

# LEAN METHODOLOGY IMPLEMENTATION IN THE EMERGENCY DEPARTMENT OF A UNIVERSITY HOSPITAL: MANAGEMENT AND SUSTAINABLE DEVELOPMENT

Cristiano Rossa da Rocha<sup>1</sup> 

Claudete Rempel<sup>1</sup> 

João Carlos Batista Santana<sup>4</sup> 

Eliziane Ferranti<sup>5</sup> 

Juciane Aparecida Furlan Inchauspe<sup>3</sup> 

Suimara dos Santos<sup>5</sup> 

Maicon Daniel Chassot<sup>5</sup> 

Michelle Dornelles Santarém<sup>2</sup> 

<sup>1</sup>Universidade do Vale do Taquari, Programa de Pós-Graduação em Ambiente e Desenvolvimento. Lajeado, Rio Grande do Sul, Brasil.

<sup>2</sup>Universidade Federal do Rio Grande do Sul, Programa de Pós-graduação em Enfermagem. Porto Alegre, Rio Grande do Sul, Brasil.

<sup>3</sup>Universidade Federal do Rio Grande do Sul, Escola de Enfermagem. Porto Alegre, Rio Grande do Sul, Brasil.

<sup>4</sup>Universidade Federal do Rio Grande do Sul, Faculdade de Medicina. Porto Alegre, Rio Grande do Sul, Brasil.

<sup>5</sup>Hospital de Clínicas de Porto Alegre. Porto Alegre, Rio Grande do Sul, Brasil.

## ABSTRACT

**Objective:** to describe the implementation of the Lean Methodology in an emergency department and its contribution to sustainable and quality management.

**Method:** this is a methodological study carried out between October 2018 and January 2022 in the adult emergency department of a public university hospital in southern Brazil, analyzing the results before and after the implementation of the Lean Methodology. The study followed the model and standards adopted by the Standards for Quality Improvement Reporting Excellence 2.0 (SQUIRE) for the description of improvement cycle standards.

**Results:** with the implementation of this methodology, actions were developed, such as innovations in work routines, both care and management, changes in patient reception with risk classification, construction of units for patient care and allocation, daily interdisciplinary meetings (huddle), full contingency plan, hospital discharge routines, external transfers, changes in the communication process with users and professionals, among other actions.

**Conclusion:** the use of the Lean Methodology has resulted in a reduction in occupancy, which has helped to optimize health resources and ensure quality care and management practices. This reduction is believed to be proof of sustainable management in health services and contributes to reducing socio-economic inequalities.

**DESCRIPTORS:** Emergency service, Hospital. Total quality management. Health management. Sustainable development. Quality of health care.

**HOW CITED:** Rocha CR, Rempel C, Santarem MD, Santana JCB, Ferranti E, Inchauspe JAF, Santos S, Chassot MD. Lean Methodology implementation in the emergency department of a university hospital: management and sustainable development. *Texto Contexto Enferm* [Internet]. 2023 [cited YEAR MONTH DAY]; 32:e20230122. Available from: <https://doi.org/10.1590/1980-265X-TCE-2023-0122en>

# IMPLEMENTAÇÃO DA METODOLOGIA LEAN NA EMERGÊNCIA DE UM HOSPITAL UNIVERSITÁRIO: GESTÃO E DESENVOLVIMENTO SUSTENTÁVEL

## RESUMO

**Objetivo:** Descrever a implementação da Metodologia Lean em um serviço de emergência, e a contribuição para uma gestão sustentável e de qualidade.

**Método:** Trata-se de estudo metodológico, realizado entre outubro de 2018 a janeiro de 2022, no serviço de emergência adulto de um hospital público universitário no Sul do Brasil, com análise de resultados antes e após a implementação da Metodologia Lean. O estudo seguiu o modelo e as normas adotadas pelo *Standards for Quality Improvement Reporting Excellence 2.0* (SQUIRE) para a descrição dos padrões dos ciclos de melhoria.

**Resultados:** Com a implementação desta metodologia, foram desenvolvidas ações, como inovações nas rotinas de trabalho, tanto assistenciais como gerenciais, mudanças no acolhimento com classificação de risco, construção de unidades para atendimento e alocação de pacientes, reuniões diárias interdisciplinares (*huddle*), plano de contingência pleno, rotinas de altas hospitalares, transferências externas, mudança no processo de comunicação com usuários e profissionais, dentre outras ações.

**Conclusão:** A utilização da Metodologia Lean resultou na diminuição da lotação e com isto pode-se otimizar recursos de saúde e assegurar práticas assistenciais e gerenciais de qualidade. Acredita-se que esta diminuição seja a comprovação de uma gestão sustentável em serviços de saúde e colabora para a redução de desigualdades socioeconômicas.

**DESCRITORES:** Serviço hospitalar de emergência. Gestão da qualidade total. Gestão em saúde. Desenvolvimento sustentável. Qualidade da assistência à saúde.

# IMPLANTACIÓN DE LA METODOLOGÍA LEAN EN EL SERVICIO DE URGENCIAS DE UN HOSPITAL UNIVERSITARIO: GESTIÓN Y DESARROLLO SOSTENIBLE

## RESUMEN

**Objetivo:** describir la aplicación de la Metodología Lean en un servicio de urgencias y su contribución a una gestión sostenible y de calidad.

