



International Journal of Learning and Change

ISSN online: 1740-2883 - ISSN print: 1740-2875

<https://www.inderscience.com/ijlc>

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DOI: [10.1504/IJLC.2025.10068208](https://doi.org/10.1504/IJLC.2025.10068208)

Article History:

Received:	08 May 2023
Last revised:	18 April 2024
Accepted:	15 July 2024
Published online:	30 December 2024

Value and main opportunities in hospital operations management

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Abstract: This paper explores the definition of value in healthcare and discusses the main challenges and opportunities in hospital operations management through semi-structured interviews. The participants included seven professionals working in hospitals and two experts with research experience on the theme. On average, they had ten years of experience in a variety of roles. The interviews were recorded, transcribed, and qualitatively analysed by the researchers. Three main categories were identified for the perception of value in health: quality and safety; positive experience; and appropriate cost. For each of the dimensions analysed, a list of types of problems and opportunities was discussed, to obtain a qualitative diagnosis of the challenges in hospital operations management that can guide the actions of professionals in other regions and contexts. The qualitative diagnosis obtained is a toolbox that can guide other professionals dealing with health services' main challenges.

Keywords: lean healthcare; hospital operations management; value in healthcare; healthcare management.

Reference to this paper should be made as follows: Souza, T.A., Lopes, E.T. and Lima, R.M. (2025) 'Value and main opportunities in hospital operations management', *Int. J. Learning and Change*, Vol. 17, No. 1, pp.95–120.

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1 Introduction

Hospitals face increasing pressure to reduce costs, improve operations and provide evidence of the quality and efficiency of their organisations (Kujala et al., 2006; Yaduvanshi and Sharma, 2017). Problems in hospital operations such as delays and cancellations have become so common in healthcare that both patients and professionals assume waiting is an inevitable part of the process. However, interruptions in the flow through the healthcare system result in frustration for patients, families, and staff. Interrupted patient flow negatively affects satisfaction, operations, and reimbursement, and impacts patient safety (Ryckman et al., 2009).

Operations management presents tools, linking supporting and patient care processes, resources, and health value delivery standards (Visser and Beech, 2005). Butler and Leong (2000) pointed out that a gap between hospital operations strategy despite the broad debate on quality, cost, and service delivery, issues widely included in the scope of competitive operations priorities. Numerous opportunities and topics emerge as prominent areas for exploration in the healthcare sector. These include information technology and new technology in services, general aspects of strategy and objectives of operations in services, selection and design of service delivery systems, strategic quality issues in services, and capacity planning, scheduling, and control (Dobrzykowski et al., 2014). In this sense, hospitals have been emphasising cost reduction and quality programs, which are considered the competitive priority initiative but show a relatively low relationship with performance.

With increasing attention to healthcare costs, energy is being put into improving hospital operations. Variables such as size or capacity, the location of the hospital, the hospital's educational mission, and the level of capital investment in facilities and technology, emerge as being related to the average length of stay (ALOS) (McDermott and Stock, 2007). Not only ALOS but other performance indicators should be adopted and thus, different approaches may be prioritised. Several problems can be pointed out regarding the management of operations in hospitals, such as confusing flows, inefficient processes, and antiquated management, which results in a system that performs below the planned performance (Hopp and Lovejoy, 2012).

Lean healthcare focuses on the added value to patients, making the best use of existing resources, reducing waste, generating fewer defects, and improving operations (Graban, 2016). Defining and measuring value is essential to understand an organisation's performance and driving continuous improvement. In healthcare, the value may be defined as patient health outcomes achieved per dollar spent (Porter, 2010).

Another vital aspect is the patients' perception of respectful treatment, considering factors such as trust, courtesy, and availability of the team; continuity and transition of care; attention to physical comfort; coordination of care and sufficient participation in treatment decisions, which influence the perceived patient's value (Joffe et al., 2003).

Waring and Bishop (2010) suggested that lean healthcare may represent a new development in the reorganisation of the health system with the potential to contribute to three outlined lines of change, the use of evidence-based guidelines, reconfiguration of occupational boundaries and new forms of clinical leadership. Thus, several applications of lean have been carried out, such as the one by Souza et al. (2020) in surgical services. However, the implementation of lean in the health area has been in a disjointed way, based on tools, with difficulties in defining customer value (Radnor et al., 2012), and there is a need to expand to a systemic view of hospital operations management and not only in parts (Lima et al., 2021).

This article aims to discuss the perceptions of hospital managers and experts, comparing their experiences with recent literature, and to identify the main types of problems and opportunities for the improvement of operations and the delivery of value to patients. Additionally, this proposal is based on a qualitative study conducted through interviews, guided by a hospital operations management (HOM) classification framework. Due to the scope of this topic, the paper will delve into the main findings across various areas, including value in healthcare, hospital operations strategy, patient flow management, material and medication flows, finance and cost management, engineering and maintenance, people management and communication, information technology, and performance indicators. By providing a comprehensive overview of these themes, this paper can assist practitioners in diagnosing potential opportunities within their institutions and defining action plans to implement lean healthcare not only in specific departments but throughout entire hospitals.

2 Conceptual background

2.1 Value in healthcare

The introduction of the term value-based healthcare has made healthcare organisations analyse their business from the perspective of price and cost and in terms of emphasising their results. Results must be important to patients and encompass all the variables needed in a complete cycle of care. The concept of values-based healthcare aligns with patient-centred care, which aims to humanise people, rather than looking at health as a commodity, providing a range of services. The results do not depend only on mortality, but also on the quality of life (Putera, 2017). According to Moliner (2009), the perception of real value exerts a direct influence on both the satisfaction experienced and the trust in the hospital. However, due to its complexity, definitions of value-based healthcare (VBHC) concepts may vary among healthcare stakeholders, despite receiving attention in academic and professional contexts (Smith et al., 2023).

