

Application of the enterprise diagnosis method in healthcare: an evaluation study in three emergency care units in the state of São Paulo - Brazil

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Abstract

The study aimed to evaluate the level of organizational maturity in three Emergency Care Units in a city in the interior of the state of São Paulo – Brazil. For this, Enterprise Diagnostic Method in Health (MDE-S) was used, an approach to study and qualify the organizational level and maturity that has as its fundamental characteristic to provide a cycle of continuous improvement in the organization. Among its results, the need for greater investment in knowledge and application of public health management tools by the administrations of the evaluated units was demonstrated. It was recommended the creation of a strategic management system and implementation of goals and guidelines based on the Lean Healthcare approach, called Hoshin Kanri.

Keywords: Maturity. MDE-S. Lean healthcare. Lean hospital.

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Aplicação do método de diagnóstico de empresa em saúde: um estudo de avaliação em três unidades de atendimento de emergência do estado de São Paulo - Brasil

Resumo

O estudo objetivou avaliar o grau de maturidade organizacional em três Unidades de Pronto Atendimento de um município do interior do estado de São Paulo – Brasil. Para isso, foi utilizado o Método Diagnóstico de Empresa em Saúde (MDE-S), abordagem de estudo e qualificação do nível e maturidade organizacional que possui como característica fundamental proporcionar um ciclo de melhoria contínua na organização. Entre seus resultados ficou demonstrada a necessidade de maior investimento no conhecimento e na aplicação de ferramentas de gestão pública em saúde por parte das administrações das unidades avaliadas. Recomendou-se a criação de um sistema estratégico de gerenciamento e desdobramento de metas e diretrizes baseado na abordagem *Lean Healthcare*, denominado *Hoshin Kanri*.

Palavras-chave: Maturidade. MDE-S. *Lean healthcare*. *Lean hospital*.

Aplicación del método de diagnóstico *enterprise* en salud: un estudio de evaluación en tres unidades de atención de urgencias del estado de São Paulo - Brasil

Resumen

El estudio tuvo como objetivo evaluar el grado de madurez organizacional en tres Unidades de Atención de Emergencia en una ciudad del interior del estado de São Paulo - Brasil. Para ello, se utilizó el Método de Diagnóstico *Enterprise* de Salud (MDE-S), un enfoque de estudio y calificación del nivel y madurez organizacional que tiene como característica fundamental brindar un ciclo de mejora continua en la organización. Entre sus resultados, se demostró la necesidad de una mayor inversión en el conocimiento y aplicación de herramientas de gestión en salud pública por parte de las administraciones de las unidades evaluadas. Se recomendó la creación de un sistema de implementación y gestión estratégica para objetivos y directrices basado en el enfoque *Lean Healthcare*, denominado *Hoshin Kanri*.

Palabras clave: Madurez. MDE-S. *Lean healthcare*. *Lean hospital*.

Introduction

At a time when enterprises are faced with great competitiveness related to constant innovations in the markets in which they operate, it is of fundamental importance that these important social organizations continually assess their production processes. This is the only way they will manage to survive, improving their products, conquering and retaining their customers, thus acquiring the necessary confidence for their survival. However, the importance of also conducting an assessment of their culture cannot be ignored. Thus, it is through it that it is possible to establish policies, programs, and strategies that support and strengthen its core purpose and values. For the Society for Human Resource Management (2017) "In aligned organizations, the same characteristics or fundamentals beliefs motivate and unite everyone, descending from the top echelon to the individual employees".

The same institution states that:

There are many tools to develop and sustain a high-performance organizational culture, including hiring practices, onboarding efforts, recognition programs, and performance management programs. The biggest challenge is deciding how to use these tools and how to appropriately allocate resources. (SOCIETY FOR HUMAN RESOURCE MANAGEMENT, 2017).

It can be concluded that the current scenario for organizations requires them to remain permanently competitive throughout their existences. According to Bhagat, Mcdevitt and Baliga (2017), the reduction of barriers to trading between nations imposed by globalization, the use of labor from different countries, the management of large amounts of unstructured data, and the focus on developing competencies for customer satisfaction are imperative issues for the survival of organizations that produce goods and services of any nature.