**Método:** se trata de un estudio metodológico realizado entre octubre de 2018 y enero de 2022 en el servicio de urgencias de adultos de un hospital universitario público del sur de Brasil, analizando los resultados antes y después de la implementación de la Metodología Lean. El estudio siguió el modelo y las normas adoptadas por el *Standards for Quality Improvement Reporting Excellence 2.0* (SQUIRE) para describir las normas de los ciclos de mejora.

**Resultados:** con la implementación de esta metodología, se desarrollaron acciones como innovaciones en las rutinas de trabajo, tanto asistenciales como de gestión, cambios en la recepción con clasificación de riesgo, construcción de unidades de atención y asignación de pacientes, reuniones interdisciplinarias diarias (*huddle*), plan de contingencia completo, rutinas de alta hospitalaria, traslados externos, cambios en el proceso de comunicación con usuarios y profesionales, entre otras acciones.

**Conclusión:** la utilización de la Metodología Lean ha dado lugar a una reducción de los efectivos, lo que ha permitido optimizar los recursos de atención sanitaria y garantizar prácticas asistenciales y de gestión de calidad. Se considera que esta reducción es una prueba de gestión sostenible en los servicios de salud y contribuye a reducir las desigualdades socioeconómicas.

**DESCRITORES:** Servicio de urgencia en hospital. Gestión de la calidad total. Gestión en salud. Desarrollo sostenible. Calidad de la atención de salud.

## INTRODUCTION

Management of the Brazilian health system involves a complex network of factors that directly influence the health status of the population. Social and economic determinants, accessibility to services, public policies, investment in new technologies and treatments, and management and care strategies are all examples of these factors<sup>1</sup>.

The hospital in this study has the following objectives in its business plan and strategic management: to provide patient-centered care, seeking quality, efficiency, and patient safety; to optimize resources and spaces, using best practices, evidence, and data in process management in the use of physical structure and continuous improvement in the way they work; and to be sustainable, expanding governance actions to achieve institutional goals and objectives<sup>2</sup>.

Emergency services (ES) have been one of the gateways to the health system; it is where the most varied types of illnesses and health problems come through. Thus, the great challenge for institutions is to carry out sustainable, quality management in the face of scarce health resources and the great demand for services to improve the health of the population<sup>3</sup>.

The quality and efficiency of the work processes in the ES are perceived by indicators and technologies that evaluate the monitoring of actions and indicate possible failures adopted by the institutions<sup>4</sup>. When health systems are not operable, the generation of indicators and the consequent decision-making by managers are compromised<sup>5</sup>.

Lean is a methodology that originated in the manufacturing industry and has been used in the healthcare sector under the name Lean Healthcare. This methodology seeks to reduce waste in production systems, continuously improving processes while increasing productivity. It also optimizes the workforce and delivers more value to customers<sup>6</sup>.

Lean in Emergencies is a project of the Brazilian Ministry of Health, developed in partnership with the Sírio-Libanês Hospital, São Paulo/SP, and aims to reduce overcrowding in urgent and emergency care in public and philanthropic hospitals, improving resource management and, consequently, the satisfaction of both users and health professionals<sup>7</sup>.

The objective of this study was to describe the implementation of the Lean Methodology in an emergency department and its contribution to sustainable, quality management.

## METHOD

The research was carried out in compliance with the recommendations proposed by the National Health Council, in accordance with Resolution 466/2012, which sets out the guidelines and regulatory standards for research involving human beings, as well as the Brazilian General Data Protection Law (LGPD).

This is a methodological study, analyzing the results before and after the implementation of the Lean Methodology in the adult emergency department of a public university hospital in southern Brazil. The initial implementation period was between October 2018 and March 2020. The study followed the model and standards adopted by the Standards for Quality Improvement Reporting Excellence 2.0 (SQUIRE) for the description of improvement cycle standards and methodological transparency<sup>8</sup>.

The adult emergency service provides care for the clinical medicine, general surgery, gynecology, and obstetrics specialties (up to 20 weeks of pregnancy). The care areas are divided according to the severity of the patients' condition, as follows: reception with risk classification, medical decision unit, short stay units 1 and 2, intermediate units 1 and 2, red unit, and stabilization box.

This study included all patients aged 18 and over, both sexes, seen in the emergency department during the period of data collection, in the following specialties: clinical, surgical, and obstetric/gynecological care, in order to compare occupancy results before and after the implementation of the Lean Methodology.

The study was carried out in three stages: process performance assessment diagnosis, improvement interventions, and implementation of the action plan. The first stage of this study began in November 2018, shortly after the hospital was selected to implement the “Lean in Emergencies” project in October of the same year. In order to be selected to participate in this project, hospitals must have more than 150 beds, be part of the Emergency Care Network and located in metropolitan regions or capital cities, be overcrowded, have a risk classification system, bed management, and an internal regulation center, among others. In this phase, the service underwent a diagnosis which evaluated, using the Ishikawa diagram, the performance of its main care, management, and support processes.

In the second stage, between January and June 2019, care and management improvements were implemented. This stage involved meetings every two weeks involving the entire multiprofessional team, when work tools were used, especially 5S, value stream map (VSM), spaghetti diagram, force x impact matrix, and full capacity plan (PCP).

