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ANALYSIS OF THE PATIENT CARE FLOW IN HEMODYNAMICS SUPPORTED BY LEAN THINKING

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ABSTRACT

Objective: to analyze the patient care flow in a Hemodynamics service grounded on Lean Thinking based on Value Stream Mapping.
Method: an exploratory-descriptive case study carried out in the Hemodynamics service of a public university hospital from southern Brazil. Data collection was conducted through participant observation with twelve members of the multiprofessional team and interviews with five participants from May 2021 to February 2022. The analysis was based on the Lean framework and on the stages foreseen in Value Stream Mapping.
Results: the Value Stream Map of the current situation of the service was prepared, identifying suppliers and customers of the process and their requirements. A total of 61 problems related to unmet requirements were listed, of which 12 were prioritized in order to promote improvement planning.
Conclusion: with Value Stream Mapping it was possible to establish improvement priorities that exert impacts on operational performance of the service. It was identified that improvements related to standardization of the activities minimize waste from failures and waiting times, which were the most prevalent in the service, among others observed.

DESCRIPTORS: Health management. Hospital Cardiology service. Workflow. Assessment of processes in health care. Quality improvement. High-cost technology.

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ANÁLISE DO FLUXO DO ATENDIMENTO DE PACIENTES EM HEMODINÂMICA SUSTENTADO NO PENSAMENTO *LEAN*

RESUMO

Objetivo: analisar o fluxo do atendimento de pacientes em um serviço de hemodinâmica sustentado no pensamento *Lean* com base no Mapa de Fluxo de Valor.
Método: estudo de caso, exploratório-descritivo, realizado no serviço de hemodinâmica de um hospital público universitário do sul do Brasil. A coleta de dados ocorreu por meio de observação participante com doze integrantes da equipe multiprofissional e entrevistas com cinco participantes no período de maio de 2021 a fevereiro de 2022. A análise sustentou-se no referencial *Lean* e nas etapas previstas no Mapa de Fluxo de Valor.
Resultados: elaborou-se o Mapa de Fluxo de Valor da situação atual do serviço, identificando-se fornecedores e clientes do processo e seus requisitos. Elencaram-se 61 problemas relacionados a requisitos não atendidos, dos quais 12 foram priorizados, a fim de promover o planejamento de melhorias.
Conclusão: com o Mapa de Fluxo de Valor foi possível estabelecer prioridades de melhoria que impactam no desempenho operacional do serviço. Identificou-se que melhorias relacionadas à padronização das atividades minimizam os desperdícios de falha e espera, que foram os mais prevalentes no serviço, entre outros observados.

DESCRITORES: Gestão em saúde. Serviço hospitalar de cardiologia. Fluxo de trabalho. Avaliação de processos em cuidados de saúde. Melhoria de qualidade. Tecnologia de alto custo.

ANÁLISIS DEL FLUJO DE LA ATENCIÓN PROVISTA A PACIENTES DE UN SERVICIO DE HEMODINÁMICA SUSTENTADO EN LA FILOSOFÍA *LEAN*

RESUMEN

Objetivo: analizar el flujo de la atención provista a los pacientes en un servicio de Hemodinámica, sustentado en la filosofía *Lean* sobre la base del Mapa de Flujo de Valor.
Método: estudio de casos, exploratorio y descriptivo, realizado en el servicio de Hemodinámica de un hospital público universitario del sur de Brasil. Los datos se recolectaron por medio de observación participante con doce integrantes del equipo multiprofesional y de entrevistas con cinco participantes entre mayo de 2021 y febrero de 2022. El análisis se sustentó en el referencial *Lean* y en las etapas previstas en el Mapa de Flujo de Valor.
Resultados: se elaboró el Mapa de Flujo de Valor correspondiente a la situación actual del servicio, con la debida identificación de proveedores y clientes del proceso y sus requisitos. Se elaboró una lista con 61 problemas relacionados a requisitos no cumplidos, 12 de los cuales 12 fueron priorizados con el fin de promover la planificación de mejoras.
Conclusión: con el Mapa de Flujo de Valor fue posible establecer prioridades de mejora que ejercieron un impacto sobre el desempeño operativo del servicio. Se identificó que las mejoras relacionadas con la estandarización de las actividades minimizan los desperdicios por fallas y esperas, que fueron los más prevalentes en el servicio, entre otros observados.

