

A Management Model for Decision Making at the Hospital Supply Chain to Minimize Waste

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The decision making is the choice of one or more activities among several options. The choice is based on a set of information that leads the decision maker to estimate the chances of these activities of happening and of their success. The hospitals are indispensable to the society and the management of these organizations has complex decision making. The waste of the hospital supply chain results directly and indirectly in several hazard products to the patients, doctors, nurses, non-clinical hospital worker, society, and environment. Technology management can have an impact in preventing these results from happening. Within this perspective, the main objective of this paper is to develop a model that will support the decision making to assist the minimization of waste in the hospital supply chain based on lean management and technology management. The proposed model was based on the concept of supply chain management and lean management and, so, this research develops literature review of these two areas. The methodology used is exploratory and descriptive. The model is tested in hospital supply chains in Brazil. The model consists of eight stages, which will contribute to transparent management and broader engagement of all employees and which will also assist in the better decision making in the supply chain of the hospitals, collaborating with the reduction of environmental and health impacts.

1. Introduction

Nowadays the health sector in Brazil has been going through great difficulties and changes, influenced not only by the need to rationalize costs, but also by the growing need to improve the quality of services as a whole. In Brazil from 2008 to 2012 there was a reduction of 12.7 % of hospitals in Brazil. According to Beske et al., (2014), hospitals supply chain gets to be responsible for consuming between 25 % and 40 % of the funds. The management of the supply chain is responsible for the largest number of hospital employees, with the second largest payroll, as it adds all the supporting industries, and for virtually all information flows and supply hospital materials.

Hospitals are challenged to find consistent and integrated management models that can raise the maximum result and avoid waste of their own or of government resources, whilst raising the maximum and continually wellbeing for the people, after all, the health hospitals are directly relating to the preservation of life image (Borchiellini et al., 2013).

The supply chains are strongly linked with the changes related to the demand forecasting, purchasing, inventory management, warehousing costs, transportation, distribution, quality management, flow of information, processes management (Lee et al., 2012). In this case, the lack or delay in any step or process can generate huge bottlenecks, since a hospital has to be available 24 hours a day, depending on the needs of the population.

The activities in health are complex, layered on top of a production chain that incorporates sequences of actions defined for the generation of products/services. Each procedure requires a specific activity of connection products/services. Not only the products/services offered in healthcare organizations are complex involving high skill, but the inputs used in production/services are increasingly sophisticated with numerous high costs (Asandului et al., 2014).

Given this seriousness the hospital managers need to troubleshoot taking assertive decision, which is a systematic process that has the focus on the analysis of a difficult situation, as to solve problems always involves a decision making stage (Munoz et al., 2013).

Decision making is a process that consists in identifying the problem, criteria, how to prepare, to analyse and to choose alternatives checking the effectiveness of the decision (Cai et al., 2013). The decision making act can be an act of suffering: the great difficulty to make decisions often happens when the manager do not have the knowledge of a particular subject or process (Ashby et al., 2012).

This study encourages the use of the proposed model as a way to direct and to promote the minimization of waste as: the energy used by operational practice and equipment with lower power consumption, the hospital practices related to pollution in the case of treatment of hospital sewage and disposal of infectious materials, as well as damaging agents such as heavy metals; and the use of plastic packaging serums and medications that can be toxic to the people, and consequently generating significant environmental impact. This research is divided into five sections, including this introduction. The second section is the literature review that addresses supply chain and lean system. In the third section presents the methodology with the basic articles used. In the fourth section is about the model proposed for decision making in the supply chain and the last section finalizes the paper with the conclusions.

2. Literature review

2.1 Supply chain management

It is noticeable to the society and especially for the users of the medical and hospital services that some hospitals need to be prepared to handle extreme demands and critical situations that might test them randomly. Thus, management should be organized to meet the needs of all patients, particularly those who enter the emergency door without any appointment. This type of demand puts the forecasting of the medical and hospital services in the list of the most complex activities in the market and this forecasting is responsible for preserving the health and lives of the patients. This vital responsibility is what makes the efficiency and effectiveness of supply chain management in the hospital and its associated links, which are essential to the success of the hospital's objectives.