Measuring outcomes and metrics have shown improvement in the quality of care, often associated with VBHC (Slingerland et al., 2023). However, there is currently no framework that addresses all VBHC criteria, despite significant recent advances. Therefore, practitioners should adopt a pragmatic approach, starting with existing models and adapting them to better respond to real-life situations (Slingerland et al., 2023).

One option used to collect information is the patient-reported outcome measurement (PROM). Generally, research indicates two main opportunities in using PROMs: promoting proactive communication and positive health behaviours in patients, and increasing clinician awareness of patient symptoms (Bianchim et al., 2023). Unfortunately, studies lack robust descriptions of PROMs' use in VBHC, and there are limitations in adoption related to technology, organisational factors, staff, and stakeholders (Bianchim et al., 2023).

Smith et al. (2023) define value as the contribution of the health system to societal well-being. According to the authors, adopting actions related to VBHC can positively impact various aspects of the health system, resulting in several benefits for societal well-being. The authors propose a framework that focuses on the entire health system, encompassing five domains: health improvement, healthcare responsiveness, financial protection, efficiency, and equity, which can be mapped into the aggregate well-being of society. On the other hand, the economic, clinical, and humanistic outcomes (ECHO) framework includes economic factors as an outcome category and suggests that categories and variables should be measured with a systemic, patient-focused view (Gunter, 1999).

Another approach, within the context of thyroid and parathyroid surgeries, began with the standard value equation (quality/cost) and proposed a new equation involving 23 inputs between quality and cost (Ayoub et al., 2024). Data sources for this approach included questionnaires and database collection, although the authors emphasise that some quality components may be difficult to measure or obtain. In conclusion, they suggest that further research is needed to study variations in their metrics and the importance of adapting their equation for specific contexts, as they used a limited one. Finally, Seattle Children's uses a home to demonstrate its health care assessment and improvement system. Patients and family members are the main customer represented by the roof and are supported by pillars that indicate areas with a focus on continuous improvement: quality, cost, delivery, and safety. The pillars rest on a foundation of professional engagement (Wellman et al., 2010).

As value improves, both stakeholders and the economic sustainability of the health system can improve. Value encompasses and integrates many goals already adopted in the healthcare area, such as quality, safety, patient focus, and cost containment. It is also critical to achieving other important goals, such as improving equity and expanding access at a reasonable cost, and setting the framework for improving health performance. However, the value of healthcare remains largely misunderstood (Porter, 2010).

Gooding (2000) already warned that attributes such as the technological level, variety of services, competence, and education of the team, impact the perceived value for choosing hospitals. Recently, after carrying out a series of interviews about value healthcare, Nuno et al. (2022) concluded that professionals perceive value as important to face the sustainability problems that the health service faces.

2.2 Hospital operations management and lean healthcare

Operations management is a fundamental function of organisations. It coordinates processes such as planning, programming, logistics, control, and improvement of the production system (Heizer and Render, 2004). Operations management in service environments should be concerned with providing quality service to customers, by understanding their needs, managing processes, ensuring compliance with objectives, and

paying attention to continuous service improvement. As such, operations management is a central and critical organisational function for success (Johnston and Clark, 2008).

Hospitals and healthcare organisations have tried to change their functional and hierarchical structures into cross-functional teams and process-oriented organisations; however, this fact must involve all levels of the organisation (Gonçalves et al., 2013). In this context, lean healthcare philosophy appears as an integrator of operations focused on flow.

Lean healthcare is an approach aimed to improve the quality of service for the patient, or end customer, by eliminating waste and inefficiency (Grabau, 2016). Such concepts initially emerged in the manufacturing industry and can be applied in practically any production system (Womack and Jones, 1997). Liker and Meier (2007) conceptualise lean in 4Ps: philosophy, process, people and partners, and problem-solving. Numerous tools and techniques appear in the 'lean ocean', such as kaizen; 5S; continuous flow; takt time; kanban; heijunka, cause-effect diagram, and value stream mapping (Buzzi and Plytiuk, 2011).

Pinheiro and Tortorella (2016), through a study about applications to improve operations in hospitals based on lean healthcare, point out as possible opportunities in this ecosystem using kaizen, problem-solving methodology, visual management, multifunctional teams, and education and training. At ThedaCare, a lean management system known as a business performance system was developed to support managers and help sustain improvements (Mannon, 2014). Lean can also be combined with other approaches, such as project management techniques and Six Sigma (Lopes et al., 2023). In the USA, analysing the application of Lean Six Sigma for operational excellence, Sordan et al. (2023) noted that business transformation and strategical improvements are the main objectives, usually adopting basic tools as descriptive statistics, VSM and process mapping. However, Lima et al. (2021) show that most lean initiatives in healthcare are mostly isolated projects, bringing a need for a greater holistic view of the applications of philosophy in the healthcare environment.

In this context, several studies discuss the implementation of lean healthcare in different areas. Souza et al. (2022) applied levelling to improve surgical production, Tortorella et al. (2022) applied lean healthcare tools to guide the choice of digital applications in H4.0, and Ward et al. (2022) do a case study in a systemic approach. In the public sector, Marsilio et al. (2022) benchmarked lean healthcare applications in the USA and Italy, finding that the countries have respectively 53% and 36% of adoption in public hospitals.

Due to the personnel component directly linked to performance in hospital services, employees are an influential factor and offer greater potential for success in hospital quality, performance, and, consequently, patient satisfaction. Better customer orientation is linked to a process-oriented view and, particularly in service delivery, effectiveness and efficiency directly depend on performance enhancement programs, available capacity, management of performance processes, and management competencies relevant to the system (Sibbel and Urban, 2001). Among the factors that motivate the implementation of lean healthcare is the reduction of patient lead time and financial improvements with a focus on cost reduction.