Considering public service providers, institutions with specific characteristics that make them different from any other sectors, there is no impediment to the successful application of lean management practices. Organizations in this sector, suppliers of goods and services to the population in general, have a multiplicity of activities, services, and processes that cross different realities (SANTOS; ORLANDO FILHO, 2020).

Analyzing specifically the Brazilian public sector, corroborating the thought of Medici (2017), Santos and Orlando Filho (2020) state that, in general, there are problems associated with the chronic lack of planning and management, with the

growth of the sector based more on political clientelism than on the needs of the population, inequality in how investments and funding resources for the sector are distributed, and the inefficiency of a sector that is not organized to achieve results, reward successes and penalize failures.

According to Salomão (2014), a survey conducted by the Brazilian Research Institute called Datafolha, at the request of the Brazilian's Federal Council of Medicine (CFM), concluded that 93% of Brazilians rate public and private health services as terrible, bad, or regular. At this point, it is noteworthy that Brazil has a public health system called "*Sistema Único de Saúde*" (SUS), inspired by the National Health Service or National Health System present in the United Kingdom (PAIM, 2009). Among SUS users, 87% of respondents reported dissatisfaction with the services offered. According to Brazilian Institute of Geography and Statistics (IBGE, 2017), in 2015, the final consumption of health goods and services in Brazil was BRL 546 billion (9.1% of GDP). Of this total, BRL 231 billion (3.9% of GDP) corresponded to government consumption expenditures and BRL 315 billion (5.2% of GDP) to expenditures by families and non-profit institutions serving families. For Santos (2019), the existence of a lack of knowledge of public health management tools and of the basic fundamentals of administration on the part of health unit administrations means that some of these units do not reach a 'high' or 'medium' level of maturity.

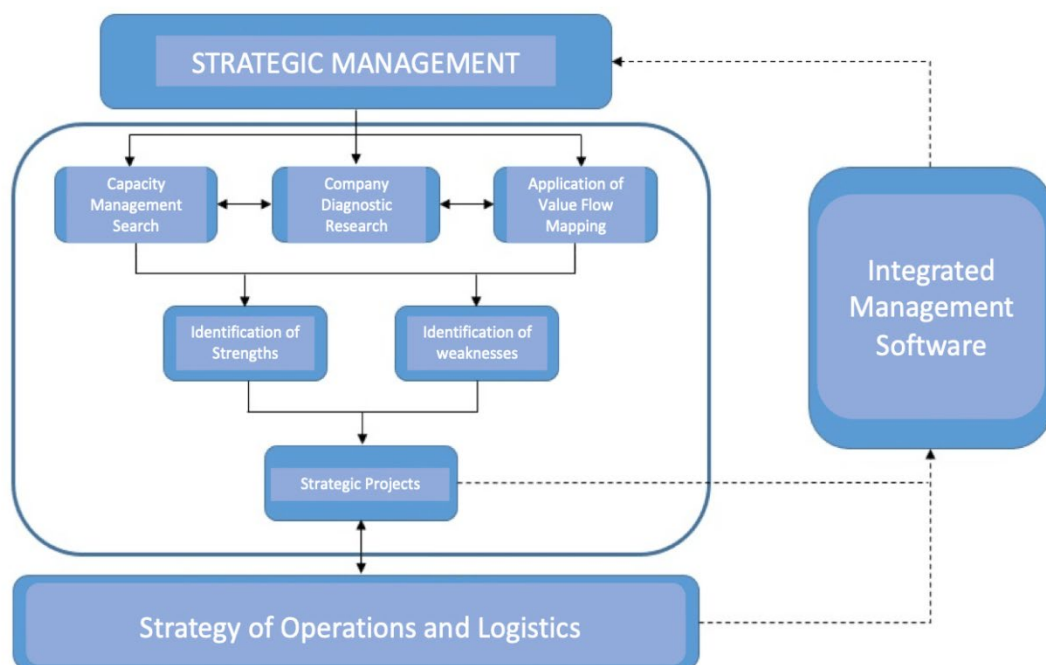
According to Calado, Batocchio, Calarge and Silva (2014) companies are at different levels of maturity. The application of lean methods and tools is structured according to the principles and the suitability of each enterprise's reality. There are actions and programs that are not sustainable because they are misaligned with strategic decisions, so with a diagnosis and alignment of objectives and guidelines and the proper choice of the application of lean tools and methods, a transformation of the production system can be achieved with considerable improvements.