The VSM and the 5S tools were used with the aim of evaluating work activities in the emergency department and thus finding and eliminating waste in both products and tasks. The spaghetti diagram was used to optimize the flow of materials, staff, and patients in the physical area of the emergency department, since this tool allows these movements to be mapped out.

After applying these tools, the effort x impact matrix and the PCP were used to prioritize and plan the tasks to be carried out.

The third stage began in the second half of March 2019. During this phase, the action plan for the emergency department was already structured and the initial tasks began to be carried out with the aim of making changes to improve the patient flow process and the quality of care. However, due to the COVID-19 pandemic, the implementation of the actions was paused, as the hospital became a reference for the care of COVID-19 patients.

These actions were gradually resumed as the number of cases of the disease fell, starting in the first half of 2022, and are still ongoing at the hospital. During the pandemic, the emergency department was restructured and received a new physical area, currently providing a larger structure than when the project was first implemented, which will be presented in the results of this study. For this reason, some of the planned actions were evaluated and adapted.

The capacity of the adult emergency department before and after the implementation of the Lean Methodology was described as the monthly average of patients/day, explained by the formula:

$$\frac{\text{Total number of emergency patients per day } (\Sigma)}{\text{Number of days in the month}}$$

## RESULTS

With the restructuring of the nomenclatures of the units, physical area, and number of beds agreed with the Municipal Health Department before and after the implementation of the Lean Methodology in the adult emergency service, new actions and work routines were developed, both in the form of care and in the divisions of physical areas, which will be described below by area (Chart 1).

**Chart 1** – Restructuring in relation to the nomenclatures of the units, physical area, and number of beds agreed with the Municipal Health Department before and after the implementation of the Lean Methodology in the adult emergency department of a public university hospital in southern Brazil (2023). (n=18)

2018 Block A			2019 Block B		
Units	Physical Area (m <sup>2</sup> )	Points of care (78) <sup>†</sup>	Units	Physical Area (m <sup>2</sup> )	Points of care (88) <sup>†</sup>
Screening	1500 m <sup>2</sup>	03	Reception with Risk Classification (RRC)	5000 m <sup>2</sup>	02
Medical Offices		05	Medical Offices		04
Green Room		22	Medical Decision Unit (MDU)		20
Orange Room		21	Short Stay Unit 1 (SSU1)		10
			Short Stay Unit 2 (SSU2)		11
Inpatient Unit (IU)		12	Intermediate Unit 1 (IU1)		10
			Intermediate Unit 2 (IU2)		15
Vascular Unit (VU)		09	Red Unit (RU)		10
Procedure Room		01	Procedure Room		01
Collection Room		01	Collection Room		‡
Ultrasound Room		01	Ultrasound Room		
X-ray Room		01	X-ray Room		
Electrocardiogram Room		01	Electrocardiogram Room		01
Vascular Unit Box	01	Stabilization Box	04		

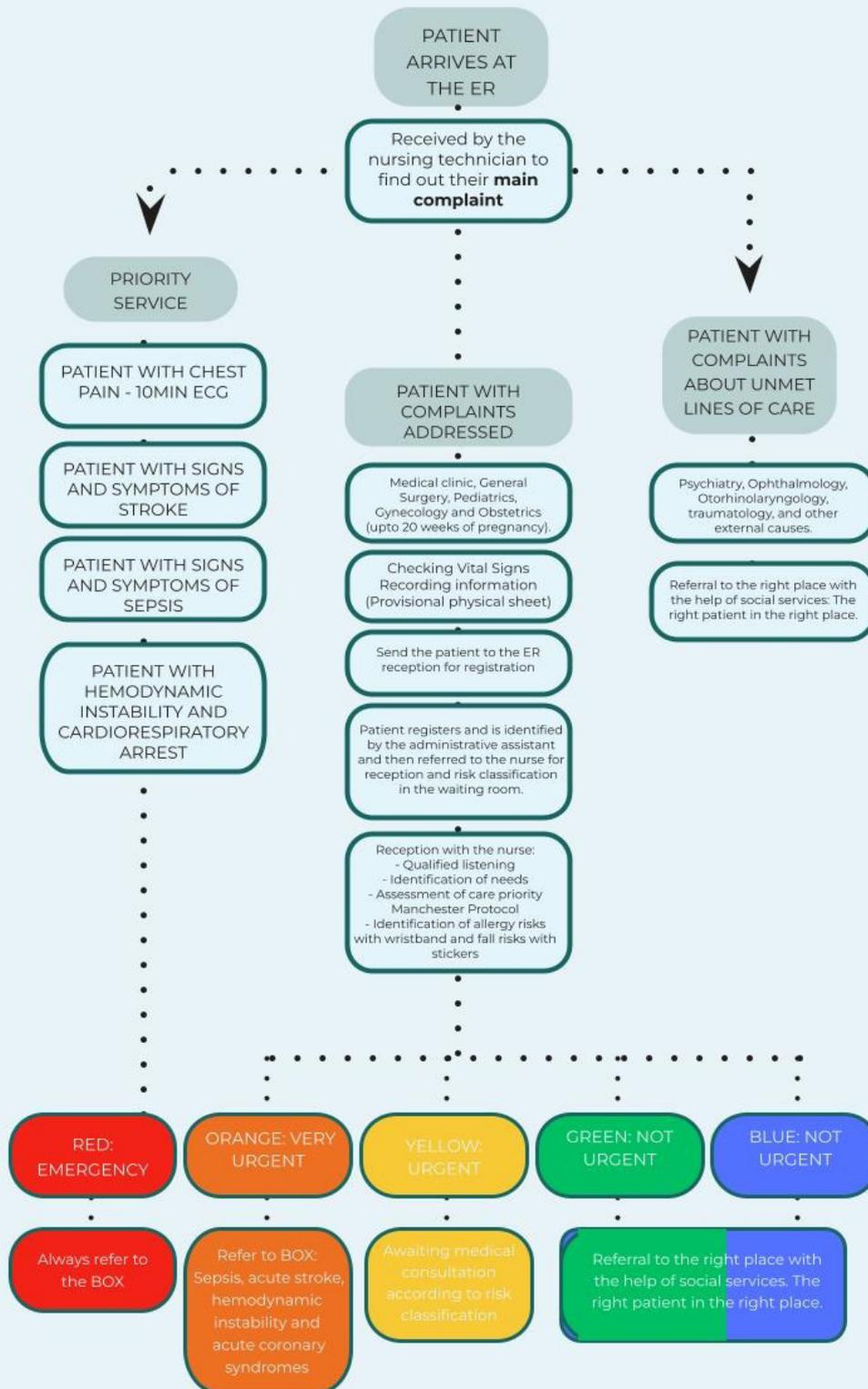
<sup>†</sup> Points of care: Places intended for direct patient care; <sup>‡</sup> With the change and restructuring of processes, these rooms are used by professionals to carry out procedures at the bedside or are shared areas with other hospital units, and are not exclusively used by the emergency department as before.