DESCRIPTORES: Gestión salud. Servicio hospitalario de Cardiología. Flujo de trabajo. Evaluación de procesos en la atención de la salud. Mejoras en la Calidad. Tecnología de alto costo.

INTRODUCTION

On the global stage, among other non-communicable diseases, heart diseases have become one of the main causes of mortality, representing a large part of the burden on health services. Such services are characterized by being interventionist, even if minimally invasive as in the Hemodynamics sector, requiring specialized teams in constant contact with technologies, process control, flows and costs, factors that configure highly complex environments[1].

The flow of patients in the hospital service is explored to optimize hospitalization beds[2] and involves internal resources and systems necessary to take each patient from admission to discharge, taking into account the care process quality and the patients' and health professionals' satisfaction[3]. However, the challenge presented to hospitals is the disparity between supply of health services and demand from the population, commonly related to flow problems and the failure to manage them, impacting institutional results[2,4].

Despite the growing epidemiological scenario in relation to cardiovascular diseases, there is a gap in studies that address patient flow management involving hemodynamic services[2,5], configuring one of the motivations for carrying out this study. It is recognized that, when systematically developed to improve processes, this strategy can reduce operational inefficiencies in Hemodynamics services, impacting overall productivity[6].

Characterized by being highly complex, the management of health services requires the need to integrate different knowledge areas in the health field, especially when seeking to optimize processes and flows. In this sense, Lean Thinking has contributed to improving health processes in the last two decades, although it is still incipient in Brazil[3,5]. The main objective of applying its tools in health services is to improve the production system performance, meeting the health needs of the population in order to generate satisfaction for patients, families and professionals[3,7].

From a Lean perspective, better performance is achieved by identifying, reducing or eliminating waste of time, resources or workforce and by developing activities that effectively add value from the customer's point of view[8]. Clients are considered to be both professionals interconnected by interdependent activities of a process and patients and their families, as end users of the service[9]. It is noted that Lean Thinking supports consumption of resources with austerity, maximizing the quality of the service offered, in addition to recognizing and fully valuing the professionals' knowledge and skills[5,9].

Value Stream Mapping (VSM) stands out among the tools used to analyze processes from a Lean perspective. It provides a view of the activities, information and resources present in the flow analyzed, providing a graphical representation of the process, with which a systemic approach is obtained for analyzing and proposing improvements[8-10]. With the perception of the whole, it is possible to direct the focus to improvements that exert a more significant impact on the value stream and that are more sustainable in the long term[10]. Some studies indicate that applying this tool in health services reduces waste, impacting financial sustainability and the patients'/health professionals' satisfaction, conditions that improve quality of the service[11-12].

Given the need to seek innovative strategies to identify opportunities to improve the patient care flow in the Hemodynamics service, the research question is as follows: Which improvements can be implemented to optimize the care flow in the Hemodynamics service? The objective is to analyze the patient care flow in a Hemodynamics service grounded on Lean Thinking based on Value Stream Mapping.

METHOD

This is a case study research[13], exploratory, descriptive and with a qualitative approach, supported by Lean Thinking and carried out in a Hemodynamics service of a public university hospital. The Hemodynamics service has a team comprised by three nurses, including the main researcher, five nursing technicians and an administrative assistant, in addition to a medical team made up of an intervention cardiologist, six endovascular surgeons and two Gastroenterology specialists, totaling 18 professionals. A total of 13 service professionals participated in the research, of which eight were only active in the observation stage, four participated in the observation and interview stages and one only took part in the interview, as he held a management position. As a result, 12 professionals were observed and five interviews were carried out. The sample was configured for convenience, considering professionals from the multiprofessional team working in the specialties to be observed, followed by one participant from each professional category for the interview stage. The sample was made up of all working categories, including a unit head, a nurse, an administrative assistant, a nursing technician and a physician.

For data collection, participant observation and individual interview techniques were adopted, both guided by a script. The former took place between May and August 2021 in the morning and afternoon shifts, following the flow of patients treated by the Vascular, Gastroenterology and Cardiology specialties, totaling 18 hours. This stage was conducted by the main researcher with the research team, exploring which professionals work in carrying out each activity and what resources are involved. The diverse information was recorded in a field diary organized through a semi-structured script and supported the preliminary preparation of the VSM for the current situation, considering the identification of clients, process suppliers, activities and information flow[8].

