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Proposal for a health information management model based on Lean thinking

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Abstract

Although assessing quality in the health field is a prominent challenge, there is unanimity among managers that it is necessary to select appropriate assessment systems and methods to assist the administration of services and provide decision-making with the least degree of uncertainty possible. Lean, also known as lean philosophy, is a management model that has been used in the area of Health. The management of data, knowledge, and health services must be carefully performed, so that quality care can be offered. at all levels of care. In this way, when implementing Lean strategies in Information Technology, it is necessary to evaluate all its processes within the institution to eliminate waste, structure functions within the applied methodology and measure improvement at all levels of the organization. Thus, the general objective of this article is that of a study that leads to a health information management model based on Lean thinking in the municipality of Ituverava. The highly heterogeneous, and sometimes ambiguous, nature of the medical language and its constant evolution, the high amount of data generated constantly by the automation of processes and the emergence of new technologies constitute the foundation for the inevitable computerization of health to promote the production and management of knowledge. Adopting Lean thinking in health may seem a challenge initially for managers and team members, but as the first results begin to appear, profound and concrete changes are visible for positive transformation for improvements in the quality of the service provided, until the culture can be learned completely in order to have the perfect care.

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1. Introduction

Planning, reviewing processes, monitoring performance, and constant improvements within organizations have become fundamental in recent years. The quality systems were created to promote competitiveness, efficiency, effectiveness with high-performance indexes of the institutions, obtaining successful results [1]. The implementation of quality management in health institutions has become a concern for managers responsible for care and which requires the efforts of different stakeholders that involve management, and is currently the main object of several health systems worldwide, with the in order to guarantee satisfactory assistance to the patient to seek continuous improvement of health management processes and procedures, through the implementation of routines in the workplace and changes in the team's [2].

Managing quality in public health institutions is a challenge, not only for the manager or due to the resources available to meet expenses, but also due to the need to restructure the production chain, eliminating care models that may disorganize the organizational culture reflecting on quality in the service provided [3]. Lean thinking, also known as lean thinking, comprises a set of principles on waste elimination (moulting), improvements in the flow of patients within institutions and quality assurance for service providers and supplies, in order that problems can be identified and solved by the team, in search of continuous improvement [4]. The main point of Lean thinking is to add value, that is, it is the ability to offer the customer exactly what he needs. Defining value means realizing that all processes have activities that generate value, in which waste must be eliminated and directly contribute to quality assurance [5].For the implementation of Lean to be successful within the institution, it is essential that managers play an active role in several areas, such as adopting planned methodology in relation to implementation; provide necessary resources; designate those responsible for the process; distribute responsibilities and involve the team; to emphasize the importance of teamwork together (well-developed communication channels; ascending and descending); manage expectations (i.e. fear of losing your job); ensure that employees understand the need for change (i.e. new roles according to the change implemented); creating an experimentation environment, with a culture of understanding risk and a safety net for trials and failures; make the team understand about competitive Lean reasons, such as benefits for the organization and for those involved in the process, presenting the future's look after the change; analyze and share information regarding cost-benefit; delegate and emphasize the responsibility of each one [6].

2. Background

2.1. Related Work

In the information and communication era, different areas of health are adopting new and diverse tools and techniques for the development of better solutions aiming to guarantee the quality, delivery time, sustainability, cost reduction, and even greater organizational performance in a scenario notoriously characterized by the marked production of information. In contrast, the availability and knowledge generated in these environments are mostly evidenced by the scarcity of appropriate infrastructure and effective integrative approaches [7].Thus, the organization and structuring of information in a synthesized way and with the purpose of identifying and formalizing their relationships, conceive knowledge, a fundamental principle that forms the basis of numerous studies in several areas [8].

Data processing is essential in decision-making processes and in assessing the quality of health services. The management of health systems requires mechanisms capable of dealing with administrative aspects that represent the conditions of organization and functioning of the various levels that make up health services. The management of a

health service involves taking care of the organizational and functional aspects associated with it. In addition, the health administration process must be composed of information systems that process data related to the individual's health and life condition, in addition to the environmental conditions and other factors that interfere in the health-disease process [9].