## Reception with risk classification (RRC)

Patients who come to the ER are welcomed by a team made up of a nursing technician, a social worker, and hospital security. The nursing technician welcomes the patient with the aim of getting to know their complaint, since the specialties covered in the ER are medical clinic, pediatrics, general surgery, gynecology, and obstetrics (up to 20 weeks of pregnancy). Patients with complaints from other specialties, such as trauma and psychiatry, when non-urgent, are referred to the referral services with the guidance of the nursing technician and social worker, to ensure that the patient is seen in the right place. Patients seen by the ER register at the administrative office and are referred to the reception desk with risk classification to be seen by the nurse. The professional identifies and evaluates the priority of care according to the Manchester Triage System (MTS) and identifies risks such as allergies and falls.

Patients classified as less urgent or non-urgent are referred to referral centers within the municipality's urgent and emergency care network. Patients with an urgent or very urgent risk classification await medical consultation according to priorities. Patients who fall within the institutional protocols (chest pain, stroke, sepsis) or who are hemodynamically unstable are immediately referred for medical care, within the specific emergency areas (stabilization box or red unit), as shown in Figure 1.

# EMERGENCY NURSING SERVICE RECEPTION FLOWCHART



**Figure 1** – Flowchart of care service based on reception with risk classification in the Adult Emergency Department.

## **Medical consultations**

Following the implementation of Lean and the restructuring of the physical area, the ER has 4 consulting rooms, 2 of which are clinical, 1 surgical, and 1 gynecological. During consultations, the patient is seen by the specialist according to their complaint and its severity. Afterwards, the patient is directed to the unit best suited to their severity (when beds are available) or they can be discharged directly from the clinic.

## **Physical units for patient allocation**

### ***Medical Decision Unit (MDU)***

This is a unit for patients who require observation or clinical stabilization for a limited period of time (they should not stay longer than six hours). During this observation period, a decision must be made between discharge or hospitalization, encouraging the autonomy of the emergency physician. In the case of hospitalization, the patient should be transferred to another area within the emergency department or to a bed in an inpatient unit. In this area, patients are mostly accommodated in armchairs, with stretchers for specific cases or overcrowding.

### ***Short stay units (SSU1, SSU2)***

Two units with a capacity for 18 patients each, accommodated in beds and stretchers. They are occupied by clinically stable patients who require low- and medium-complexity care and are unable to wait for hospitalization or external transfer in armchairs.

### ***Intermediate unit 1 (IU1)***

This unit is for patients who need monitoring and medium-complexity nursing care and are awaiting stabilization for admission to nursing beds. Patients who are on continuous regular insulin (non-ketotic patients), amiodarone, full heparin in an infusion pump and who are on a penicillin desensitization protocol are treated in this unit. The unit accommodates 10 people, all with beds and continuous monitoring.

### ***Intermediate unit 2 (IU2)***

Unit with patients with a higher degree of dependency, using non-invasive mechanical ventilation, in palliative care, with medium complexity care and awaiting hospitalization or transfer. This unit accommodates 15 patients, 4 of which are for respiratory isolation, all with beds and no continuous monitoring.

### ***Red unit (RU)***

This unit is where patients with clinical and hemodynamic instability are admitted, with indications of continuous monitoring of vital signs and the need for intensive care. The unit has 9 individual beds, all with continuous monitoring.