Method

The method used in this study is based on the "Lean methodology in healthcare" (COSTA; GODINHO FILHO, 2016; CURATOLO; LAMOURI; HUET; RIEUTORD, 2013; DAHLGAARD; PETERSEN; DAHLGAARD-PARK, 2011; KIMSEY, 2010; RAMORI; CUDNEY; ELROD; ANTONY, 2021). More specifically, it is based on the MDE-S (Enterprise Diagnosis Method in Health), which is a method to study and qualify the level and maturity of the enterprise, where the observation and evaluation of results takes place, through

the application of a set of methods and tools according to Lean. The MDE-S involves the collection and systematization of information related to various aspects of business management that are not always known by all and, normally, much information is not expressed and used in decision-making (CALADO; BATOCCHIO; CALARGE; SILVA, 2014). The MDE-S, graphically presented in Figure 1, consists of three main axes: Capacity Management Search, Company Diagnostic Research and Application of Value Flow Mapping; emphasizing that self-assessment and evidence gathering generate the identification of strengths and weaknesses that translate into possible improvements to be made.

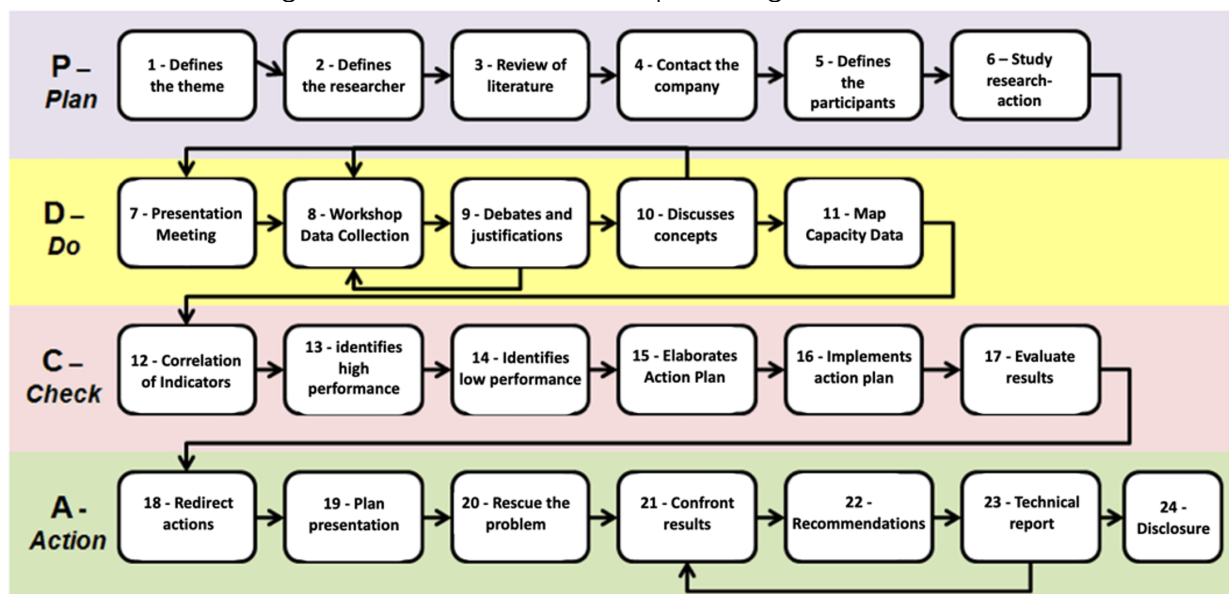
Figure 1 - Enterprise Diagnosis Method in Health - MDE-S



Source: CALADO; BATOCCHIO; CALARGE; SILVA (2014).

In this study, to achieve its objective, the scope of the assessment was delimited, based on steps 7 to 14 of the MDE-S (Figure 2), except of step 11, in which information was obtained from the health professionals of the units. These data were then categorized and calculated and, after being analyzed, produced the necessary inputs for the formulation of a value judgment, finally presented in the final considerations and recommendations.