However, there are barriers mainly associated with human factors (Costa et al., 2017; Leite et al., 2022), which are considered one of the success factors for implementation by Sobek and Lang (2010). Moreover, leadership engagement and governance are critical to

projects success (Freitas et al., 2023; Rosa et al., 2023). In this context lean still have a lot of opportunities of improvement in several departments, including optimisation of patient flow, inventory reduction, and decrease in metrics as length of stay and waiting times (Sordan et al., 2023). Finally, professionalism, implementation fidelity and the need for evidence-based research are barriers that can impact on value creation during lean implementation (Leite et al., 2022).

3 Methodology

This paper uses primary data to deeply understand the real perceptions of professionals, accessed by conducting semi-structured interviews with people involved in hospital management, seven professionals (P1–P7), and two specialists (S1–S2) with a doctorate and at least one relevant publication on the topic. Respondents have diverse backgrounds from areas such as management, economics, engineering, nursing, and medicine, with an average of ten years of experience in hospitals, five of which have twelve or more years of experience. The participants play a variety of roles, including project analysis, continuous improvement, customer service, medical practice, and administrative tasks. This diversity enabled us to collect insights from multiple viewpoints, leading to a more comprehensive understanding of the subject matter. Furthermore, their affiliations span across universities, hospitals, and government agencies, further broadening our perspective. The selection of participants was based on their expertise in HOM and their willingness to contribute to the study.

Interviews are essential to map practices of specific social universes in which conflicts and topics are not well explained. Thus, the interviews allow researchers to study, collect evidence about the reality of each subject interviewed, and understand and describe the logic necessary for the researched field (Duarte, 2004). Semi-structured interviews focus on incorporating a series of themes to be covered systematically and consistently designed to elicit more elaborate responses. Also, it enables interviewees to respond in their terms, and be valuable to understand the way they perceive the subject (Qu and Dumay, 2011).

The interviews and the corresponding analysis were based on the hospital operations management – HOM framework dimensions proposed by Souza and Lima (2019): operations strategy, hospital PPC, patient flow, materials and medicines flow, finance and costs, engineering and maintenance, people and communication management, information technology, and performance KPIs. As value in lean healthcare is focused on patient flow, the dimension of production planning and control is intertwined with patient flow, and both dimensions were merged in the analysis presented in findings.

With the help of an interview guide, specific objectives and supporting questions were established for each of the health dimensions, aiming at understanding the current context of the interviewees' organisations and their perceptions of the main types of problems and opportunities. The analysis was developed adapting the thematic analysis model with six steps: familiarising yourself with your data; generating initial codes; searching for themes; reviewing themes; defining and naming themes; producing the report (Braun and Clarke, 2006). However, once the authors started from an existing framework, the steps regarding to themes were adapted to the healthcare dimensions proposed by Souza and Lima (2019).

All interviews were scheduled in advance online and recorded in specific software, where all interviewees attested to their authorisation for recording with anonymity. In total, 433 minutes of recording were transcribed and sent to respondents for analysis and validation. Later, the authors translated the citations to English, with minor adaptations to write this paper.

4 Findings

4.1 Value in healthcare

The business relationship between the value delivered to the customer and trust needs to be traced for key decision making between these actors (Eberle et al., 2017). Therefore, it is necessary to survey this perception of value by patients and health professionals to define a good strategy. The interviews carried out brought up topics related to the perception of value that should be considered for a good structuring of the hospital strategy. There is a convergence in what was exposed by interviewees about the quality and safety of patients, positive experience, and adequate cost. Some participants cited topics such as high-quality care, friendliness, and reliability, as well as analysing service time as a measure of value delivery, in addition to comprehensive care with patient focus and scientific evidence.

“The service time, an integral and integrated service, and the quality. The quality I say is that all conduct is based on evidence, protocols, and everything else.” (P3)

The introduction of the term value-based health causes the performance of health systems to be evaluated, not only based on price and cost but with emphasis on results. Outcomes are something whose importance is predominant from the patients' point of view and should encompass all things necessary in a complete cycle of care (Putera, 2017). One of the outcome measures can be directed to the quality of life, as it is a more refined measure than morbidity and mortality, measures commonly used in healthcare settings (Neto and Ferreira, 2003). Thus, analysing the process with an assistance bias, the cure is not always the main value, because it is linked to other variables such as available structure, technical limitations, and human resources. Also, the hospital organisation must design its operations with a focus on a well-defined value and seek to develop its resources to achieve this. Faced with this theme, one of the interviewees, who is a doctor, highlighted as possible topics of value the relief of symptoms, comfort, and, if possible, the cure of the disease.

Another factor that commonly appears during the interviews is the humanisation of the patient and their families. Humanisation has been a relevant theme in health services, which can be explained as the recognition of human nature in its essence and the elaboration of cooperation agreements, ethical conduct, and professional attitudes consistent with human values (Rios, 2009). Again, the time to solve the problem and assist the patient in the operations appears as an important variable:

“We usually talk a lot about the issue of delivering humanized care for this patient. In the shortest possible time... The less time we solve the patient's problem, the better... with quality... So that this patient leaves with his problem solved in the shortest time and in a humanized way.” (S2)

In addition, it was also highlighted that an internal analysis of organisations focused on cost, waste, and the use of their resources is also linked to a delivery of value. Thus, synthetically, one interviewee summarises the main topics and categories most used in terms of value in health:

“The operation strategy, considering the hospital, in my view, must provide the patient with adequate care, at the proper time, in the proper volume, at the proper cost. So, may all these proper deliveries, let’s say, at the proper time... They contribute to a better outcome at the lowest cost, let’s say, or the least effort that can be given to a positive outcome.” (P6)

Therefore, by analysing and crossing the themes exposed by the interviewees, the main relevant topics about the perception of value and their category in the analysis of the material can be expressed, as shown in Table 1.

