (2004, p. 24) states: "the power behind TPS is a company's management commitment to continuously invest in its people and promote a culture of continuous improvement."

- **Lean team.** This success factor is related to a multidisciplinary internal team created to work together to achieve planned improvements. It should be operated outside the hierarchy (COSTA *et al.*, 2017). "A team approach to problem-solving can create a shared understanding of a problem, how it can be solved and an acceptance of the subsequent countermeasures" (MAZZOCATO *et al.*, 2010, p. 379). Usually, this team provides training and has an obligation to spread the knowledge within their departments. This team is also responsible for the success of lean implementation. It is important that the people who make up the team are those who should do so, regarding their functions and responsibilities, instead of only those willing to get involved.

- **Strategic alignment.** The alignment between lean and the organization strategy justifies implementation. Hence, this alignment creates a sense of purpose to the staff and highlights the importance of their work (AL-BALUSHI *et al.*, 2014). To Hines *et al.* (2008), the organizational strategy is not enough itself; beyond that, it should be fully communicated throughout the entire organization. A clear strategy helps to define what the organization wants, why and how to achieve it. "Alignment is making sure that everybody understands the strategy, and that everything they do contributes to the success of achieving the organizational goals" (HINES *et al.*, 2008, p.21).

- **Understanding value.** The primary purpose of lean production is to create/add value and reduce waste. To achieve this goal, it is necessary to understand the customers' vision and discern what is truly valuable to them (AL-BALUSHI *et al.*, 2014; HOLDEN, 2011; MAZZOCATO *et al.*, 2010; COSTA *et al.*, 2017; RADNOR, 2010). In the context of healthcare operations, this value refers to the patient's experience. It means faster waiting times (for and within appointments), service humanization, information sharing, tangible evidence, etc.

- **Training and engagement.** One of the main barriers faced in an implementation project is employees' resistance, mostly because they are usually afraid of changing routines for not understanding the reasons and benefits. "One way to ensure that intervention would not be rejected by staff was to involve them in its selection and design. This practice, while not always present even in successful implementations, was always absent from unsuccessful ones" (KREINDLER, 2016). Staff training is fundamental to achieve a lean hospital. It creates commitment and a favorable culture to lean. As stated by Kim *et al.* (2006, p. 197), "lean production concepts and tools should not be foreign to health care professionals who already understand systems thinking." However, to Hines *et al.* (2008), training is not always enough itself, so, to achieve a culture of change, it is necessary to internalize change, bringing staff engagement after all. Engagement brings staff support, willingness to improve, and eventually builds readiness to change.

- **Assessment and control.** This factor is related to continuous improvement. Assessing and controlling changes and achievements could act as a fuel to keeping lean culture active within the organization. "By making information visible and transparent for everyone, people become more motivated to

improve the processes" (KOLLBERG; DAHLGAARD; BREHMER, 2006, p. 18). According to Leggat *et al.* (2018), lean focuses on measures, data, and targets. The same authors also affirm that financial data must be accompanied by nonfinancial data to provide a full picture of processes and outcomes, bringing real feedback to stakeholders.

Lean healthcare implementation in hospitals is often a complex and hard task. However, the identification of the success factors that make a hospital ready to start a lean journey might facilitate the implementation before and during this process.

RESEARCH DESIGN

This paper analyzes the success factors required for a favorable introduction of a lean initiative and how a Brazilian hospital has been prepared for it. To achieve this purpose, we performed a case study. The case study is an appropriate research strategy once it "investigates a contemporary phenomenon within its context of real life, especially when the boundaries between phenomenon and context are not clearly defined" (YIN, 2001, p. 32). By studying experiences from real life, we would be able to provide some explanation about the phenomena and propose actions to assist lean healthcare implementation.

We selected a private general-purpose hospital located in northeastern Brazil. The hospital is under the initial stage of lean implementation and provides an appropriate environment to analyze success factors and implementation challenges. In addition, easy access to company employees and documents was crucial to our choice. Due to confidentiality issues, we do not disclose hospital identity. To increase reliability, we developed a case study protocol based on the success factors previously identified in the literature. In the case study protocol, data collection instruments, procedures, and general rules were formalized (YIN, 2001). The prime sources of data were (i) semistructured interviews; (ii) *in loco* observations; (iii) documents related to the lean implementation and the customer satisfaction survey; and (iv) nonstructured interviews with key employees.