### ***Stabilization box***

The unit contains four boxes for the care of clinically unstable patients or those who meet the protocols for chest pain, stroke, and sepsis, each of which can admit two patients. It also has a procedure room with capacity for two patients.

## Test request routines

Without impeding medical decision-making (not even in clinical or surgical specialties), but especially in those units where quicker responses are required, some complementary tests can no longer be ordered, such as spirometry, breast ultrasound, and genetic markers.

## Consulting request routines

Following the same line, only Cardiology, Neurology, Gastroenterology (Digestive Hemorrhage), Transplants and General Surgery consultations should be requested in areas where decisions are made more quickly. It has also been widely publicized that, in units where patients stay longer, the autonomy of physicians on duty is preserved and they define, using common sense, which consultancies with specialties they wish to request.

## Routine duties of medical managers

Among the changes implemented was a change in the routine duties of medical managers who, in addition to remaining responsible for monitoring the unit's indicators and performance, the duty schedule, and the distribution of on-call staff in the different areas, also have a pro-assistance role, coordinating the medical team's interface with other members of the multiprofessional team.

## Discharges and referrals

Another essential change to reduce overcrowding was the creation of the Emergency Discharge Team (EDT). This team is made up of nurses, physicians, social workers, and psychologists from the ER itself who are responsible for defining patients with transfer profiles to less complex hospitals.

## Huddle

Operational meetings, held by the medical management and supervisors, together with the multiprofessional team involved in patient care and the internal regulation center, lasting approximately 10 minutes, during the 3 work shifts (including weekends) at specific times. This meeting updates the priorities for beds, exams, consultations, discharges, and transfers, among other urgent demands at the moment.

## Development of internal communication and information mechanisms

The daily publication and dissemination of the Emergency Meter (Figure 2) facilitated the communication of actions and the routine use of this new language among professionals, residents, students, and service users. The Emergency Meter is updated daily and is available for consultation on the website of the Hospital de Clínicas de Porto Alegre (HCPA).



**Figure 2** – Emergency room capacity: Emergency meter.  
Source: Hospital de Clínicas de Porto Alegre. Emergency Meter, 2023.

## Preparation of the Full Contingency Plan (FCP)

In the FCP, care and management actions are defined according to the emergency room's capacity and involve other sectors and units of the hospital and the health network. The FCP is divided into 4 levels: routine (up to 74 patients), level 1 (75-84 patients), level 2 (85-96 patients), and level 3 (97 patients and over).

### Other actions

Creation of a discharge room on the inpatient floors, with the aim of improving the release of beds; reinforcement of board meetings, and meetings with the hospital management; reformulation of contact with outpatient areas regarding patient referrals and rescheduling of post-discharge appointments.

### Emergency room capacity

The preliminary results correspond to one of the aims of implementing the Lean Methodology, which is to reduce crowding in the emergency department, as shown in Table 1.

**Table 1** – Emergency room capacity before and after implementing the Lean Methodology. Porto Alegre, RS, Brazil, 2023.

Period	Average number of patients/day	
	2018	2019
July	101.1	82.3
August	108.8	84.4
September	112.6	66.6

Source: Hospital de Clínicas de Porto Alegre, 2023.

The months of July, August, and September 2018 correspond to the last three months before the start of the project and also to the winter period, a time when demand for emergency care increases due to the seasonal increase in respiratory diseases in the state. As a result, it can be seen that the most significant difference occurred in September 2019, a period when the project was already in full progress with the execution of the planned tasks with daily and rigorous monitoring of the service occupancy.

## DISCUSSION

According to the National Health Survey carried out in 2019, before the Coronavirus pandemic and published by the Brazilian Institute of Geography and Statistics (IBGE), more than 70% of the population needed the public system for care and treatment of health problems<sup>9</sup>. This explains the large number of people seeking care in hospital emergency rooms and the overcrowding of these services, directly impacting sustainable development and the balance between supply and demand, so sought after by health managers<sup>10</sup>.

Studies have identified that the increase in the volume of patients in emergency services has a negative impact on the quality and safety of care, with an overload of work for staff. This increases the risk of errors and adverse events, hospital costs, worsens the rates of re-evaluation and definition of medical conduct, and consequently increases the use of tests, medications, and hospital materials<sup>11-12</sup>.

The idea of sustainable development has been incorporated into the government, environmental, and business discourse. This standard model must be economically viable, socially fair, and

environmentally correct, with the presence of actors representing public management, economic agents, and civil society. The idea is to seek effective solutions to socioenvironmental problems; in this specific case, the difficulty in accessing health services, long waiting times, overcrowded services, and high costs<sup>13-14</sup>.

In this context, the 2030 Agenda is an international agreement, legitimized at the United Nations (UN) General Assembly, which aims to make development sustainable for all nations and peoples. To make this feasible, 17 Sustainable Development Goals (SDGs) were established, including “Health and Well-being”, the third goal, which aims to achieve universal health coverage, including financial risk protection and access to quality essential health services at all ages<sup>15</sup>.

Given the concern about people’s living conditions from a social point of view, there is a growing need to create policies and instruments aimed at promoting a better quality of life and reducing the inequalities generated by the deprivation of minimum essential needs for the maintenance and promotion of human life<sup>16</sup>. This means that the development of a country or region is essentially linked to the opportunities offered to the population, just as organizational development must be aligned with global health and sustainable management practices, as some studies have shown<sup>16-17</sup>.