Table 1 Value perception

<i>Category</i>	<i>Relevant topics</i>
Quality and safety	Quality
	Safety
	Reliability
	Outcome
Positive experience	Comfort
	Agility
	Humanisation
	Relatives
Adequate cost	Waste
	Available resources
	Cost

The delivery of value is related to tangible and intangible aspects of health services, such as cordiality, agility, and service provision (Christensen et al., 2008). Therefore, a challenge for hospital managers is in surveying and translating these values into their operation, implementing improvements and control points to verify the achievement of this delivery of value, looking for quality and patient safety, a positive experience with a suitable cost.

4.2 Types of problems and opportunities by HOM dimensions

Regarding types of problems and opportunities contained in each dimension of the hospital operations management, the interviewees raised several topics, such as lack of vision of flows and existence of silos in hospitals, poor communication, non-standardised demand, and capacity management processes, planning failures, data divergence and lack of KPIs. The evidence will be presented throughout this section and the complete list of types of problems and opportunities are presented in Table 2 in the discussion.

4.2.1 Hospital operations strategy

Related to the operations strategy topic, interviewees converged on the existing gap in the strategy for operations.

According to interviewees, failures in horizontal and vertical communication exists, which leads to a 'void' of strategic information and operational guidelines for those who work at the edge of organisations. Kunonga et al. (2010) stated the gap between planned and realised is one of the biggest problems related to the non-achievement of the strategy by organisations, which is also addressed by one of the participants.

"...there is this very large gap between the strategic goals and the operational goals... So, what we see is that there is not much of this unfolding for operations." (S2)

The technicality of health processes and the 'protagonism' of the clinical staff in decision making is also evidenced, generating a disintegration with the strategy and managerial development. This high technicality in the hospital environment has historically developed 'silos' between processes, increasing the disintegration and poor view of the flow by employees, which leads to fragmented and disintegrated processes in healthcare (Institute of Medicine Committee on the Future of Emergency Care in the US Health System, 2007).

"Because these companies, hospitals, work a lot in silos, the strategy encounters several barriers in this unfolding. So, the translation of the strategy suffers from several distortions, and it fails to overcome some barriers from department to department." (P6)

The strategy deployment has a holistic impact on the organisation and must be analysed in detail by the hospital's top management. Campos (1996) defined strategy deployment as a process of subdividing a main guideline into several others, appointing responsible people through a means-end relationship.

4.2.2 Patient flow management

Patient flow management covers the hospital PPC and patient flow in the adopted model. From the analysis of interviews, patient flows are usually not mapped, and their planning often takes place in a short period, with no medium to long-term plans. This fact causes an imbalance between the capacity and demand, impacting waiting and idleness along the chain. Another factor exposed was the feeling that the hospital is always 'crowded' because teams perceive only the daily routine and demand accumulation, due to a lack of planning. Thus, processes related to production planning and control are necessary in the hospital environment. The application of such techniques in operations management is exposed by a specialist:

"... I was fortunate to live in this larger hospital institution... in which production engineering was introduced precisely as an external tool for organizing production. And a cell was built that did all the care programming and all the prediction of hospitalization actions, especially those related actions, not urgent ones... Based on the need brought by the clinic, she analysed the availability and carried out a whole study of rearrangement and organization of the rooms, breaking the logic of schedules periods belonging to a specific doctor ... it is undeniable that a process of programming and production

control, which is the patient's path that would be the care chain, seemed to perform better and seemed to perform better..." (S1)

Many types of problems cited are related to production scheduling and the use of technologies to facilitate this process. Normally, this decision is taken in a disintegrated way between sectors, which can harm the flow. Again, organisational communication appears as a problem and the use of information technology is presented as a possible solution. Patients' typology, medical specialties, and the type of disease, among other parameters, need to be mapped, controlled, and programmed based on statistics to facilitate planning, as well as flows inside and outside the hospital, as is evidenced by an expert who exposes his experience in hospitals before and after lean applications:

"As it was seen before lean... I do it as it arrives, and I allocate it as I see fit. We can say so, without any prior planning. Without any study of demands that are possible to plan and, mainly, without the interaction of hospital resources... And, mainly, identifying the capacity of its resources. So, it's something that is a very big gap, it's knowing how much I'm able to meet, to be able to start planning how I'm going to allocate this demand that will arrive." (S2)

Cheng (1987) already showed that there are some areas of hospitals where additional improvements can be made, such as computerisation in critical processes. Training people and information circulating in the patient flow are also highlighted. Teams are efficient within the process and not in the flow, which is exposed by the interviewed physician:

"I think there is still some difficulty in understanding what the patient needs. So, who is asking... Because, if you talk about flow, you are talking about several small transfers, throughout the patient's history in the institution... And every time you move from one sector to another, or even within the same sector... At these intersection points of care, it is where we must be very attentive, that the problem can occur." (P7)

Vos et al. (2007) studied the impact of layout and design of physical space in the management of operations, presenting, through a simulation of discrete events, the evaluation of the flexibility and suitability of a building for the management of hospital operations. Concepts applied to installed capacity and internal logistics demonstrated better fluidity and efficiency in hospital flow.