The interviews took place between December 2021 and February 2022 to validate the VSM and the problems mapped during the observation. The interviews were audio-recorded using a cell phone and lasted a mean of thirty-nine minutes. They began with a brief presentation on the framework used, followed by a presentation of the VSM for the current situation and the problems identified, based on the clients' unmet criteria. According to the Lean framework, requirements are the conditions necessary to develop an activity or receive a service[8]. During the interview, the participants were encouraged to share their perceptions regarding the care process, highlighting factors that impact the patient care flow.

After the *verbatim* transcription of the interviews, an integrated analysis of the data obtained in the observations and interviews was carried out, whose set of information allowed constructing the final version of the VSM for the current situation, which was transposed into the Microsoft Visio® 2022 software. The analysis followed the stages foreseen in VSM: Identification of the clients and their requirements; Problems related to the unmet requirements; Mapping validation; and Prioritization of the problems surveyed[8].

The organization of the list of problems followed the mapped stages of the process, relating the problems identified to waste. From the Lean Thinking perspective, waste consists of activities that do not add value to the process, classified into eight types[9]: failures; overproduction, production greater than demand; transport of supplies and patients; waiting for professionals, patients or resources; stock; unnecessary movement; excess processing; and human potential or talent, when professionals are disengaged.

To prioritize the problems, three criteria were applied based on a previous study developed in a hospital context[11], namely: non-standardization; impact on patient safety; and implementation of short-term improvements. The criteria were applied successively, assigning grades 9, 3 and 1 depending on the relationship degree between the problem and the criterion: strong (9), medium (3) and weak (1).

The research was approved by the Committee of Ethics in Research with Human Beings of the proposing institution and followed all indicated ethical precepts, highlighting the following: the participants' anonymity through alphanumeric codes; and signing of the Free and Informed Consent Form by the main researcher and participants, in two copies, one of them intended for the participants. The COREQ checklist was followed to carry out the research.

RESULTS

With the analysis of the patient care flow in Hemodynamics, the activities carried out at each stage, the customers and suppliers of the process were identified. Based on this relationship and the necessary resources, the clients' requirements are presented, with a view to analyzing those not met, which resulted in 61 problems, highlighting them based on prioritization, in 12 opportunities for improvement. The set of these results was represented in the VSM for the current state, which is presented in detail below:

The main client in this flow is the patient, based on the need to undergo an exam or procedure in the Hemodynamics service. Several professionals work during the process, identified as internal clients, who need to have requirements met in subsequent stages to follow the process flow. The professional categories identified were the following: Administrative assistant, Nurse, Nursing technician, Anesthesiologist, Surgeon and General Services assistant.

Regarding the process stages, the following were identified: admission, procedure, transport to recovery, recovery and discharge. The flow starts with the patient, whose input is scheduling of the procedure by the medical team. The first stage of the process is the patient's admission, carried out by a nurse who checks the schedule and begins preparing the patient based on a Nursing checklist and history; by a physician, who performs the pre-anesthetic assessment; and by an administrative assistant, responsible for organizing the necessary documents and availability of requested materials. The team's requirements to develop of these activities are as follows: scheduling in the surgical map; confirmation of a vacancy in the Intensive Care Unit (ICU);: transport of the patient by stretcher bearers; preparation of the patient in the hospitalization unit and in the Hemodynamics service for the procedure; confirmation of consent form, blood reserve and specific medications, as well as pre-anesthetic evaluation.

In the procedure stage, the general requirements are the following: complete team in the sector; prepared room; safe surgery checklist carried out; patient registration in the Hemodynamic equipment; ultrasound available; time organization to initiate procedures according to available room time; and available and appropriate Personal Protection Equipment (PPE). The first substage of the procedure (Preparation of the procedure room) is carried out by two nursing technicians, who assemble the surgical table and check the Orthoses, Prostheses and Special Materials (OPSM) stock in consultation with the physician performing the procedure. The requirements include available and tested equipment, materials and medications in stock, verification of the electrical and gas network, availability, control and registration of OPSM use in procedures.

Upon completion of room preparation, the nurse is communicated verbally and begins the substage of transporting the patient to the procedure room, usually carried out by the nurse. The requirements considered at this stage are as follows: assembled operating table and medical confirmation of the patient's release for the procedure.