Figure 2 - Structure of the Enterprise Diagnosis Method



Source: CALADO; BATOCCHIO; CALARGE; SILVA (2014).

The MDE-S has already been applied to measure the level of maturity at different times and in different health units. An application was following the quality in the dissertation Assessment of Maturity Level by the Automotive Enterprise Diagnostic Method, 2014; In Portugal, in the dissertation Assessment of health units using the Baldrige methodology and LESAT: a case study of a hospital in the central region of Portugal, 2014; In the dissertation Adoption of Lean practices in the public health service: an evaluation study, 2019.

To apply the MDE-S in the units studied, a software was developed for use on a web and mobile platform (tablets and smartphones) called MDE-S 1.0, based on the combination of two tools, the LESAT-MIT and the Malcom Baldrige Award, which when combined make it possible to measure results in terms of the institution's positioning in terms of practice and performance. In this context, it is important to define the concept of practices and performance:

- a) Practices are the processes implemented in the enterprise/institution to improve business management, that is, they are the management and technological tools implemented in the organization. These include organizational aspects such as employee involvement and teamwork;
- b) Performance refers to the measurable results of processes previously implemented in the organization, such as the volume of material being

processed, cycle times, and impacts on business results such as market share, customer satisfaction level, and employee morale.

The established criteria for the study of the MDE-S

The criteria used to judge the data collected through the questionnaires were not intended to resolve all the existing doubts, disputes and contradictions intrinsic to any system related to people, but sought to implement an adequate process in terms of purposes, performance and quality, with the objective of obtaining contributions that would lead to a progressive improvement in the performance of the context, program or other object of the evaluation process.

The Malcolm Baldrige Award and the Lean Enterprise Self-Assessment Tool - MIT were chosen to build the criteria for this evaluation study.

The Malcolm Baldrige National Quality Award recognizes American organizations in the business, healthcare, education, and non-profit sectors for performance excellence. It is the only formal recognition of excellence in public and private organizations in the United States of America. It is administered by the Baldrige Performance Excellence Program, which is based and managed by the National Institute of Standards and Technology, an agency of the U.S. Department of Commerce (NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY, 2018).

Based on the determination of needs, in a maturity and capacity model format, the Lean Enterprise Self-Assessment Tool (LESAT) was selected for this evaluation study. LESAT was developed by a team from industry, government, and academia under the auspices of the Lean Aerospace Initiative at the Massachusetts Institute of Technology in 2000 and 2001.

In a concept formulated by Nightingale (2002), LESAT is a self-assessment tool of the current state of an enterprise and its readiness to change. The tool is organized into three evaluation sections:

1. Lean practices relevant to the Lean transformation process, with emphasis on business leadership and change management.
2. Lean practices related to "an enterprise's lifecycle processes", that is, the processes involved in the realization of the product or service.
3. Lean practices applicable to infrastructure support units.

MDE-S software

To collect data for the evaluation study, the WEB platform MDE-S 1.0 questionnaire was used to interview. According to Elliot (2012), this type of instrument is useful because it is intended to be used as "an investigation technique, with a high number of questions that aims at knowledge of facts, behaviors, opinions, beliefs, attitudes, interests, expectations, motivations, preferences, and situations experienced". Therefore, in this study, the objectives of the interviews are:

- a) Allow the interviewees to make criticisms and suggestions.
- b) Allow the candidate to express themselves orally.
- c) Enable the reach of information "guarded" by the interviewee.
- d) Provide a closer judgment; and
- e) Simulate the reasoning of both: interviewer and interviewee.

While conducting the interviews, there may be some difficulties such as: taking relevant notes, occurrence of assumptions and guesses, and it is also possible to have an emotional involvement by the actors involved in the process of its execution. Therefore, some precautions and recommendations were taken, such as:

- a) Stimulate the involvement of the interviewees. In this case, it was carried out with the directors and the management and operational staff of the Emergency Care Units, in this article, called 'UPA', which is its abbreviation in Portuguese for the name: *Unidade de Pronto Atendimento*;
- b) Establish a previous script through scheduled remote meetings and filling out the questionnaire.
- c) Encourage the interviewees to make notes in front of the interviewer, in addition to allowing value judgments about the UPA system that were crowded, this due to the condition of partnership and freedom of expression previously established in the process.
- d) Do not, at any time during the diagnosis, make promises of benefits.
- e) Give to interviewees, as well as to interviewer, complete freedom of expression and dialogue.
- f) Promote informality and objectivity in the common purpose previously contracted and agreed upon.