The Lean Methodology was born in the automobile industry through the Toyota Production System and its philosophy is to reduce costs and waste. The tools used converge to identify flows, map activities and their value in time, search for losses, and produce activities with greater value, less consumption, and less waste, using the same human resources and settings<sup>18</sup>. This strategy is widely applied in various organizations and its goals involve process improvements, as seen in studies in the textile and furniture industries<sup>19-20</sup>.

When applied in the healthcare field, the Lean Methodology is called Lean Health Care and its purpose is to restructure practice scenarios, reorganize patient flows, and produce new care and management indicators in healthcare services<sup>21</sup>. This methodology has shown interesting results, as demonstrated by a study carried out in a pediatric hospital in Cincinnati (USA), which reduced the turnover time of isolation rooms<sup>22</sup>. In another study carried out in the emergency department of a hospital in Naples (ITA), it was possible to reduce waiting times, improve efficiency in care, and provide employees with a quality working environment<sup>23</sup>.

Developed by the Institutional Development Support Program of the Unified Health System (Proadi/SUS), in partnership with the Sírio-Libanês Hospital (São Paulo/SP), the “Lean in Emergencies” project takes place in cycles starting every six months. In order to participate, the hospital needs to meet certain eligibility criteria which consider the structure, institutional governance, and certain characteristics of the emergency service<sup>7</sup>. Hospitals that have implemented this project in their emergency departments have achieved satisfactory results, such as an increase in the number of patients admitted via the emergency department, earlier discharge, as well as a reduction in the maximum length of stay and integrated management between the institution’s different services<sup>24-25</sup>.

The actions defined during the implementation of the project in the emergency department of the hospital under study were planned with the aim of improving both care and management. However, the transformation in the way of working brought unexpected consequences and reactions during its implementation, especially with regard to workers and the cultural change related to the new management model. This data corroborates a study carried out in hospitals in Brazil and Portugal, which identified difficulties related to technology (work tools) on the part of the workforce and cultural adaptation to the use of these technologies<sup>26</sup>. For this reason, these actions have been evaluated and have undergone adjustments and changes according to the needs of the service.

Reception with risk classification, for example, ensures that patients are assigned to the appropriate place according to their needs, with only the most serious cases remaining in the hospital ER. The presence of social workers together with nursing technicians when patients arrive at the service

was necessary to optimize patient referrals. A study carried out in the emergency department of a hospital in Ribeirão Preto/SP found that the presence of a social worker provides a moment to listen to patients and families, meeting social demands, and those of other professionals in the care team<sup>27</sup>.

In the Medical Decision Unit (MDU) and the Short Stay Units (SSU), the target length of stay is between 6 and 72 hours, respectively. These units allow for a clinical assessment of patients before they are admitted to hospital, and help to speed up their discharge, as they are cared for by an exclusive team, allowing for agile therapeutic planning and, consequently, the optimization of hospital bed management. A study carried out in a tertiary hospital in Korea showed that the creation of short stay units can reduce prolonged hospitalization, especially in situations of overcrowding in emergency services. In addition, the study presented clinical results showing a reduction in admissions to intensive care units after the creation of these units<sup>28</sup>.

Management actions such as Huddle, FCP, and EDT are tools that optimize patient flow and facilitate the work process, evaluating specific needs and problems, making communication with other sectors of the institution and other services in the health network more dynamic. A recent study of 24 hospitals in the United States that implemented FCP in their emergency departments showed that this action contributed to a reduction in waiting times, patient satisfaction, an improvement in mortality rates, and higher operating revenues<sup>29</sup>.

## CONCLUSION

The implementation of the Lean Methodology in the emergency department has contributed to sustainable and quality management, since it has provided those involved with a systemic vision of the actions taken, expansion and modification of the physical area for patient care, organization of work processes, and optimization of human and material resources, with repercussions on the reduction of the service's capacity and costs for the health system.

The involvement of a multiprofessional team is essential for adapting care processes, both in terms of leadership commitment and in diagnosing the flow map and the respective values assigned to each step. It is essential to recognize that reducing the number of patients in an emergency service strengthens the health system, opening up space for new patients to be assisted and bringing care security to both the staff and patients.

## REFERENCES

1. Aleluia IRS, Medina MG, Vilasbôas ALQ, Viana ALD. Gestão do SUS em regiões interestaduais de saúde: Análise da capacidade de governo. *Ciênc Saúde Coletiva* [Internet]. 2022 [cited 2023 Mar 29];27(5):1883-94. Available from: <https://doi.org/10.1590/1413-81232022275.10392021>
2. Hospital de Clínicas de Porto Alegre. Carta Anual de Políticas Públicas e Governança Corporativa 2022 [Internet]. Porto: Hospital de Clínicas de Porto Alegre; 2022 [cited 2023 Mar 29]. Available from: [https://www.hcpa.edu.br/downloads/carta\\_de\\_governanca\\_2022\\_\\_copia\\_1.pdf](https://www.hcpa.edu.br/downloads/carta_de_governanca_2022__copia_1.pdf)
3. Miranda WD de, Silva GDM da, Fernandes L da MM, Silveira F, Sousa RP de. Desigualdades de saúde no Brasil: Proposta de priorização para alcance dos Objetivos do Desenvolvimento Sustentável. *Cad Saúde Pública* [Internet]. 2023 [cited 2023 Jun 15];39(4):e00119022. Available from: <https://doi.org/10.1590/0102-311XPT119022>
4. Souza OL, Costa DN, Oliveira DML, Almeida HOC, Mendonça IO. Indicadores de qualidade nos serviços de urgência hospitalar. *CGCBS* [Internet]. 2018 [cited 2023 Mar 29];4(3):173-88. Available from: <https://periodicos.set.edu.br/cadernobiologicas/article/view/5177>
5. Vandresen L, Pires DEP de, Trindade L de L, Ribeiro OMPL, Martins MMFP da S, Mendes M. Challenges faced by nurse-managers at work in brazilian and portuguese hospitals: a mixed-