The supply chain aims to seek integration between organizations participating directly or indirectly in the flow of a product or service, comprising: suppliers, manufacturers, wholesalers, retailers, and customers in order to provide an effective and efficient (Hutchins et al., 2008) flow of goods or services through logistics, reducing costs and adding value to the end customer (Beske et al., 2014).

According to the Supply Chain Council, the supply chain includes a number of management techniques performing the integration and coordination of the business processes (Deutsch et al., 2013) and the alignment strategy throughout the production chain in order to satisfy the end customers in the supply chain and to reduce costs (Ashby et al., 2012). The business processes that must be integrated and coordinated include procurement, manufacturing, marketing, logistics, and information systems (Gimenez et al., 2012).

Hospitals tend to reduce all supply problems, because of insufficient budgetary resources: many these problems are related to waste and misuse of inputs and equipment, the low qualification of supply professionals: and the little attention to planning supply chains in hospitals (Infante et al., 2013).

The management of the supply chain is considered complex. The performed procedure requires a specific combination of products and services: their composition may vary between different organizations and even according to different types of patients and professionals of the same organization (McConnella et al., 2014). Not only the services offered in hospitals are convoluted, but the inputs used in production are increasingly sophisticated, with numerous high costs.

2.2 Introduction to lean

Lean had its origins in the Toyota Production System (TPS). The term lean manufacturing emerged from a method to optimize the automotive manufacturing, and therefore, this word is normally associated with the factory floor. However, the lean approach has a much broader scope, since it seeks to increase efficiency (minimum time, cost and capital invested) in any process.

This system aims to improve the activities that add value to processes, services and customers, working for the elimination of all the activities that do not add value and generates waste, focusing on time and motion which changed the way of production in the world.

As Yousri et al., (2011), lean is a perspective that can assist in sustainable development. The correct use of lean tools such as VSM (Value Stream Map), 5S, Kaizen, TPM (Total Productive Maintenance), Poka Yoke, or others, can benefit organizations in order to achieve their goals.

The interest in the activities of this approach in the health sector has grown significantly in recent years (Qrunfleh, 2013). Hospitals are beginning to understand that they can learn and do more with less, like the Toyota's case.

The lean philosophy has great potential to improve the process of providing healthcare, without errors and with customer value (Hutchins et al., 2008). Lean principles can be applied in hospitals the same that they are being applied in manufacturing processes. According to Womack (2005), comparing the hospital management with other processes, the hospital management has been slow to identify the main customer's desired values. Due to the complexity of the health system, processes are often designed to meet the needs of the internal customers - doctors, hospitals, insurance companies, and government payers: anyway, it is important that the value should be set by the main customer, the patient.

Studies that report that lean tools help to identify and combat waste, could analyse and point out that in the same way these tools may contribute to the solution of hospital problems and provided to hospitals with a different perspective, assisting in making hospital decision.

2.3 The process of the decision making

During the job activities, the decision making is considered the function that characterizes the organization's performance. Regardless of the aspect of the decision, the decision making should be the result of a systematic process, which involves studying the problem of data collection, production of information, establishment of proposed solutions, choice of decision, feasibility and implementation of the decision, and analysis of the results.

In the organizational context, Munoz et al., (2013) considers that the formal decision making is structured by rules and procedures that specify functions, methods, and standards which, in turn, establish values that influence how the organization faces the choice and uncertainty. The expected combination of culture, communication, and agreement improves efficiency and it helps to achieve a higher level of rational choice behavior.

In this way it is possible to assert that the information is a key resource for decision making. The more structured is the decision-making process, the more appropriate is the use of methodologies such as lean management that can respond to the demands and information needs of the decision maker. Similarly, the information required for such decisions is more objective and quantifiable, making necessary the use of information resources that can organize, retrieve, and pass on information collected during the working process. The decision maker will try to get results from a more qualitative process and he or she will be influenced by his or her experience and contingency situations; during this process the information can contribute in the decision making (McConnella et al., 2014).

In the context of decision making and considering its value, information has been used as an additional resource for the development of the work process in organizations (Wang et al., 2013). The domestic production of information and the use of sources outside the organization raise the creation of information systems for identification of the problem, providing more appropriate conditions for recovery and use of the decision making.