- g) Not to be used during interviews of formats that are too technical, with the clarification of each question and its assessment levels for the interviewees during the meetings.
- h) Take due care when asking the questions, so as not to induce the answer, but with due conceptual clarification.

It is noteworthy that the evaluators/interviewed did not inhibit, criticize, or resist the answers, but there was a good level of interpretation of the questions because it is a special condition in a participatory manner, agreed with the UPA management.

The instrument applied

The questions were closed and opened with monitoring by the manager and the participation of employees from different sectors of the UPAs, in the case of closed questions an alternative was chosen for each question. In the answers, the reason for the grade is questioned (Justification field:), the answers in the form are justified to support the list of recommendations for the implementation of the action plan/strategic planning after the diagnosis.

It is noteworthy that the process of making the questionnaire available to the interviewees took place within a period of 20 (twenty) days and the deadline for its return were agreed with them. At this moment, the interviewer was available to the interviewees to resolve any doubts about the instrument or the study that is of its purpose and relevance. Thus, the questionnaires were made available electronically via the WEB platform for the UPAs located in the city of Guarulhos/SP.

The results of the study, depending on the research carried out, were subsequently used to find the strengths and those that need improvement, with the objective of helping the organizations contextualized in this study, through their decision-making processes, to produce improvements in the services provided to the society in which they are located. That is, the different points of the questionnaire allowed, after being processed and analyzed, assess a position of the evaluated organizations, where it was attempted to perceive in their management processes, the points where improvements can be implemented, a relevant factor in the planning of future projects to be implemented by them.

Considering the analysis of its data, the questionnaire consisted of 120 questions, covering all its dimensions and categories, according to the criteria

established in the study, and for each of them a scale was defined whose ratings were stipulated as: "Does not meet", "Partially meets" or "Fully meets" the dimensions.

The objective was to allow the interviewees to express their thoughts regarding each topic, justifying the rating they assigned when necessary. Each item of the instrument has supporting questions, to help understand what is wanted to know and, in this way, enable the respondent to attribute a corresponding concept, conveniently justifying their answer.

Results and discussion

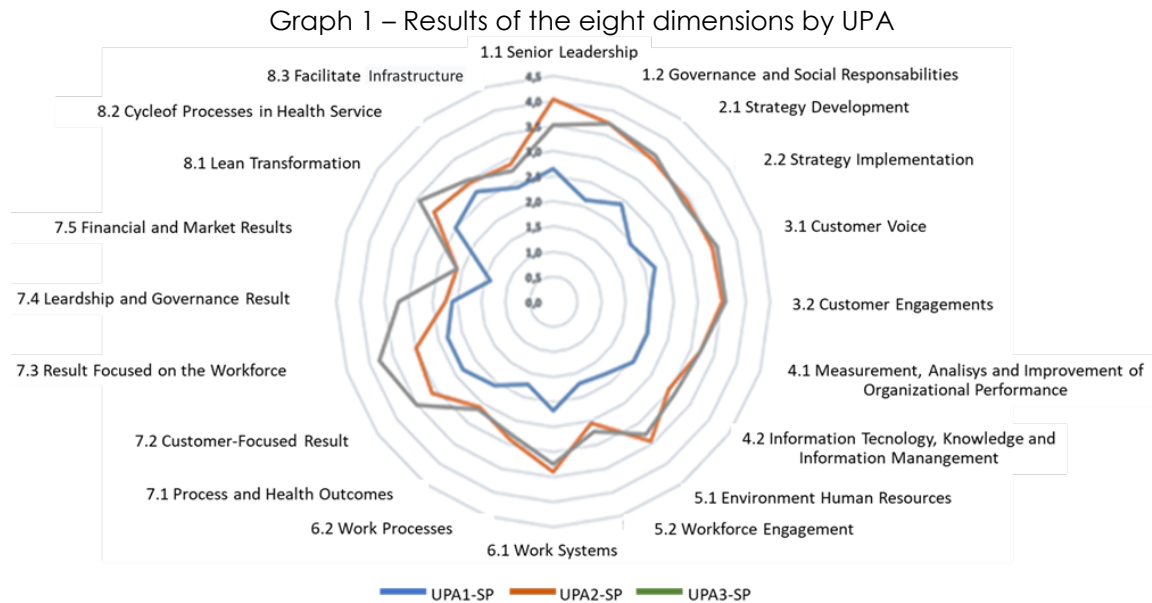
This chapter aims to present the results obtained in the study, harmonizing it, concomitantly, with the analyses corresponding to each aspect addressed. At this stage of the evaluation, the indicators in the eight related areas were verified: in the structure of the enterprise diagnosis method elaborated by Calado, Batocchio, Calarge and Silva (2014). These diagnostic areas were analyzed in three UPAs located in Guarulhos/SP. To determine a value for practice and performance, it was necessary to differentiate a priori the survey topics related to one concept and another. After this analysis, it is necessary to calculate the average of both concepts described. The results are presented in percentage numbers for subsequent framing of practices (PR) versus performances (PF). To obtain the General Index of Practice and Performance of the studied unit of, all PR values were calculated by adding all the data obtained by the interviewee regarding PR and then dividing by the sum of the possible PR scores. Table 1 below shows a comparison of Practice and Performance of the three evaluated units.