methods study. *Texto Contexto Enferm* [Internet]. 2023 [cited 2023 Jul 10];32:e20230059. Available from: <https://doi.org/10.1590/1980-265X-TCE-2023-0059en>

6. Souza de Oliveira A, Carvalho Viana B, Alves Roberto JC, Pereira Souto S. Aplicação da metodologia lean manufacturing a gestão da manutenção industrial. *R G Secur* [Internet]. 2023 Nov [cited 2023 Sep 20];14(6):8997–9018. Available from: <https://doi.org/10.7769/gesec.v14i6.2277>
7. Hospital Sírio-Libanês. Lean nas emergências [Internet]. 2018 [cited 2023 Mar 29]. Available from: <https://www.leannasemergencias.com.br>
8. Ogrinc G, Armstrong GE, Dolansky MA, Singh MK, Davies L. SQUIRE-EDU (Standards for QUality Improvement Reporting Excellence in Education): Publication Guidelines for Educational Improvement. *Acad Med* [Internet]. 2019 [cited 2023 May 28];94(10):1461-70. Available from: <https://doi.org/10.1097/ACM.0000000000002750>
9. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional de Saúde – PNS [Internet]. 2019 [cited 2023 Mar 29]. Available from: <https://www.ibge.gov.br/estatisticas/sociais/saude/9160-pesquisa-nacional-de-saude.html?=&t=resultados>
10. Morley C, Unwin M, Peterson GM, Stankovich J, Kinsman L. Emergency department crowding: A systematic review of causes, consequences and solutions. *PLoS One* [Internet]. 2018 [cited 2023 Mar 29];13(8):1-42. Available from: <https://doi.org/10.1371/journal.pone.0203316>
11. McKenna P, Heslin SM, Viccellio P, Mallon WK, Hernandez C, Morley EJ. Emergency department and hospital crowding: Causes, consequences, and cures. *Clin Exp Emerg Med* [Internet]. 2019 [cited 2023 Mar 29];6(3):189-95. Available from: <https://pubmed.ncbi.nlm.nih.gov/31295991/>
12. Ministério da Saúde (BR), Grupo Hospitalar Conceição. Inovação Tecnológica no Enfrentamento da Superlotação Hospitalar: A experiência do Hospital Nossa Senhora da Conceição – Porto Alegre/RS. Porto Alegre: Hospital Nossa Senhora da Conceição; 2018.
13. Hopwood B, Mellor M, O'brien G. Sustainable development: Mapping different approaches. *Sustainable Dev* [Internet]. 2005 [cited 2023 Mar 29];13(1):38-52. Available from: <https://doi.org/10.1002/sd.244>
14. Mazzarino JM, Turatti L, Petter ST. Environmental governance: Media approach on the united nations programme for the environment. *Environ Dev* [Internet]. 2020 [cited 2023 Mar 29];33:100502. Available from: <https://doi.org/10.1016/j.envdev.2020.100502>
15. World Health Organization. Inter-agency and Expert Group on SDG Indicators – IAEG-SDGs [Internet]. 2022 [cited 2023 Mar 29]. Available from: <https://unstats.un.org/sdgs/iaeg-sdgs/>
16. Dalto KKS, Pires MM, Aguiar PCB. Development as freedom in Brazil. *Soc Nat* [Internet]. 2021 [cited 2023 Mar 29];33:e59137. Available from: <https://doi.org/10.14393/SN-v33-2021-59137>
17. Boff L. Sustentabilidade: O que é, o que não é. Petrópolis, RJ(BR): Vozes; 2016.
18. Santos DMC, Santos BK, Santos CG. Implementation of a standard work routine using Lean Manufacturing tools: A case study. *Gest Prod* [Internet]. 2021 [cited 2023 Mar 29];28(1):e4823. Available from: <https://doi.org/10.1590/0104-530X4823-20>
19. Lista AP, Tortorella GL, Bouzon M, Mostafa S, Romero D. Lean layout design: A case study applied to the textile industry. *Prod* [Internet]. 2021 [cited 2023 Mar 29];31:e20210090. Available from: <https://doi.org/10.1590/0103-6513.20210090>
20. Mohan Prasad M, Dhiyaneswari JM, Ridzwanul Jamaan J, Mythreyan S, Sutharsan SM. A framework for lean manufacturing implementation in Indian textile industry. *Mater Today: Proc* [Internet]. 2020. [cited 2023 Mar 29];33(7):2986-95. Available from: <https://doi.org/10.1016/j.matpr.2020.02.979>