4.2.3 Materials and medicines flow

Logistical flow is essential for materials management and for medicines and materials supply for the patient's health (Castelar et al., 1995). Inventory management has been identified as one of the lean practices influencing the resilience of the healthcare supply chain (Alemsan et al., 2022). More specifically, drug stocks usually found in hospital pharmacies are characterised by fluctuating demands and uncertainty, imposing greater management robustness on organisations in terms of sizing and management (Raimundo et al., 2015). This importance was reinforced by the interviewees, as the flow of materials and medicines was reported as having a direct impact on the patient and the delivery of value, regarding the reliability, agility, and safety of the process. Thus, mapping this flow and doing effective planning are relevant topics among health managers. Recurring problems such as stock sizing, material standardisation, and supplier qualification appear among citations:

“So, the issue of lack of material, lack of medication, we don’t have many recurrences. And the satellite pharmacies in the hospital, have great importance for dispensing medicines by schedule. So, this ensures patient safety. I am delivering that medicine, at that place, at the right time.” (P3)

Regarding types of problems related to the hospital logistics chain, Wachs et al. (2018) raised as examples the need for standardised routes for transporting materials between hospital sectors, establishing a transport rhythm, and developing a standardised routine for the return of materials and equipment, in addition to the physical organisation of items at the storage location. Other disciplines related to point-of-order calculations, purchases, and the need to study ‘just in time’ models in hospitals are mentioned along with the need to incorporate technologies to evolve these processes with a reliable connection to patient planning.

“But we never talk, in health, about purchasing supplies in a just in time model, for example, that the industry practices. It is much more a conservative model of maintaining a minimum stock, even relatively large, depending on what in health we talk about redundancy and not running the risk of unavailability. So, it is frequent and common that you have a little more stock than you had in the historical series.” (S1)

Interviewees also exposed problems such as the return of medicines, which impact patient safety, time, and financial expenses. The return of medication is a chargeback process between items distributed to units by the hospital pharmacy and can occur for many reasons, such as the patient not consuming the medication, patient discharge, and errors (Limberger et al., 2013). One of the interviewees exemplifies the need for research and implementation of improvements in this topic:

“But there is no such thing as a bill of material. That you plan a demand condition in the future and extrapolate for which medicines, materials, or inputs will be consumed depending on that demand. So, this detail does not yet exist in the hospital environment.” (P6)

Other type of problems such as physical limitations and dimensioning of operational teams in the flow of supplies and communication should also be addressed to improve hospital operations management. However, the issue of stocks is unanimous among the interviewees:

“Everything that is not crucial for the patient, he may have a minimum stock. That, I’m very supportive. Even being a doctor, I understand perfectly that maintaining an equivalent stock is keeping money standing there, with no function whatsoever... It’s identifying which are those products that I use in my hospital, which are, in fact, of strategic importance for the patient, and those that are not.” (P7)

Gurtler et al. (2020) show that, in the context of a pandemic, problems related to the supply chain need a daily look and demonstrate results by applying actions such as the definition of therapeutic alternatives, efficient stock management, participatory management, reserve purchases directly with manufacturers, integration between units of the same complex, in addition to the rational use of medicines.

4.2.4 *Finance and cost*

Health costs have been growing and the sustainability of the system has emerged as one of the main challenges (Almeida, 2010). Therefore, according to the topics highlighted during the interviews, cost management and hospital finances are essential for identifying, measuring, and controlling costs throughout the production process.

The interviewees expose type of problems related to accounting, where opportunities regarding standardisation, inspection at the source, and the existence of disallowances in accounts are evident. Disallowances means the refusal or cancellation of budget, account, or funds considered undue or illegal, which the health operator does not consider correct for payment (Rodrigues et al., 2004). From a financial point of view, the interviewees expose issues such as cash flow management, medication purchase planning, and contribution margin. Knowledge of production costs is necessary and often, operational teams do not have this knowledge or monitoring, leaving the cost team in charge of this control, with monitoring and critical analysis being very far from the reality of the operation, as is said by an interviewee:

“I think one of the main problems here is that we discuss cost once a month, superficially. And when I say once a month, it is when the month has passed, that we will discuss the cost of what has passed...” (P1)

Another emerging topic among the interviewees is related to the duration of the entire financial process, commonly called the financial cycle. Brazilian respondents point to a long time between service provision and payment by health operators or even underfunding of the country's unified health system.

4.2.5 *Engineering and maintenance*

Respondents also mentioned some engineering and maintenance-related problems, listed hereafter, although there was not as much focus on this area.

Information technology, manual data processing, and errors in records emerge as improvement opportunities. Patrício et al. (2011) highlight the importance of using electronic medical records and the development of information systems to improve operations. Clinical engineering in the hospital environment has evolved and gained importance in management for the application of technology and engineering methods to solve technical and maintenance problems (Silva, 2015). On the dimension related to engineering and maintenance, interconnected problems with equipment, infrastructure, regulations, and suppliers emerge. Respondents state that this dimension has a direct impact on the flow of patients and allows for their agility, comfort, and safety.

“...engineering and maintenance, I see a direct link with the patient flow. Why do I see this? Enter the question of the bed that can be used, the chair that can be used, the equipment that can be used, and the machine that works 24 hours a day and can be used. Of the machine that cannot stop, but that always needs maintenance, ready to use, understand?” (P2)

The typology of equipment, current use, cost, and sophistication, for example, impact hospital maintenance strategies. Thus, a strategic plan of this dimension is necessary, assessing points such as preventive maintenance, and the search for equipment efficiency, reducing idleness and waste in the processes.

4.2.6 *People management and communication*

Hospitals are organisations with high use of manpower and technologies simultaneously, being a complex service production that requires a culture of excellence with an effective look at people management (Burmester, 2019).