Table 1 – Average and percentage of performance of the evaluated units in São Paulo

Indicators	UPA1		UPA2		UPA3	
	Average	Performance	Average	Performance	Average	Performance
Practice	2.1	41%	3.3	67%	3.3	66%
Performance	2.2	44%	2.7	55%	3.1	61%

Source: The authors (2021).

The results obtained by each organization are also presented in the form of a radar chart that allows a more interactive interpretation of the results (Graph 1).



Source: The authors (2021).

Topics 1 to 7 present in Graph 1 relating to the Baldrige Award methodology, while topic 8 is composed of questions that result from the LESAT methodology. In Graph 1, topics 1 to 6 are composed of questions that aim to assess practices, and topics 7 and 8 is concern to issues related to performance, which allows the organization's positioning to be defined.

To demonstrate the parameters that the method can show, it follows the same set of data extracted from the MDE-S in three Basic Health Units located in the state of Rio de Janeiro, Santos (2019) shown in Table 2, which unlike the three UPAs in São Paulo, that the UBS had not been the subject of actions to implement Lean management methods in healthcare (Lean Healthcare) until the moment of application of the MDE-S.

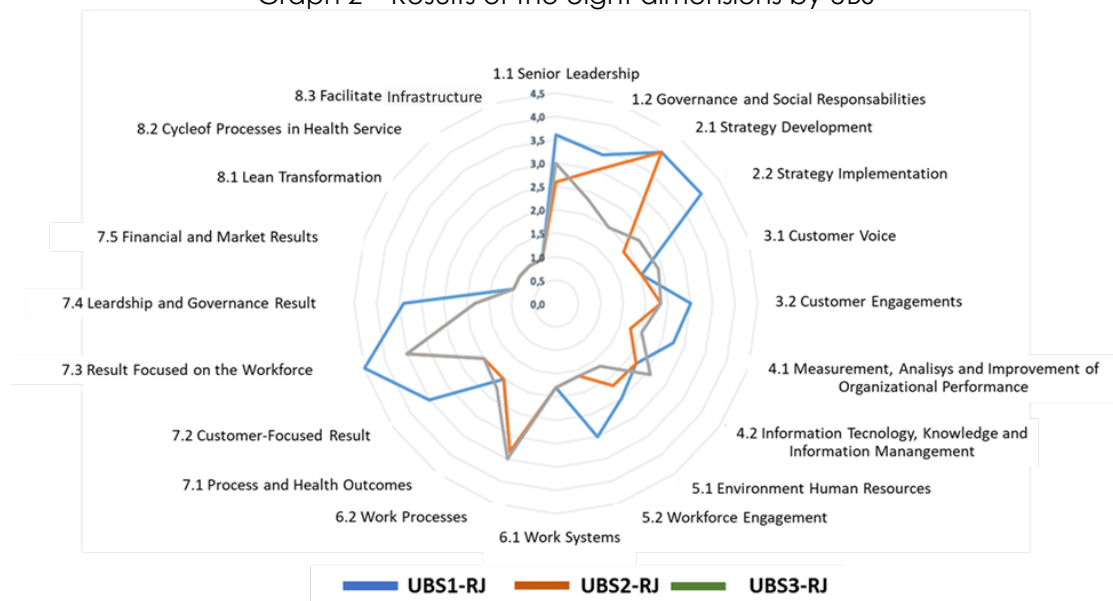
Table 2 – Average and percentage of performance of the evaluated units in Rio de Janeiro