21. Silva TO, Vieira LM, Lemos TS, Sant'Anna FP, Sanches RS, Martinez MR. Gestão hospitalar e gerenciamento em enfermagem à luz da filosofia lean healthcare. *Cogitare Enferm* [Internet]. 2019 [cited 2023 Mar 29];24:e60003. Available from: <http://doi.org/10.5380/ce.v24i0.60003>
22. Ankrum AL, Neogi S, Morckel MA, Wilhite AW, Li Z, Schaffzin JK. Reduced isolation room turnover time using Lean methodology. *Infect Control Hosp Epidemiol* [Internet]. 2019 [cited 2023 Mar 29];40(10):1151-6. Available from: <http://doi.org/10.1017/ice.2019.199>
23. Imbrota G, Romano M, Di Cicco MV, Ferraro A, Borrelli A, Verdoliva C, et al. Lean thinking to improve emergency department throughput at AORN Cardarelli hospital. *BMC Health Serv Res* [Internet]. 2018 [cited 2023 Mar 29];18:914. Available from: <https://doi.org/10.1186/s12913-018-3654-0>
24. Zepeda-Lugo C, Tlapa D, Baez-Lopez Y, Limon-Romero J, Ontiveros S, Perez-Sanchez A, et al. Assessing the impact of lean healthcare on inpatient care: A systematic review. *Int J Environ Res Public Health* [Internet]. 2020 [cited 2023 Sep 21];17(15):5609. Available from: <https://doi.org/10.3390/ijerph17155609>
25. Fernandes HMLG, Jesus MVN, Silva D, Guirardello EB. Lean Healthcare in the institutional, professional, and patient perspective: An integrative review. *Rev Gaúcha Enferm* [Internet]. 2020 [cited 2023 Mar 29];41:e20190340. Available from: <https://doi.org/10.1590/1983-1447.2020.20190340>
26. Vandresen L, Pires DEP de, Martins MMFP da S, Forte ECN, Leão E, Mendes M. Potentialities and difficulties of technological mediation in the work of nurse managers in hospitals. *Texto Contexto Enferm* [Internet]. 2022 [cited 2023 Apr 19];31:e20220173. Available from: <https://doi.org/10.1590/1980-265X-TCE-2022-0173en>
27. Costa JS, Meneghette JP, Cabral JKO. O acolhimento do serviço social junto às famílias no âmbito da urgência e emergência. *Qualidade HC* [internet]. 2021 [cited 2023 Mar 29];2(1):168-76. Available from: <https://www.hcrp.usp.br/revistaqualidadehc/edicaoSelecionada.aspx?Edicao=13>
28. Ok M, Choi A, Kim MJ, Roh YH, Park I, Chung SP, et al. Emergency short-stay wards and boarding time in emergency departments: A propensity-score matching study. *Am J Emerg Med* [Internet]. 2020 [cited 2023 Sep 21];38(12):2495-9. Available from: <https://doi.org/10.1016/j.ajem.2019.12.014>
29. Tabriz AA, Birken SA, Shea CM, Bried CJ, Viccellio P. What is full capacity protocol, and how is it implemented successfully? *Implement Sci* [Internet]. 2019 [cited 2023 Mar 29];14(1):73. Available from: <https://doi.org/10.1186/s13012-019-0925-z>

## NOTES

### ORIGIN OF THE ARTICLE

Article extracted from the thesis – The Lean project in emergencies: management and sustainable development, presented to the Graduate Program in Environment and Development, Universidade do Vale do Taquari, in 2023. This study is linked to project – *Desfechos clínicos e gestão da assistência de enfermagem do paciente adulto crítico: Estudo multicêntrico*.

### CONTRIBUTION OF AUTHORITY

Study design: Rocha CR, Rempel C.

Data collection: Rocha CR, Santarem MD, Ferranti E, Santana JCB.

Data analysis and interpretation: Rocha CR, Santarem MD, Ferranti E, Santana JCB.

Discussion of results: Rocha CR, Rempel C, Santarem MD, Inchauspe JAF, Santos S, Chassot MD.

Writing and/or critical review of content: Rocha CR, Rempel C, Santarem MD, Inchauspe JAF, Santos S, Chassot MD.

Review and approval of the final version: Rocha CR, Rempel C, Santarem MD, Ferranti E, Santana JCB, Inchauspe JAF, Santos S, Chassot MD.

### APPROVAL OF ETHICS COMMITTEE IN RESEARCH

Approved by the Ethics Committee in Research of the Hospital de Clínicas de Porto Alegre, opinion number nº4.100.693 and 2020-0286, Certificate of Presentation for Ethical Appreciation CAAE: 32560920.0.1001.5327.

### CONFLICT OF INTEREST

There is no conflict of interest.

### EDITORS

Associated Editors: José Luís Guedes dos Santos, Maria Lígia Bellaguarda.

Editor-in-chief: Elisiane Lorenzini.

### HISTORICAL

Received: June 12, 2023.

Approved: September 27, 2023.

### CORRESPONDING AUTHOR

Cristiano Rossa da Rocha

crdrocha@hcpa.edu.br