The next substage is the anesthetic procedure, which begins with positioning the patient on the surgical table, followed by continuous cardiac monitoring, anesthetic induction and procedures for installing tubes, drains and/or invasive catheters. Four professionals generally participate: a nurse, a nursing technician, a physician and an anesthesiologist resident. The necessary requirements are

the following: tested equipment; safe surgery checklist; materials and medications available for the anesthetic procedure; surgical positioning; and patient monitoring.

At the end of the anesthetic procedure, the examination/surgery substage is initiated, with eight professionals usually participating: a surgeon; two surgery residents; two nursing technicians; a nurse; a physician; and resident anesthesiologists. The requirements for this stage include patient anesthetized and positioned, and angiograph available and working.

With the examination/surgery substage completed and the patient leaving the room, the last substage of the procedure proceeds (Cleaning and organizing the room), commonly carried out by two nursing technicians and a cleaning assistant. The requirements considered are sending materials for disinfection to specific sectors, the patient's exit from the room and vacating the room for cleaning by the hygiene team.

Subsequently, the "transport to recovery" stage begins, where the patient can be transferred to the ICU or Post-Anesthetic Recovery Room (PACU). Transport to the ICU is in charge of a nurse, a physician and a resident, anesthesiologists, completing the patient care flow in the Hemodynamics service. In case of transport to PACU, the activity is carried out by a nurse and a nursing technician. Some requirements were considered at this stage: definition of transport to the PACU or ICU, completion of the procedure, clinical stability, removal of the introducer and dressing of the access route. Next, the recovery stage is initiated in which continuous hemodynamic monitoring of the patient, observation and care until discharge is carried out. This stage is carried out by a nurse and a physician. The requirements were as follows: monitor; gas network; materials and beds available.

After recovery, the flow ends with the discharge stage, with medical evaluation. The guidelines for hospital discharge or transfer to the inpatient unit are provided by a nurse. The requirements identified are as follows: clinical stability of the patient; compressive dressing according to the access route; post-anesthesia recovery; provision of instructions to the patient; shift transfer to the hospitalization unit; and transport in charge of stretcher bearers.

Closing the VSM is characterized by the process output, which consists of defining the diagnosis and/or carrying out treatment for the patient, whose requirements consist of interpersonal and technical aspects, namely: receiving treatment in a timely manner, observing humanized care, with quality and standardized. Requirements related to society and the environment present in all stages of the process were also identified, namely: rational use of resources, management of results focused on quality and safety.

Figure 1 presents the VSM showing how the flow of activities and information takes place, as well as the problems identified at each stage of the process listed from 1 to 61.

Chart 1 presents the stages mapped, relating them to the 61 problems identified in VSM.

The 12 problems prioritized after applying the criteria are listed in Chart 2, according to the process stages and waste identified. Application of the first criterion to the 61 problems, related to non-of standardization, resulted in 44 problems classified with a score of 9, denoting a strong relationship with the criterion. Application of the second criterion, corresponding to the impact of the problem on patient safety, indicated 37 problems, to which the third criterion was applied, which aimed at analyzing short-term improvements. Thus, 12 problems were prioritized for obtaining a score of 27 points.

It is noted that "failure" waste was identified in all the problems prioritized, followed by "waiting time", which was predominant in the process. It is observed that there is more than one type of waste related to the problems, considering that they do not occur in isolation.