Indicators	UBS1		UBS2		UBS3	
	Average	Performance	Average	Performance	Average	Performance
Practice	2,3	46%	2.4	47%	2.9	59%
Performance	1.7	34%	1.7	33%	2.2	44%

Source: The authors (2021).

The results obtained by each organization are also presented in the form of a radar chart that allows a more interactive interpretation of the results (Graph 2).

Graph 2 – Results of the eight dimensions by UBS

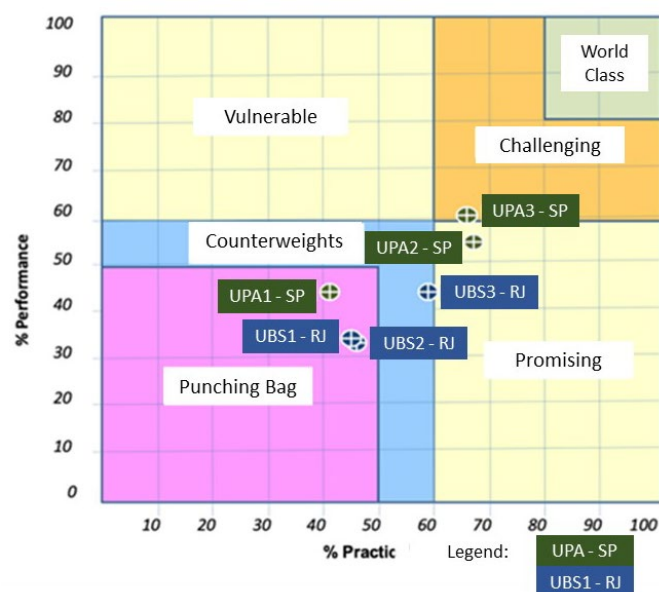


Source: The authors (2021).

Graph 2 shows some strengths and weaknesses of the evaluated units. In the graph it is obvious that point 8, referring to the LESAT tool, were not answered by the respondents, and a rating of 1 was assigned to these topics. The occurrence of this aspect is since hospital units have not been subject to any type of Lean transformation.

For a better understanding of the relationship between the organization's position according to practice and performance indices and, consequently, its ability to respond to the challenges of competitiveness in the market. An analogy with the ability and performance of boxers was used to rank the organization. The analogy and subsequent ranking are shown in Graph 3.

Graph 3 – Boxing analogy by UPA and UBS

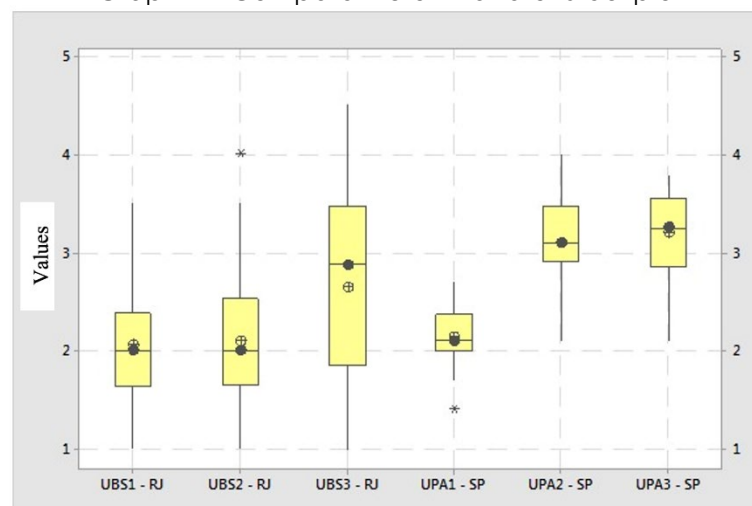


Source: The authors (2021).