Organisational communication is an emerging topic in several dimensions mentioned above and with evidence of impact on hospital operations. Limited communication, inadequate accountability, and unclear job expectations foster a culture of individualistic behaviour that gets in the way of improving operations. This individualistic behaviour is further mitigated by at least three factors: limited knowledge, lack of shared understanding, and heritage of functional knowledge culminating in strong departmentalisation and a reluctance to share openly across departmental boundaries (Ghosh and Sobek, 2015). Thus, it is necessary to map and plan institutional communication, in addition to specific channels for different themes and profiles, such as reaching the clinical, nursing, and administrative staff. Another important factor is the relationship between communication and leadership, where interviewees refer to the responsibility of direct leaders for assertive communication, contributing to the organisational climate and reducing turnover:

“Personnel and communication are two pillars, perhaps the most complicated in any hospital. An activity that requires a lot of movement of people. And people with different backgrounds, different profiles, making communication between them very difficult... Communication is very structured from nurse to nurse, from doctor to doctor, from administrative to administrative.” (P5)

“Hospital leaders. I think supervisors, coordinators, and managers are very poorly prepared when it comes to leadership.” (P1)

Due to the personnel component directly linked to performance, employees are an influential factor and offer greater potential for success in hospital quality and performance and patient satisfaction. Better customer orientation is necessarily linked to a process-oriented view and, particularly in service delivery, effectiveness, and efficiency directly depend on performance enhancement programs, available capacity, management of performance processes, and management competencies (Sibbel and Urban, 2001).

4.2.7 *Information technology*

Information technology and management systems are essential in health as they help both in the competitiveness of organisations and the agility of processes, as well as in improving the quality of patient care (Pereira et al., 2012).

The impact that technology has brought to health operations is visible, however, many complain about the delay of some hospitals on the topic:

“I think this is what has advanced the most in hospitals, in my professional experience. I have been a medical doctor for 20 years. In management for 7 years. This, unequivocally, is what has evolved the most in recent years. I think these are advances that have added a lot to quality. They are fantastic tools.” (P7)

Problems such as disintegrated databases, divergence of information, need for process automation, development of IT suppliers, and need for sophisticated equipment are raised among interviewees. Training employees in the area, using data analysis platforms, and the design of process-based systems emerge as short-term actions.

“The administrative part depends much more on IT today... The nursing technician, nurse, or doctor does not need a system just at a given time, to launch something or other, he needs it almost all the time. We have all the possible levels of technology there to be applied within the care of a patient.” (P6)

The integration of clinical and administrative information has become key to improving IT operations in health, requiring a parallel education of professionals, and raising needs for improvement in records, such as automation of medical records (Filho et al., 2001).

4.2.8 Performance indicators

Finally, the interviews explored the dimension of performance indicators and KPIs, and a summary of the issues raised can be found next.

Vignochi et al. (2014) show that information sharing is essential for the application of an indicator system in a hospital environment with a focus on knowledge development and quality management. In this regard, respondents explore problems such as the need for indicators focused on operations, performance, and efficiency.

“There are some indicators within the system... but most of our indicators are done manually, through spreadsheets.” (P4)

“The main problem today in a hospital is to produce too much information, too much information. So, I think the biggest difficulty, problem, is choosing those that are really key. Those that indicate performance.” (P5)

Financial indicators such as average revenue and cost ticket are cited among the most important when talking about operations management, as they are the result of a series of processes, flows, consumption, and personnel included in the service and thus can be explored as guides of the operation.

“But I think that, in terms of operations, for me, one of the most important is the average revenue ticket and average expense/cost ticket. Not the indicator itself, I think the indicator itself is important too, but mainly, the analysis of the indicator. Because, for you to analyse this indicator, you need to evaluate the use of medications, the procedures performed in the hospital, the complexity of these procedures, the patient’s stay, the bed turnover.” (P1)

Regarding the last question, in which the interviewees exposed topics not covered or reinforced a topic already addressed, suggestions emerged such as: focus on the customer and delivery of value; people involvement; leadership development; need for an overview of the hospital’s OM; need for flow vision; development and application of production management and project management tools; lean culture as change management; and management of installed capacity.

5 Discussion

The interviews carried out allowed the collection of the perception of professionals and specialists for a deeper understanding of the themes. The results obtained corroborate and complement other improvement opportunities for operations management applications (Sordan et al., 2023). Nilsson et al. (2017) when carrying out the implementation of value-based healthcare conducted interviews, indicating difficulties in measuring

outcomes, as well as problems related to technology. In addition, even though the researchers involved representatives of the patients in some discussions, the suggestions presented were often unfeasible due to the lack or difficulty of collecting data, like some challenges pointed out by other authors (Ayoub et al., 2024).

Analysing the issue of operations strategy, Landry et al. (2016) identify two commonalities in their case studies: a leader and a strategic intent. Leadership is one of the topics that was raised by respondents in this study, as well as other issues related to human resources management. It should be noted that, leadership and results-orientation are some aspects discussed in the literature that influence lean implementation performance (Ong et al., 2023), and should be given special attention for the success of the implementation. In this sense, the use of lean in healthcare can bring gains in quality, efficiency, and productivity to teams, and increase job satisfaction and autonomy (Bektas and Kiper, 2022).

Akinleye et al. (2019) found strong evidence of the relationship between better patient experience, lower readmission rates, and better outcomes and economic performance. The authors point out that this may be related to the availability of systems, resources for continuous improvement, and other aspects that financial support allows. In this context, approaches to improving economic performance can vary by area and context. Hillebrecht et al. (2022) point out that the maintenance of equipment by outsourced labour can reduce costs in low-income countries, which contrasts with other studies in high-income countries.

In the project to improve flows in the emergency department, Bonalumi et al. (2017) identified weaknesses in their process like those raised by respondents in this study. The authors highlight delays due to the arrival of patients, non-standard procedures, and waits. In their redesign, however, the researchers cite the resistance of employees to change.

Respondents also raised other topics about human resources, such as turnover and motivation. As motivation is related to the feeling good in the function, understanding and defining competencies for specific roles is important for operations improvement, as Gao et al. (2023) did for the hospital operations assistant. For this, it is important for future research, to map competences for lean implementation in different organisation levels (Santos et al., 2023). Moreover, compensation and rewards, performance appraisal, and learning culture are some options that can improve the performance of professionals in health systems (Parayitam et al., 2021).