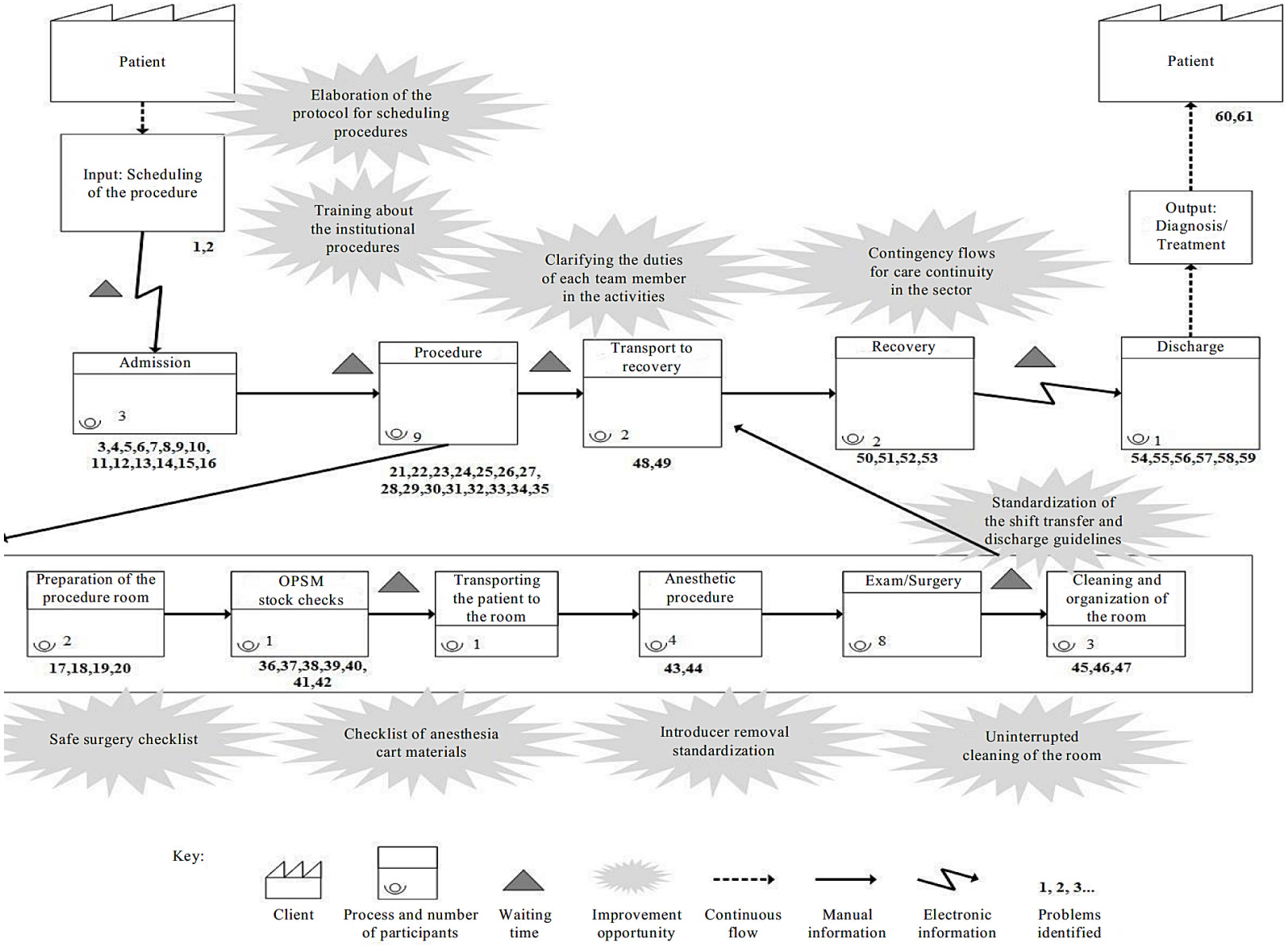

Figure 1 – Value Stream Mapping for the current state of patient care in Hemodynamics. Florianópolis, SC, 2022.

Chart 1 – Problems identified in the Value Stream Mapping for the current patient care situation in the Hemodynamics service. Florianópolis, SC, 2022.

Process stage		Description of the problem
Input - Scheduling the procedure		1. Lack of organization of the shifts by specialty to optimize room occupancy. 2. Imbalance between demand for procedures and capacity to perform them.
Admission		3. Lack of procedure scheduling in the surgical map. 4. Delay in patient arrival due to delay in transporting patients by stretcher bearers. 5. Delay in admission due to lack of ICU space or delay in confirming the space. 6. The consent form to carry out the procedure is not checked/applied. 7. Non-standardization of procedures that require blood component reserves, generating non-confirmation of blood reserves. 8. Non-standardization and absence of confirmation record for specific medications (e.g., chemotherapy). 9. Non-standardization of patient identification checks. 10. Lack of patient preparation for surgery in the inpatient unit. 11. Absence of an institutional communication system to activate transport by stretcher bearers. 12. Non-assessment of priorities to define the transport order. 13. Incomplete surgical map forecast (schedules, surgery order, necessary materials). 14. Physical area with insufficient space for simultaneous admission and recovery of patients. 15. Absence of a flow for defining the cancellation of elective procedures. 16. Absence of a definition of criteria for emergency procedures.
Procedure	Preparation of the procedure room	17. Medication supplies by the pharmacy do not cover the entire opening hours of the sector. 18. Lack of preventive maintenance of the devices, outdated system and deficient control. 19. Failure to control dispensing of psychotropic medications. 20. Lack of adequate cushions for patient positioning.