The criteria used to select the interviewees were (i) he/she must be at a senior level; (ii) he/she must be involved in the initiation of a lean journey; (iii) he/she should be responsible for monitoring overall outcomes. Thus, we selected two managers (the General Director and the Quality Manager). The interview occurred in a meeting where both interviewees were together to discuss the questions made by the researchers, complementing each other. The external consultant trained both, and they were responsible for developing improvements in the hospital. Information about the data collection through interviews is displayed in Table 2.

Table 2 - Data collection through interviews

Instrument	Who	When	Duration
Semistructured interview	Director (Interviewee A)	Visit 1	1h:20min
Semistructured interview	Quality Manager (Interviewee B)	Visit 1	1h:20min
Nonstructured interviews and *in loco* observation	Employee 1 (Interviewee C)	Visit 2	2h:15min
Nonstructured interviews and *in loco* observation	Employee 2 (Interviewee D)	Visit 2	2h:15min

Source: Authors.

The semi-interviews were face-to-face, recorded and transcribed immediately afterward. The data were triangulated, considering all empirical information. We adopted some reliability criteria, such as case selection criteria, interviewees' selection criteria, data collection from semistructured interviews, internal documents, data triangulation, and a list of success factors found in the literature (Table 1).

After collection, the data were analyzed through content analysis. First, we organized the information into research categories considering the data presented in Table 1. For this, coding techniques were used to group issues identified during the case study, summarizing them into themes, and making

connections among categories to explain whether the phenomena of interest were supported by the cases or not.

RESULTS

General description of the Hospital

The hospital aims to provide health treatment and maintenance through a modern structure and trained professionals. It was open in 2016, and despite being in an early stage, it has a structured emergency department, diagnostic and imaging center, intensive care unit, surgery center, clinical hospitalization, and surgical hospitalization for postoperative patients who left the surgical center. It counts with more than 300 direct employees.

The hospital intends to be a reference in healthcare in the Brazilian northeast when fulfilling its mission of "offering the best experience in caring for people." Its central values are ethics, cooperation, quality with innovation, humanization, valorization of human capital, socio-environmental responsibility, owner attitude, and knowledge sharing.

To accomplish its mission, the hospital contracted external consultants since its initial years, aiming at quality improvement and process efficiency. One of the actions was to develop a lean training program. For that, a group of employees was qualified in lean concepts and quality management methodologies such as Six Sigma and DMAIC (Define, Measure, Analyze, Improve, and Control).

Success factors in implementing lean healthcare

After studying the hospital operations, the success factors in implementing lean production were analyzed regarding the categories showed in Table 1.

Leadership/Lean Team

The staff in the studied hospital considers lean production as a continuous improvement philosophy with full engagement of people. Therefore, the responsibility of identifying improvements is a task from each management area, according to their specific needs. In July 2017, there was a training program with an external consultant from Hospital Sírio-Libanês, a remarkable Brazilian hospital when it comes to quality, customer satisfaction, and patient safety. During this training, the lean principles and its main tools were presented to managers and nursery staff. Using the DMAIC method and the concepts learned from the training program, three improvement projects were carried out, which were accompanied by the external consultant. The projects were held in three different areas: the billing sector, emergency department (ED), and personnel management (PM).

In the billing sector, the main purpose of the project was improving bill accuracy and reducing conflicts between the billing sector and the patient's medical insurance, which was accomplished. In the PM sector, the aim was to reduce the turnover rate with specific actions in the sector, which was also achieved and continues to be measured monthly by area. In ED, no action was taken until the data collection for this case study. However, they developed some objectives for future intervention in this department.

There is not a lean team responsible for the implementation and dissemination of lean concepts in the hospital. The managers are individually responsible for their results. The absence of a lean team may lead to a focus on local improvements instead of global and systemic improvement. As mentioned by Interviewee A, "often the coordinators get lost in the problem instead of focusing on the solution, even simple things that could be solved quickly, but they insist on looking for a guilty in another team to 'save' themselves."