To define the level of organizational maturity of the health units contextualized in this study, the classifications defined by Seibel (2004) were considered, considering the General Indexes of Practice and Performance obtained by applying the LESAT x BALDRIGE model. These indices are classified as: (i) Punching Bag; (ii) Counterweights; (iii) Vulnerable; (iv) Promising; (v) Challenging; and (vi) World Class.

In this case, organizations that are classified as "Challenging" or "World Class" have high levels in terms of maturity. Those classified as "Vulnerable" or "Promising" present a medium level of organizational maturity. Finally, those classified as "Punching Bag" or "Counterweight" have a low level of organizational maturity.

Graph 4 – Comparative UPA and UBS boxplot



Source: The authors (2021).

Graph 4 of a boxplot comparing the UBS to UPAs shows smaller amplitudes of UPAs' values, minimum values of UPAs above those of UBS, and higher central values (average and median) than those of UBS. Emphasizing that the UPAs underwent Lean transformation processes, which had not yet occurred with the UBS until the application of the MDE-S.

Conclusions

One of the main characteristics of all societies is access to basic health care and the right of all citizens to protect this situation. In public services, the state finance's hospital departments with specific budgets to manage, and it is known that a large part of these costs are allocated to human resources, with no remaining resources to invest and improve other areas of administrative action or services, among other

issues. Executives need to be cautious to meet all the needs of the surrounding community, and it should be noted other aspects that the Lean approach can add value to the activities developed.

Lean is an approach that aims to correct delays and waste to increase the effectiveness and efficiency level of the institution. All actions must be designed with a focus on the customer (patient), in order to meets the expectations of these actors. Anything that does not add value to the patient must be seen as waste and therefore must be combated.

As for the analysis of the MDE-S, it allowed to elaborate the outline of the entire evaluation. It greatly facilitated the development of the study, as it showed the step-by-step procedure to be carried out. The planning phase was the most time-consuming phase. Afterwards, the data collection phase took the defined period with the interviewees a few days late because this collection took place during the period of the COVID-19 pandemic, which still did not hinder the progress of the study. In the analysis of Practices and Performances data, considering the practice and performance data of the evaluated units, it was verified that the Units that have not yet undergone Lean transformation processes have value and a low level of maturity and percentages below 60% for practice and below 60% for performance.

In the Boxing Analogy analysis, the Boxing Analogy chart helped, through a quick view, to show where the UPA ranked when plotting the percentage points of practices and performances. It also allowed visualizing the positioning of the evaluated unit in a graph.

The study showed in the units below 60% in the Practice and Performance values the existence of a strong lack of knowledge of public health management tools and of basic administration fundamentals by the administrations of the evaluated units. At this point, it was found that none of these units have a 'high' or 'medium' level of maturity, with two units located in the maturity classification zone as Punching Bag, (UBS1-RJ, UBS2-RJ and UPA1-SP), and one unit located in the maturity classification zone as Counterweight (UBS3-RJ), that is, all with levels of maturity classified as 'low', those that obtained a "medium" level were UPA2-SP and UPA3-SP.

Recommendations

To adopt this new form of management, it is necessary that the organization, through its employees, accept it. For this, it is considered of fundamental importance

to carry out a process to encourage motivation towards this new form of organizational management. It is noteworthy that the entire process of changing organizational culture needs substantive actions to clarify new goals and objectives that are to be achieved, and to carry out processes to encourage motivation that will lead to the realization of what is desired.

The concept of organizational culture encompasses all practices, habits, principles and values within an organization. It is important that all employees understand this culture and share its values. If done properly, the process of understanding and absorbing a significant change in an organization's culture can positively influence the behavior of its employees relating to the impacts caused by its implementation.

Finally, it should be added that some problems encountered relating to performance and operations show the importance of public administration managers starting to give greater relevance to the development of Lean projects in the health system to promote a culture of continuous improvement, which, is an important and positive aspect of this work.

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