Chart 1 – Cont.

Process stage		Description of the problem
Procedure	Procedure	21. Lack of suitable-size lead PPE for the team. 22. Surgeon attire before completing the preparation of the operating table and anesthesia of the patient. 23. The Hemodynamics sector is far from the support services, with a Materials Center and Pharmacy. 24. Lack of surgical material resources for backup when converting an endovascular procedure to open surgery. 25. Absence of a definition regarding the procedures that can be performed in the Hemodynamics sector. 26. Failure to record the materials used. 27. Failure to register the patient on the examination equipment. 28. Absence of a definition regarding the responsibilities of each team member. 29. There is no patient temperature monitoring and warming protocol. 30. Failure to carry out a safe surgery checklist. 31. Lack of ultrasound equipment for the sector. 32. Delay in arrival of the medical team. 33. The surgical time forecast does not correspond to the scheduled time. 34. Delay or cancellation of other surgeries. 35. Lack of staff to continue providing care to patients after the department's opening hours.
	OPSM stock checks	36. Low quality of materials due to lack of a systematic evaluation. 37. Lack of OPSM checks before the patient enters the procedure. 38. Failure to replenish OPSM stock. 39. There is no administrative assistant for the relevant activities. 40. Nurse leaving the sector to replace materials and medications. 41. Failure to deliver the OPSM traceability registration copy to the patient and the report on the procedure performed. 42. Non-standardization in the list of materials per procedure.

Chart 1 – Cont.

Process stage		Description of the problem
Procedure	Anesthetic procedure	43. Absence of a checklist for checking materials in the anesthesia cart. 44. Non-standardization of criteria in pre-anesthetic evaluation in relation to the indication of special exams and ICU space.
	Cleaning and organizing the procedure room	45. Organization of the room by nurses simultaneously with cleaning by the hygiene team. 46. Arrangement of sterile materials in the room for the next procedure before cleaning from the previous procedure is completed. 47. Absence of an exclusive cleaning professional in the sector who works during all opening hours.
Transport to recovery		48. Non-standardization of the location for removing the introducer. 49. Lack of equipment to monitor patients during transport to the ICU.
Recovery		50. The medical prescription of medications administered in the procedure that have continuity is not checked. 51. Absence of a contingency plan to continue providing care to patients after the department's opening hours. 52. Failure to record the anesthetic recovery assessment scale. 53. There is no dedicated nursing technician for patient recovery.
Discharge		54. Waiting for transport by stretcher bearers. 55. Lack of medical discharge record by the responsible surgeon. 56. Absence of medical staff in the sector until the patient's discharge. 57. Lack of information about diet and medications in transitional care. 58. Non-standardization in patient discharge instructions, whether verbal or written. 59. Difficulty passing patient information on to the destination sector during shift changes in the sectors.
The entire process		60. Lack of indicators for process management. 61. Failure to manage chemical, recyclable and infectious waste.

Chart 2 – Problems prioritized in the Value Stream Mapping for patient care in the Hemodynamics service. Florianópolis, SC, 2022.

Process stage		Problems prioritized	Waste
Admission		3. Lack of procedure scheduling in the surgical map. 6. The consent form to carry out the procedure is not checked/applied. 9. Non-standardization of patient identification checks.	Failure, overproduction, waiting time, inventory and movement.
Procedure	Procedure	28. Absence of a definition regarding the responsibilities of each team member. 30. Failure to carry out a safe surgery checklist.	Failure, overproduction, transport, waiting time, movement and human potential.
	Anesthetic procedure	43. Absence of a checklist for checking materials in the anesthesia cart.	Failure, transport, waiting time and movement.
	Cleaning and organizing the procedure room	45. Organization of the room by nurses simultaneously with cleaning by the hygiene team.	Failure and overproduction.
Transport to recovery		48. Non-standardization for removing the introducer.	Failure and waiting time.
Recovery		50. The medical prescription of medications administered in the procedure that have continuity is not checked. 51. Absence of a contingency plan to continue providing care to patients after the department's opening hours.	Failure and waiting time.
Discharge		57. Lack of information about diet and medications in transitional care. 58. Non-standardization discharge instructions, whether verbal or written.	Failure and waiting time.

The problems with some of the participants' statements are illustrated below, referring to their perceptions regarding the need for planning in terms of the scheduling of surgeries and standardization, in the form of checklists and records.