Although assessing quality in the health field is a relevant challenge, there is unanimity among managers that it is essential to select appropriate assessment systems and methods to assist the administration of services and provide decision-making with the least degree of uncertainty possible. Many institutions use quality indicators as an instrument to measure quality, with the aim of identifying how and where improvement can be made. Therefore, health indicators are useful to assess and monitor the activities carried out by health services, in addition to contributing to the identification of the degree of risk of the occurrence of a certain event or health problem, as well as checking values and acquiring information that allows intervening in the reality you want to know, in order to achieve goals and objectives [10].

Lean, also known as lean philosophy, is a management model that has been used in the area of Health [11], and has its origin in the automobile industry. Different applications in common problems in the routine of many health services such as long queues, rising costs, and various types of recurring waste such as inventory, administration, and logistics were solved through small actions based on the Lean methodology. The ability to increase the agility and documentation of processes, reduce errors and indirect costs, and optimize the use of resources are presented as the main benefits when applied to the operational context. In addition, studies suggest Lean as a strategy that can favor a profound transformation at the organizational and managerial levels [12].The use of Lean in health aims to provide an increasingly accurate service to patients, with cost reduction and that does not cause harm from the time they enter until they leave the health organization; solving problems of greater occurrence within the sector, such as long lines, high costs and recurring waste [13]. This thinking in health is guided by six principles: Lean is to create value; Lean is an attitude of continuous improvement; Lean is a unit of purpose respect for the people who develop the work; it's visual; is standardization with flexibility [14].

The principles of Lean employed in health are positive and add improvements for several reasons, as health organizations are divided into departments (silos) and, often, the only person who sees the patient's flow is himself. In these systems, the path of the patient is composed of long periods in different health institutions, so that the value of the aggregated information is summarized in small intervals of time. When applying this thinking, specifically in the context of the continuous flow of value, it is essential that the deconstruction of processes is done. Thus, in a scenario where the patient provides systems with dispersed information, it is possible to ensure changes that occur across functional boundaries. Lean Healthcare promotes patient-focused assistance, in which therapeutic and interventionist results offer improvements in operational management, with the satisfaction of the technical team and patients, reducing waste and costs [15].

2.2. Goals

The main goal is to propose a health information management model based on Lean thinking that acts as an auditable instrument of analysis, representation, and improvement of the quality of health information in the municipality of Ituverava through medical procedures in the different areas that make up the Unified Health System (SUS). As specific objectives of this work, we have:

- review the different models, thoughts, and philosophies applied to health information systems, in order to support the proposed methodology based on the best practices exposed in the literature;
- evaluate the different information, flows and practices present in the health information systems that make up the location of the present study;
- know the levels of flow bottlenecks within a hierarchical and regionalized system in order to identify the waste (seedlings) of information present in the municipality;
- improving the reliability of the information, allowing managers to have greater visibility through the use of visual tools and providing greater security in the decision-making process;
- provide means for using audit filters to assess the quality of care provided to patients to identify strengths and weaknesses, allowing corrective actions.

In the next section, some key concepts for the execution of this article will be presented. The fourth section presents the research proposal with the methodology that will lead the proposed study and the discussion in the fifth section. Finally, the sixth section summarizes the conclusions and next steps for the development of a more comprehensive model on a management model of health information systems based on the Lean philosophy in the municipality of Ituverava / SP.

3. Research Protocol

3.1. Study Design

According to Vergara [16], research on the management theme can be classified as to the ends and the means. As for the purposes, it refers to applied, exploratory, and methodological research. As for the means, this work included bibliographic and documentary research in the stage of characterization of health information systems, their processes, in addition to a mapping of those responsible and users of these systems, present in the municipality of Ituverava. In this sense, the activities will be planned and developed in three phases:

- Phase 1 - bibliographic and documentary study: Integrated by the conceptual framework and the identification of precedent elements for the development of the management model. In line with one of the objectives of this work, this phase includes three activities: a) survey of the portfolio of information systems that support the activities of the municipality and the context in which these applications are used; b) bibliographic review in order to identify the state of the art of using Lean tools in relation to health information management; c) mapping and characterization of the processes involved in the information routine at different levels of health care.
- Phase 2 - Model structuring and information management: Includes the description of the execution steps and the complete specification of the management model. The first activity aims to specify, based on the theoretical framework, the architecture of the model, which included the quality model with its dimensions and peculiarities, the instruments for sensitive assessment for each dimension, in addition to the elaboration of a map in order to identify those responsible, users and other stakeholders involved with the systems. The second activity of this phase will consist of the selection, analysis, and mapping of the data flow and application of value to the processes explained in Phase 1 for the structure of the management model.
- Phase 3 - Evaluation of the applicability and effectiveness of the model: in this step, activities will be developed to verify the effectiveness of the management model. The first activity will review the processes in order to assist decision making based on the literature review and the intervention tools to be applied in each process. In the end, we will have a report on the processes for health information systems, identifying possible waste (seedlings) of information, allowing the improvement of the application of resources, and, therefore, making a more effective intervention choice.

3.2. Data source

Public health operation and management processes are supported by an information technology infrastructure, through a set of nationwide information systems, including epidemiological, primary care, outpatient and hospital events, and among other actions carried out by the Ministry of Health. The data sources included in this study will come from health information systems that integrate the dimensions of information related to the municipality of Ituverava at government, state, and regional levels.

3.3. Literature Review

An integrative literature review will be carried out to map the different techniques and processes applied to this context, this stage of the study is a Scoping Review study and will be prepared according to the methodology of the Joanna Briggs Institute (JBI).

The search will be performed electronically in the databases: Latin American and Caribbean Health Sciences Literature (LILACS), Web of Science, National Library of Medicine (PubMed), Cumulative Index to Nursing and

Allied Health Literature (CINAHL), Scielo, ScienceDirect, SCOPUS and World Health Organization Library Database (WHOLIS). For the combination of descriptors, the Boolean terms will be considered: AND, OR, and NOT composing the search formulas.

After conducting the search, it is estimated to include research conducted in English and Portuguese, with a quantitative and qualitative approach, primary studies, systematic reviews, meta-analyses and/or meta-syntheses, books and guides, published or not published until the present period. and answer the question of the established search. Websites and advertisements in the media will be excluded. For the search, descriptors and their synonyms will be used according to the Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH).

3.4. Lean Tools

Lean thinking consists of principles and techniques, the first being associated with the institution's philosophy, which are the bases that guide lean strategic actions such as establishing value for the customer, defining flow, maintaining continuous flow, pulled production, integration of the supply chain, focus on quality, visual management, use of technology, technical staff and processes, development of human resources and continuous improvement. The second is the means by which the principles are achieved and maintained, namely: value stream mapping (VSM), just in time, *kanban*, automation (*jidoka*), five Ss (5S), standardization, workload leveling (*heijunka*), group technology and cell layout, employee according to takt time, zero-defect quality control, total production maintenance, visual control, multi-professional and teamwork, empowerment (autonomy) and kaizen [17].

The tools used in lean thinking are mechanisms for applying and structuring the results for eliminating waste and adding value throughout the process. Tools such as Value Stream Mapping, 5S, *Heinjuka*, Single Minute Exchange of Die (SMED) or quick tool change, Poka-Yoke, Kanban, Kaizen, Visual Management, Standardized Work, Gemba, Andon and Total Productive Maintenance (TPM). These tools should help to identify the processes that do not add value to the organization so that the results can be optimized and acquire a competitive advantage [18].

4. Discussion

Interinstitutional data production and sharing have grown considerably in recent years. According to Miloslavskaya and Tolstoy [19], humanity has generated more data in the past two years than in its entire past history. However, there is a great difficulty for institutions to analyze the data produced, due to its volume, speed, veracity, variety, and values found in the different sectors that integrate health services [20]. Due to the complexity, scope, and particularities of the SUS, the management of data, knowledge, and health services must be carefully performed, so that quality care can be offered at all levels of care. In addition, the diversity of forms, structures, and patterns present in information systems represents a challenge for the safe and reliable exchange of information [21].

In this sense, the definition of organized processes and the adoption of continuous thinking in the improvement of the activities performed are extremely important to overcome the heterogeneity and intangibility present in the spheres that constitute health information systems (HIS). The heterogeneity of the data is intrinsically connected to the type of information generated by health services. The highly heterogeneous, and sometimes ambiguous, nature of the medical language and its constant evolution, the high amount of data generated constantly by the automation of processes and the emergence of new technologies and the need to process, analyze and make decisions based on this information constitute the foundation for the inevitable computerization of health to promote the production and management of knowledge [22].