3. Methodology

This research is exploratory and descriptive. It is exploratory, because it aims to provide greater familiarity with the collection of data, reporting its true importance, revealing new sources of information involving literature. It is descriptive, because from the exploratory research it will survey the features that are part of the problem.

The main objective of this paper is to develop a model that will support the decision making to assist the minimization of waste in the hospital supply chain based on lean management and technology management.

The business of healthcare organizations generates a large impact on the environment, through high consumptions like: the energy, or the materials used in the hospitals procedures (Wang et al., 2013). The model will provide processes for an alignment of all the hospital staff in order to minimize the wastes of hospital processes and environmental impacts by means of transparent management and engagement (Nazir et al., 2014).

4. Model for decision making

The hospital management is intended to optimize the operation of the processes, in order to obtain maximum efficiency regarding use of used products/services. The manager needs to use knowledge, techniques, and procedures that allow managing the operation of services towards the set goals. In this

sense the main difficulty lies in hospitals, especially in the multiplicity of interests that have to be accommodated due to the variety of technical specialties that hospitals need.

It is essential for the hospital to have an active management through innovation, in this sense, people engage people to be the main instrument for change. One of the keys is the lean management transparency to engage people to search engine results. Effective management has as essence the constant pursuit and innovation through technology and new methodologies focused on change and achieving results.

The model has eight phases according to Table 1. On the basis of the lean principles, which encourages efforts to be transparent (clear communication), contributing to the strengthening and engagement of all employees to assist the waste reduction and achievement of goals.

Table 1: Eight phases of the model

Phases	Description
Phase 1 Customer definition	As the first principle of lean it is to determine that the value to the main customer is the patient.
Phase 2 Lean leadership	The planning establishment and monitoring of the company's goals and guidelines are crucial to achieve the proposed objectives.
Phase 3 Planning and goal setting	The objective is to determine the strategic focus connection with the organization's processes reducing activities that do not add value.
Phase 4 Focus on value	Setting stock value should always contemplate the prospects of "stakeholders" of the company, such as shareholders, customers, society, environment, and it is well identified in strategic planning.
Phase 5 Teamwork	The purpose is a concerted effort to achieve goals, to achieve the purposes, and to bring positive results for some groups of people: teamwork enables the exchange of knowledge, the formation of ideas, and the generation of knowledge.
Phase 6 Mapping the current situation and development of proposals for improvements	It provides the identification of waste and it enables a proposal for improvements to minimize them. Perhaps this is the most powerful mechanism for the formation of the mental model of lean management, creating an organization able to learn continuously.
Phase 7 Implementation of improvements and sustainability	The authors cite examples of implementation through kaizen events, action plans, or projects. The standardization activity is a common practice found in lean.
Phase 8 Continuous Improvement	After the implementation of improvement proposals it specifies the unconditional domestic demand for excellence, where entire organization seeks continuous improvement of its processes, while releasing the creativity and self-discipline of all employees.

The continuous improvement process has to be supported by everyone in the hospital and it should be one of the pillars of the system of recognition and motivation.

Lean allows the hospital to minimize waste, to reduce lead time of patients and processed materials, to increase productivity, to better use its capacity, and to hence its profitability. Lean is gaining space in hospitals, because it is helping to raise the results with higher quality in customer services.

5. Conclusions

The decision making process is the main function of managers, because there is no perfect decision: the managers always have to think about the advantages and disadvantages of each alternative to choose the best one, always seeking the best economic performance. Anyway it is important the managers realize that there are also non-economic results such as the satisfaction of members of the business and employees.

Lean is being introduced in the hospitals, helping them to direct all the minimization of waste to achieve the expected results. The application of lean techniques helps in decision making due to provide better identification of waste generated in the processes (Handayani, 2015), helping to minimize the revealed weak points and to define the priority for change, cost savings, and better quality products and services (Womack, 2005).

The objective of this research intends to help to develop a model (Figure 1) to support decision making helping to minimize waste based on the lean system, which allows the improvement of quality of service and reducing costs involved in the supply chain.