The communication always flows top-down, from managers to their teams. However, Interviewees C and D did not demonstrate knowledge about the emergency committee and other actions to improve their work, showing failure to communicate and engage employees from senior manager levels.

Strategic alignment

The hospital has started the lean journey triggered by an external consultancy. The main operational problems were the turnover and the high number of conflicts between the billing sector and the patient's medical insurance. For the patient care areas, what is expected from lean is: increasing income from a more significant availability of the operating room, decreasing register time (e.g., Surgical Center, ED, and DIC – Diagnostic Imaging Center), and reducing the patient's waiting time for medical screening (ED and DIC).

In a private hospital, the process is very bureaucratic in trying to avoid conflicts between the billing sector and the patient's medical insurance.

> Classification is fast, registration is fast, but the patient takes a long time to be attended because, behind the scenes, there is a lot of paperwork, and people do not act to facilitate. That is the bottleneck that leaves the patient stuck. If a patient can be attended without a stamp authorization, why they do not make the examination available as soon as possible? These points should be improved. (INTERVIEWEE A).

The General Director understands that the information flow needs to be improved more urgently because it has left patients "trapped" inside the hospital, generating waste and reducing service capacity. In her words, "we need smart people here, with logical thinking, and not bureaucratic ones. People who understand the process and reduce waste" (Interviewee A). Lean production applied to information flow is understood as a way to reduce bureaucracy through a detailed analysis of activities, separating value-added activities from non-value-added activities.

The hospital has, in its agenda, some objectives of "what lean brings" as reducing waiting time, reducing patient throughput time, increasing surgical capacity and demand. These goals could be used to motivate organizational change, promoting engagement and commitment.

Understanding value

The hospital valorizes the patient satisfaction score, which is measured monthly through a patient satisfaction survey. The survey is answered by voluntary patients and the questions involve waiting time, service, and other aspects of care. Nonetheless, one of the most significant complaints is about waiting time in urgent care. From the customers' perspective, the value is understood as quick service, friendliness, agility in taking exams, award, and discharge.

An emergency committee for the waste reduction was established in the emergency department. An action plan was created to achieve goals about waste reduction. Some actions are, for example, preparing a list of exams that can be done in the emergency without authorization, training of attendants with information about the patient's path and how to act through waiting times, encouraging doctors to make the hospitalization decision through clinical evaluation and not waiting for unnecessary examinations.

Training and engagement

As previously mentioned, the training program was conducted in July 2017 by the consulting firm of Hospital Sírio-Libanês. The hospital sectors that participated in the program were: Quality, Nursing, People Management, Billing, and Care. Currently, there is no internal program for training and disseminating lean concepts to employees, as they believe that the training received one year ago was

enough to have process agents involved. As mentioned by Interviewee B, "no need was identified for more training since many assistants participated in the training program from Sírio."

However, in spite of an apparent unconcern about training, the quality analyst, who is responsible for process improvement in the surgical center, will take a specialization course about operational excellence with financial support from the hospital.

Assessment and control

Both sectors, Surgical Center and ED, have specific objectives for improvement and a specific assessment approach. In the ED, the hospital measures and monitors patients per shift per day, as well as the time between patient arrival and classification, classification and registry, and registry and attendance. There is no service time data (patient within the doctor's office) to constitute an active performance measure.

Although lean has not been implemented yet, process outcomes are measured monthly for management purposes and to figure out improvement opportunities for a future lean project. Some usual indicators are evasion rate, adherence to the accreditation checklist, emergency-to-normal hospitalization conversion, patient satisfaction, average time of delivery (in the delivery of reports), and total waiting time (urgency).

DISCUSSION

The hospital is still in an incipient stage of lean implementation. Nevertheless, it is already possible to analyze the implantation path until now regarding the success factors posed by the literature. Table 3 shows the comparison between the literature propositions and the practices performed by the hospital.