For me, what most impacts this care flow is this issue of scheduling the surgical map, this is a very big problem in Hemodynamics (N2).

I think the first thing is to define the procedures (N3).

For me it's time, these things that run and run (…) *The scheduling, I think that it's very bad.* [...] *Planning leaves a lot to be desired* (N4).

Following the checklist and trying to prevent other problems that may arise due to lack of checks and assessments upon admission. And the issue of applying the safe surgery checklist (N1).

[…] *We already do everything, but not with a method. We end up counting on people's commitment and training. But I think it's time to create a safety method and culture. Our record is also poor. I think that it would be checklist and registration* (N5).

Applying VSM provides for the projection of a future map by eliminating unnecessary stages in the process. In this study, it is highlighted that the VSM for the current situation represents the future state, as the stages mapped remained the same and the improvements were associated with the list of problems.

The integrated data analysis showed that the problems prioritized are present in all stages of the process, and that non-standardization was observed as a common cause of waste, mainly resulting in failures and waiting time. It was found that activities that might be standardized are carried out in different ways, depending on each professional or specialty, such as: procedures for surgical scheduling; safe surgery checklist; patient registration in the hemodynamic equipment; procedures for removing the introducer; safety of the medication process; and discharge instructions for patients.

Waste due to excess processing was the only one not identified during the patient care flow mapping in the Hemodynamics service. The suggestions for improvements regarding the problems prioritized consist of the development of protocols, standard operating procedures, training and implementation of institutional routines adapted to the Hemodynamics service.

DISCUSSION

Lean Thinking aims at offering maximum value from the perspective of those receiving the service, reducing costs and maximizing quality[14]. Even though from a Lean perspective, value should come from the patient's conception, some studies indicate that this aspect is incipient, as the costs and productivity analyses have received greater focus, followed by professional and leadership aspects[7].

In this research, the patient care flow mapping in the Hemodynamics service made it possible to describe the process stages, suppliers, customers and their requirements, as well as the problems presented at each stage, based on the waste found. Such waste exerts a direct impact on meeting the clients' requirements in the process, including the patients, as end clients. A recent review on the application of Lean Healthcare in hospital services[15] showed that the VSM tool was used in 62.5% of the studies. This allows the necessary detail to evaluate existing processes with a view to improvements, despite its limited application in the health sector, a condition that denotes the need for instrumentation on the Lean framework and its tools[16].

In this research, the first requirement not met was the scheduling of procedures in a surgical map, especially because it configures the patient care flow input in Hemodynamics and because it involves the performance of professionals in the other activities of this process. The surgical map is a management, planning and organizational instrument that supports sizing of the surgical

rooms, using information from patients, surgical procedures, professionals, materials, devices and indispensable support services. It is stated in the literature that failures in scheduling surgical rooms reduce efficiency, generate delays in procedures and increase costs, a condition that can be improved through standardization and the use of indicators to monitor operational performance[16].

Not checking/applying a consent form to carry out the procedure also stood out in this research, considering the failures that arise from this gap and the need to standardize the verification moment. An informed consent is a legal document that endorses the patient's right to make informed decisions about their health treatment. Although it is one of the items on the safe surgery checklist recommended by the World Health Organization (WHO)[17], consent must be formalized at an earlier time, preferably in an environment other than where the surgery is to be performed, a condition that was not observed in this research.

Another requirement in which there was non-standardization in the VSM carried out concerns checking the patients' identification, although it is also part of the safe surgery checklist and has direct implications on patient safety and care quality[16-17]. It is noted that for more than two decades, patient identification has been considered an important barrier to the occurrence of preventable adverse events associated with care, responsible for being one of the main common causes of various safety incidents[18]. Similarly to the results found, adherence to the correct patient identification protocol is still flawed[19], as is adherence to other patient safety strategies recommended by the WHO[20].

Non-standardization may result from the absence of a definition of the specific duties of each team member, a condition evidenced in the results of this research, which may involve non-compliance with the safe surgery checklist in the Hemodynamics service under study. This condition leads to potential failures[19] that can be avoided by checking at the times indicated in the checklist, namely: before anesthetic induction; before surgical incision; and before the patient leaves the operating room[17]. It is noted that implementing a safe surgery checklist favors strengthening of the patient safety culture and effective communication between the care team, in addition to being associated with the reduction of serious adverse events that culminate in deaths[21]. It is considered that it is possible to advance patient safety in this specific sector, with the recent validation for Brazilian Portuguese of a checklist for radiological procedures in Hemodynamics, which may contribute to future studies in the area[22].