Regarding technology, according to Aceto et al. (2018), the main challenges in implementation are related to security, privacy, design, performance, efficiency, heterogeneity, interoperability, and legal issues. However, adopting technologies as machine learning for operational improvement can improve data report and quality, and reduce bottlenecks and costs (Mahdavi et al., 2021), supporting staff to deal with the huge amount of information health systems are creating every day. Also, the use of learning health systems has shown benefits for operations, with improvement of health service delivery and of patient health outcomes (Somerville et al., 2023).

Finally, regarding the use of indicators, a discussion arose about the definition and collection of data to be analysed. In this sense, Piekarska et al. (2022) compare the approaches in different countries, analysing some steps that were taken in the definition of quality indicators, such as the use of guidelines for developing indicators, participation of a multidisciplinary team, review of existing indicators and evaluation and

improvement cycles. Also, it is important that future research should define a dashboard with main clinical and non-clinical metrics of lean (Santos et al., 2023).

In summary, it was possible to identify a large number of types of problems and opportunities that can be adopted by organisations, and act as a starting point for diagnosis and improvement programs. Some of these findings corroborate a recent literature review on Healthcare 4.0 (Sony et al., 2023), that emphasised critical factors, as the use of big data, culture, leadership, and patient-centricity. Therefore, this study can serve as a guide for managers to understand their institution's situation and gain clarity on some of their main HOM challenges, not limited to a specific department but for the entire organisation. Table 2 summarises the most common topics, their challenges, and opportunities of tools, methods, and lean principles applicable, according to interviews, scientific literature, and the authors' experience.

Table 2 Main types of problems and opportunities, and corresponding lean tools, methods, and principles for hospital operations management

<i>HOM dimension</i>	<i>Main type of problems and opportunities</i>	<i>Examples of applicable lean tools, methods, and principles (Lima et al., 2021)</i>
Hospital operations strategy	• Strategy focusing only on the value of the business, forgetting the value of the patient. • Existence of 'silos' and lack of flow visualisation. • Dichotomy between clinical and managerial decisions. • Communication fails (vertical and horizontal). • Excessive meetings. • Low leadership development. • Divergent thoughts of employees about the strategy. • Gap in indicator development and deployment.	Production flow (e.g., continuous flow, heijunka, takt time), continuous improvement (e.g., DMAIC, kaizen, KPIs, voice of customer), diagnosing and problem-solving (e.g., 5 whys, ABC analysis, process mapping, VSM, waste analysis), complementary management approaches (e.g., project management, SCRUM, simulation), Hoshin Kanri
Patient flow management (Hospital PPC + patient flow)	• Lack of a process related to capacity management. • Lack of a process related to demand management. • Idleness. • Ignorance of value. • Patient waiting time at different points in the flow. • Lack of flow and protocol design. • Local decisions impacting the global view. • Ignorance of the processes on the part of the team.	Production flow (e.g., continuous flow, heijunka, takt time), continuous improvement (e.g., DMAIC, kaizen, KPIs, voice of customer), work organisation and visual management (e.g., 5S, poka-yoke, standardised work, teamwork, visual management), diagnosing and problem-solving (e.g., 5 whys, ABC analysis, process mapping, VSM, waste analysis),

Table 2 Main types of problems and opportunities, and corresponding lean tools, methods, and principles for hospital operations management (continued)

<i>HOM dimension</i>	<i>Main type of problems and opportunities</i>	<i>Examples of applicable lean tools, methods, and principles (Lima et al., 2021)</i>
	• Communication fails. • Gap in training. • Lack of general planning. • Inexistence of criteria and parameters for production scheduling. • Disconnected scheduling and planning processes across sectors. • Lack of a unified view between PPCFP and patient flow. • Development of technologies for patient flow management.	complementary management approaches (e.g., project management, SCRUM, simulation)
Materials and medicines flows	• Traditional purchase order calculations • Low qualification of suppliers and standardisation of materials. • High medicine return rate. • Need to design the dispensing flow. • Lack of standards. • Low stock accuracy. • High stock. • Rupture of stock. • Need for robust stock sizing methods. • Need for studies of just in time x just in case models for hospitals. • Supply chain disintegration. • Study of demand and patient flow integrated with the flow of materials and medicines. • Lack of standardisation affecting quality and safety. • Communication failure in the chain. • Necessity of dimensioning teams in the supply chain. • Physical space limitations. • Development of technologies for managing the flow of materials and medicines.	Production flow (e.g., continuous flow, heijunka, takt time), continuous improvement (e.g., DMAIC, kaizen, KPIs, voice of customer), work organisation and visual management (e.g., 5S, poka-yoke, standardised work, teamwork, visual management), diagnosing and problem-solving (e.g., 5 whys, ABC analysis, process mapping, VSM, waste analysis), complementary management approaches (e.g., project management, SCRUM, simulation)

Table 2 Main types of problems and opportunities, and corresponding lean tools, methods, and principles for hospital operations management (continued)