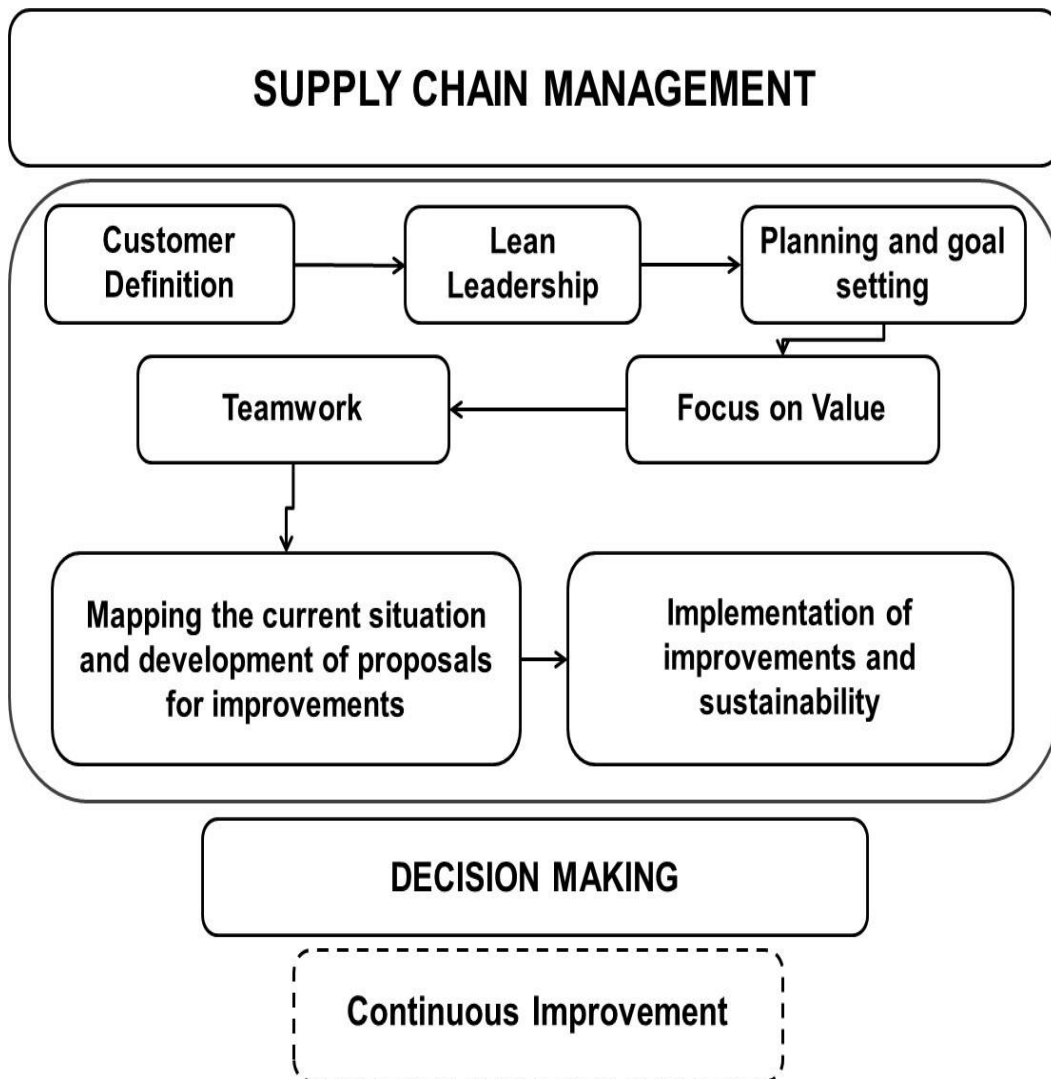


Figure 1: Proposal of the model

The proposed model aims to assist organizations that provide health service to make the best decision in order to identify the important points in the view of the customer (patient) through changing organizational culture, being the main vehicle teamwork (doctors and nurses). The satisfaction of the end customer, the patient, is only possible if the entire supply chain is compromised and integrated into coherent and effective practices: the teamwork might the best decisions, regarding the survival of the organization as well as customer satisfaction, the patient.

This study proposes a model that might help hospitals to minimize waste and environmental impact. It was not the aim of this study to test and validate the proposed model. Future work can overcome the limitation of not testing and to not validating the proposed model. The authors intend in their future studies to implement the model in several hospitals as well as industries, in order to analyse the possible variations of the model.

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