In this research, checking the anesthesia cart materials prior to the procedure was highlighted as an essential requirement, appearing on the list of problems prioritized since, in addition to generating risks for the patients, the possibility of insufficient materials and medications during the anesthetic act can contribute to delays in initiating the surgery, highlighting waste from failure, transportation, waiting time and movement. There is diverse evidence that relates the improvement of intraoperative indicators to the application of a daily surgical room setup checklist based on the Lean framework[23]. However, among the results of this research, it was possible to show that the preparation and organization of the operating room carried out by nurses is simultaneous to the cleaning performed by the hygiene team, resulting in overlap and lost quality of both activities.

Regarding the discrepancy in the standard when removing the introducer, which occurs both in the operating room and outside it, it is inferred that there is a need to disseminate the institutional protocol and monitor teams in in-service education spaces. This precaution is considered central in interventional procedures[24].

Although checking the prescription of medications administered in the procedure that have continuity is part of one of the basic patient safety protocols, this study found that there are problems in carrying out this activity. This condition is similar to a study that identified 29% of incorrect checks, showing the importance of institutional protocols on the topic[25].

The absence of a contingency plan for care continuity for patients after the Hemodynamics service opening hours was highlighted as a problem in the results of this research, as it may limit performance of procedures and overload the professionals from the afternoon shift. Other problems prioritized related to transitional care refer to lack of information about diet, medications and general guidelines at the time of patient discharge or transfer. It is stated in the literature that standardization in transitional care moments is an effective action for patient safety and care continuity[26].

In view of the results presented, waste due to failure and non-standardization were identified in several stages of the VSM, which have a direct implication on the performance of the flow analyzed, especially on patient safety. Such problems create opportunities for improvements that require innovative strategies in the context researched, aligned with strengthening the safety culture. In this sense, among other strategies, the WHO Global Action Plan for Patient Safety[27] highlights safety of the clinical process through protocols, patient and family engagement and in-service education of health professionals as basic guidelines for eliminating adverse events in care provision[21]. However, it is worth noting that management of the care processes is one of the major challenges for nurses[28].

It was considered that conducting interviews only with professionals might constitute a study limitation since, From the Lean perspective, value is attributed according to the view of those who receive the service. However, it is worth noting that the patients were not included as research participants due to the restrictions imposed by the COVID-19 pandemic scenario.

As contributions, this study presents results that enable improving the professional Nursing practice and that of the multiprofessional team, exerting impacts on organization and management of the Hemodynamics service, based on the VSM tool. This tool has been applied to health research studies, whose main purpose is to seek new solutions to recurring problems and impact care quality through the elimination of waste. The results led to improvements that could be implemented in a simple and objective way, which still offer a great contribution to the work process.

The improvements implemented in the field studied include scheduling procedures on a surgical map in the hospital system; checking standardized patient identification by applying the pre-surgical checklist; defining the responsibilities of each team member by preparing a standard operating procedure; implementing the safe surgery checklist for hemodynamic procedures; structuring the room cleaning times by the cleaning team after the Nursing staff had organized the room; standardization for removing the introducer in the recovery room, with application of an occlusive dressing at the end of the procedure in the surgical room; standardization of the discharge guidelines described in the standard operating procedure; and elaboration of a care continuity plan after the sector's working hours.

FINAL CONSIDERATIONS

Through the VSM of patient care in the Hemodynamics service, the Lean Thinking theoretical-methodological framework made it possible to identify chaining of the process and the professionals' interdependent activities; in addition, it classified them into suppliers and customers, requirements to carry out activities in technical-scientific standards and the problems present in the process. Prioritization of the problems allowed classifying improvement opportunities to enhance the service flow, with a view to reducing waste and improving care safety and quality.

The opportunities for improvements revealed based on the problems prioritized exert impacts on patient safety, mainly in relation to the need for standardization and reduction of failures, in addition to conferring visibility to other mapped waste elements, with a view to optimizing the process to maximize the quality that is expected in the Lean framework.

In relation to deepening the topic, it is considered that future studies may analyze the impact of improvement plans based on process and result indicators.

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NOTES

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CONFLICT OF INTEREST

There is no conflict of interest.

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