<i>HOM dimension</i>	<i>Main type of problems and opportunities</i>	<i>Examples of applicable lean tools, methods, and principles (Lima et al., 2021)</i>
Finance and cost	• Traditional accounting view without looking at flow. • Need for robust production cost calculation. • Existence of disallowances. • Rework during the billing process. • Manual process with multiple conferences in the flow. • Missing records or inadequate information. • Lack of standardisation of flows. • Need for cash flow and high working capital. • Various sources of payment. • Underfunding (SUS in Brazil). • High delay in the financial cycle. • Decentralised invoicing. • Low integration between sectors in the production of the account. • Lack of knowledge on the part of professionals. • Development of technologies for cash flow management. • Inexistence of electronic medical record systems in some hospitals.	Continuous improvement (e.g., DMAIC, kaizen, KPIs, voice of customer), work organisation and visual management (e.g., 5S, poka-yoke, standardised work, teamwork, visual management), diagnosing and problem-solving (e.g., 5 whys, ABC analysis, process mapping, VSM, waste analysis)
Engineering and maintenance	• Low equipment availability for maintenance • Equipment stopped and idle. • Lack of planned maintenance. • High corrective maintenance rate. • Structure and physical area can get in the way of this flow. • Gap in hospital equipment mapping. • Lack of urgency and priority management. • Maintenance is seen as operational and not a strategic point. • Very sophisticated and very expensive equipment. • Study of rules and regulations of the authorities.	Continuous improvement (e.g., DMAIC, kaizen, KPIs, voice of customer), work organisation and visual management (e.g., 5S, poka-yoke, standardised work, teamwork, visual management), diagnosing and problem-solving (e.g., 5 whys, ABC analysis, process mapping, VSM, waste analysis)

Table 2 Main types of problems and opportunities, and corresponding lean tools, methods, and principles for hospital operations management (continued)

<i>HOM dimension</i>	<i>Main type of problems and opportunities</i>	<i>Examples of applicable lean tools, methods, and principles (Lima et al., 2021)</i>
People management and communication	• Lack of service level agreements (SLAs). • Lack of supplier qualification and management. • Few global suppliers of quality equipment. • Lack of material for maintenance.	Continuous improvement (e.g., DMAIC, kaizen, KPIs, voice of customer), work organisation and visual management (e.g., 5S, poka-yoke, standardised work, teamwork, visual management), diagnosing and problem-solving (e.g., 5 whys, ABC analysis, process mapping, VSM, waste analysis), complementary management approaches (e.g., project management, SCRUM, simulation)
	• High turn over rate.	
	• Low organisational climate.	
	• Delay in hiring personnel.	
	• Need for continuing education.	
	• Low leadership development.	
	• Low autonomy for people.	
	• Rigid hierarchy.	
	• Existence of silos in the system.	
	• Gap between strategy and operation.	
	• Need for institutional communication.	
	• Divergent languages and communications between administrative and assistance areas.	
	• People with different backgrounds and profiles.	
	• High level of technical assistance training.	
	• Databases and platforms without integration.	
	• Third-party systems development.	
Information technology	• Need for process automation. • Employee dependence on the system. • Opportunity to use Power BI. • Manual indicators. • Duplication and errors of information. • Operational rather than strategic focus. • Need for IT investment. • Lack of responsible for robust data analysis. • Need for system design focusing on flows and processes. • Need for computerised equipment for the hospital.	Production flow (e.g., continuous flow, heijunka, takt time), continuous improvement (e.g., DMAIC, kaizen, KPIs, voice of customer), diagnosing and problem-solving (e.g., 5 whys, ABC analysis, process mapping, VSM, waste analysis)

Table 2 Main types of problems and opportunities, and corresponding lean tools, methods, and principles for hospital operations management (continued)

<i>HOM dimension</i>	<i>Main type of problems and opportunities</i>	<i>Examples of applicable lean tools, methods, and principles (Lima et al., 2021)</i>
Performance indicators	• Need for a look and focus on operations. • Analysis of safety indicators only. • Need for performance and efficiency indicators. • High amount of data, indicators, and measurements. • Divergence of results. • Production of manual indicators. • Need for robust KPI critical analysis. • Low level of knowledge of the areas about costs. • Dichotomy between assistential and administrative communication.	Production flow (e.g., continuous flow, heijunka, takt time), continuous improvement (e.g., DMAIC, kaizen, KPIs, voice of customer), work organisation and visual management (e.g., 5S, poka-yoke, standardised work, teamwork, visual management)

6 Conclusions

Hospital operations management should be responsible for delivering value to the patient with a focus on quality and safety, offering a positive experience at an adequate cost. For this, action must be taken in the deployment of the strategy, mitigating communication failures, and breaking down barriers and silos in the organisation. In this context, this paper contributes to the literature by comparing and discussing perceptions from scientific papers and professionals who work daily in operations management. The results reveal that HOM must effectively manage patient flow through comprehensive planning and programming, supported by robust management of hospital capacity and demand, with decision-making at a global level rather than just a local level. Another critical aspect of HOM discussed is the management of material and medication flow, with opportunities for optimising inventory size to mitigate high inventories and adopting models such as just-in-time throughout the supply chain. Financially, HOM should focus on optimising cash flow to reduce lead time and rework in the billing process. From an engineering and maintenance perspective, there are opportunities for implementing planned maintenance, optimising equipment procurement, and managing hospital equipment effectively. People management and communication processes are also crucial, requiring attention to organisational climate, staff turnover, leadership development, and alignment between administrative and clinical staff. In the realm of information technology, efforts should be directed towards strategic integration of databases and platforms, enabling the establishment of consistent and robust key performance indicators (KPIs). Lastly, emphasis should be placed on customer-centricity and value delivery, involving stakeholders in the process of improving operations and fostering a culture of lean change management.

With the results of this paper, other professionals related to the hospital sector can act on the opportunities raised to improve HOM. While many of the findings were previously identified in the literature, this research contributes by providing a comprehensive overview of the challenges and opportunities in hospital operations management. It can be utilised for institutional diagnosis and to define initial steps in systematically implementing lean approaches in hospitals. Additionally, a list of opportunities is identified, which can guide future research and improvements in HOM. The research is limited by its focus on managers and specialists primarily in Brazil. Thus, it is recommended to replicate the interviews with professionals from diverse contexts to obtain feedback and evolve the identified problems and opportunities. Furthermore, a thorough exploration of the identified opportunities is suggested to validate them with real-life cases.

Acknowledgements

This work was partially supported by FCT – Fundação para a Ciência e Tecnologia within the R&D Units Project Scope UIDB/00319/2020.

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