Table 3 – Literature propositions *versus* case study findings

To be continued

Success factors	Literature	Case study
Commitment from top management	To develop motivation and engagement for change and continuous improvement (DROTZ; POKSINSKA, 2014). "Lean practices require perseverance and top-down commitment combined with bottom-up implementation" (AIJ *et al.*, 2013).	Although committed with continuous improvement, top management has failed in promoting employee engagement, allowing bottom-up implementation.
Lean team	A team approach provides a shared understanding of a problem and support to solve it (MAZZOCATO *et al.*, 2010, p. 379). However, teamwork is not easy to implement in the healthcare context due to power structure and relationships among the staff (DROTZ; POKSINSKA, 2014).	The training program helped in the formation of an informal group of people interested in lean healthcare. However, there is not a real lean team in the hospital, just committed managers responsible for departmental improvements.
Strategic alignment	The fit between the actual approach taken and the circumstances and ambitions of the adopting organization will influence the chances of success (ULHASSAN *et al.*, 2013).	The desired lean outcomes are aligned with the goals set by the annual strategic planning.
Understanding value	Understanding value from the patient's perspective is supported by establishing an association between patients' expectations and the delivered value by medical care (FARROKHI *et al.*, 2015).	The hospital uses satisfaction surveys and seeks to be closer to patients by different means, including social media. As a result, it is easier to figure out the patients' expectations.
Training and engagement	Training provides employees with the necessary tools to effect changes in their area of work (DICKSON *et al.*, 2009). Engagement is the key weapon against employee's resistance to change.	A training program was held to trigger the lean initiative, but it is not a continuous activity. The full engagement was not achieved yet.

Conclusion

Success factors	Literature	Case study
Assessment and control	It is critical for lean success to set a performance measurement system to evaluate the effectiveness of the program (DICKSON *et al.*, 2009).	The hospital uses performance indicators and collects data to measure them on a regular basis. This activity supplies inputs to plan new improvement actions, and it supports lean implementation.

Source: Authors.

The lean implementation path is still long and there are cultural and practical barriers that must be overcome. However, the lean underpinnings are already established, mainly by the strategic alignment and the performance measurement activities.

The case study findings indicate that there is a commitment from the top management, but there is not a real concern about employee engagement and training. According to Dickson *et al.* (2009), the two basic lean concepts are the elimination of waste through standardization of processes and the involvement of all employees in process improvement. Our findings showed that the second pillar of engagement is still very poor in the hospital, which constitutes a major threat to lean implementation. Even though employee engagement was not noticed as a priority, the organization showed a recovery possibility by creating an Emergency Committee.

For being part of the strategic agenda, quality and process improvements have been widely monitored. The hospital has clear goals to achieve and a well-defined assessment approach, showing a consolidated improvement culture.

It was found that there is a real pressure to adopt lean healthcare within areas that suffer more with competitiveness, such as Surgical and ED. Notwithstanding, managers seem not to focus on the lean implementation process, but on the improvements that lean brings.

CONCLUSION

This study highlights how lean implementation has been conducted in a Brazilian hospital and how the success factors found in the literature have been followed (or not) to help the implementation. Almost all factors identified during the literature review are present at a certain level in the hospital, revealing a partial lean readiness in the hospital.

However, although employee engagement and training are considered crucial for lean sustainability, this factor was not well developed in the hospital. Hence, this point must be improved by involving the staff, showing them the lean goals and obtaining commitment beyond top management headquarters, but throughout the hierarchy.

This paper brings some theoretical and managerial implications. Through a literature review, it was possible to identify success factors to implement lean production in healthcare organizations. Identifying critical success factors has provided useful insights for the enhancement of the decision-making process needed for allocating the right resources to support lean healthcare implementation. Another contribution emphasizes that the lean implementation process is a strategic decision with systemic implications, which depends on the context, and consequently, on the ability to adapt to each situation. Furthermore, the success factors provide drivers to support lean implementation and sustain the lean system in hospitals.

It is important to consider the limitations of our study. For example, the findings are limited because the case study was conducted in only one company, not allowing comparisons. Moreover, the case study methodology does not allow generalization of findings due to its intrinsically qualitative nature. This factor naturally suggests further empirical research on survey studies, using larger samples for more generalizable results. From the practitioner's point of view, another relevant research opportunity would be the development of mathematical models to prioritize success factors when implementing lean healthcare.

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