The essence of Lean thinking is the elimination of superfluous activities, that is, waste, which interposes itself in the most diverse processes, assistance, support, and administrative. By eliminating effort that does not add value, there will be time and resources accessible for things that are needed. Eliminating waste means doing what is relevant, providing more space to improve the quality of work and patient safety; so that the processes to actions become fast, efficient and effective, while at the same time reducing costs and improving the workplace [23].

When inserting Lean thinking in a health organization, managers first need to assess the organizational structure, as the vast majority of health care organizations are structured at hierarchical levels with vertical decision-making movement, that is, from the top to the bottom. base. Lean has a better performance when in a horizontal process, going

from a need for service until its delivery, without ceasing the flow; in order to make it possible, leaders must organize their employees into operational teams, orienting themselves on the individual products or services offered to the patient. Such lack means that the team needs to understand that they work for the patient and not for the sectors of the institution, which demands a reorganization of the team to satisfy the requirements of the process [24].

Among the main aspects that negatively influence the decision-making process, we can highlight the low quality, availability, and integration of population health data. Despite the existence of such data, there are reasons that prevent access by managers and health professionals, such as the non-computerization of processes, the heterogeneity, and duplicity of data in health information systems, and the existence of a large amount of isolated data and accessible only in a given context. Thus, health data is commonly found dispersed through independent systems and fragmented in closed databases. Such factors can cause problems of quality of the information, making it difficult to coordinate and evaluate them, considering that, despite the intense volume, the information remains decentralized without it is possible to assist the decision-making process [25].

Lean Information Technology (IT), also called Lean IT can be defined as the participation of the team through the use of Lean principles, with systems and tools, incorporating, aligning and synchronizing IT management with the area of business; being able to offer quality information with an effective information system, promoting continuous improvement and innovation of processes[26].

For the implementation of Lean IT to have effective results, it is necessary for the manager to be able to: (i) have a vision of what is important for the management of the institution and choose Lean tools that are appropriate for IT complications; (ii) integrate the implementation of the tools together with five management components: strategy, processes, structure, performance and culture metrics. Thus, when implementing Lean strategies in IT, it is necessary to evaluate all its processes within the institution to eliminate waste, structure functions within the applied methodology, and measure improvement at all levels of the organization, promoting the Lean culture [27].

According to Paesa [28], the principles are the first accepted truths, and after them, the laws constitute the theory. The method establishes that the steps must be adopted, with autonomy represented by the choice of technology to be used. Taking the method, choosing the technology, and specifying its form of application, we have the technique itself. Among the elements that are fundamental to the application of Lean, the principles evaluate this philosophy as continuous improvement applied to the institution's processes. The techniques are listed as operational, for evaluating their practice in daily use. In this way, it is possible to move with the institution's team between a high level of abstraction (Lean principles) and a level of practical application (Lean techniques). A recurrent cause of failure in Lean implementations is the lack of understanding of Lean as a philosophy [29], [30].

Techniques without principles lead to the blind application, oblivious to decisive factors. Only through the principles is it possible to apply the techniques. The principles are more comprehensive in their recommendations, with a degree of abstraction that hinders their operationalization, due to this factor it is necessary to resort to techniques [28].

5. Conclusions and future work

The implementation of Lean thinking in health opens up a range of opportunities for continuous improvement, because through the integration with the team on concepts and tools it is possible to build a health system with low costs, with less waste, reducing waiting time and queues, adding value in each process, without overloading the team through changes in habits, that is able to understand the real need of the user and able to deliver what he really needs in a timely manner. Increasing resources in a health organization, whether inputs, technology, finances, and human when the whole process is unstructured, will generate more waste, affecting the institution, the team, and especially the customer. Adopting Lean thinking in health may seem a challenge initially for managers and team members, but as the first results begin to appear, profound and concrete changes are visible for positive transformation for improvements in the quality of the service provided, until the culture can be learned completely in order to have the perfect care.

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