

LEAN MANAGEMENT IN HEALTHCARE
ENTERPRISE PROJECT: BEATRIZ ÂNGELO HOSPITAL'S
CARDIOLOGY DEPARTMENT

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Master Thesis in Health Services Management

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December 2012

Agradecimentos

Este projecto existe pela colaboração e apoio de pessoas excepcionais. Foi graças a elas que reuni conhecimento, coragem e condições para concretizar mais uma vontade académica. A todos agradeço a participação, nomeadamente:

Ao Prof. José Crespo de Carvalho pelo gosto, cuidado e amizade extraordinários que demonstra a ensinar.

Ao Departamento de Cardiologia do Hospital de Loures, em especial ao Dr. Miguel Ribeiro e à Técnica Solange Fernandes, por toda a colaboração. Foi uma honra conhecer pessoas com tamanho profissionalismo e humanismo.

Às minhas chefias, pela mente aberta e por permitirem uma equilibrada conciliação entre as minhas escolhas pessoais e as minhas tarefas laborais.

Aos colegas, em especial Sérgio Rodrigues, Ricardo Ferreira, Carlos Alves, Maria Rodrigues, Maria Vasconcelos e Marta Franco, pela contributo e boa disposição, mesmo em tempos difíceis.

Aos meus amigos, porque sempre acreditaram no sucesso deste trabalho, porque sofreram com a minha ausência e festejaram o cumprimento de mais um objectivo.

Ao Jorge por toda a paciência, pelo companheirismo e pela partilha de todos os momentos que envolveram este projecto desde o primeiro ao último dia.

À minha família, por tudo.

E a Deus.

Dedicatória

Este projecto só poderia ser dedicado aos meus BAGAPI.

Esta família é a minha razão de viver e é por causa deles que tudo é possível.

"The best way to predict the future is to create it."

Peter Drucker

Resumo

Com os sinais de crise, tornou-se imperativo para as organizações focarem-se na redução de desperdício. Como filosofia de gestão, o termo Lean tem como focus a melhoria da produtividade, a eliminação de desperdício e promove actividades que acrescentam valor para o cliente. Este conceito é transversal a todo o tipo de serviços, inclusive no sector da saúde

O objectivo deste estudo prende-se com a introdução e análise de práticas de Lean Management no Departamento de Cardiologia do Hospital de Loures.

Por isso, no 1º capítulo são descritos a origem, os conceitos e as técnicas de Lean Management.

No 2º capítulo são apresentados exemplos de como o Lean Management pode ser aplicado e com resultados positivos, nos vários tipos de serviços.

A caracterização e modo de financiamento do Hospital de Loures, e por conseguinte o próprio serviço de Cardiologia, são analisados no 3º capítulo.

Ao longo do 4º capítulo, é descrita a Metodologia utilizada na análise da Cultura Organizacional e de Liderança do serviço e na implementação de Lean Management no serviço de Cardiologia.

No 5º capítulo é realizado o diagnóstico para aceder ao grau de mentalização e preparação dos recursos para a mudança, são identificadas as principais causas de desperdício e os respectivos resultados são discutidos.

Das principais conclusões do estudo, que constam no último capítulo, destaca-se como a integração dos princípios de Lean Management permite trazer melhorias no serviço de Cardiologia através de técnicas simples de implementar. Como desenvolvimentos futuros, propõe-se a melhoria continua no serviço de Cardiologia e a expansão deste conceito para outros departamentos e hospitais do país.

Keywords: Lean Management, Saúde, Desperdício, Valor.

JEL: I12; M11.

Abstract

Signs of "crisis" make it more imperative that organizations focus on reducing waste. Lean as management philosophy sets its focus on improving productivity, eliminating waste and promoting activities that really add value to the client. This concept transcends boundaries, achieving industry's services in general.

The purpose of this study is the introduction and analysis of Lean Management in the Department of Cardiology of a Portuguese Hospital.

Thus, the first chapter is intended to deepen the knowledge related to the origin, concepts and techniques of Lean Management.

The second chapter presents examples of how Lean Management can be applied in transversal services, including various cases of Lean Management applied to Healthcare.

The financing analysis of the entity where Cardiology Department belongs to is described in chapter 3.

Along forth chapter, the used methodology is described for both analysis of the organizational culture and leadership of the department and analysis of Lean Implementation on Cardiology Department.

In the fifth chapter the degree of mindset and readiness of resources for change is assessed, the main causes of waste are presented and its elimination results discussed.

From the main conclusions of this study, last chapter, it is highlighted how integrating Lean Management principles in healthcare improves health services and how spreading good practices in its delivery is possible with simple techniques. As future developments it is proposed the department's continuing improvement and the initiation of this philosophy in other departments and hospitals of the country.

Keywords: *Lean Management, Healthcare, waste, value.*

JEL: I12; M11.

Executive Summary

There comes a point that is unsustainable to continue supporting the huge costs associated with the health sector as they translate into an enormous weight on national spending. Reducing waste in this area is an urgent need to guarantee viability and competitiveness in an increasingly global market. By ensuring quality services, the organization becomes a center of excellence, but this is only possible with the implementation of efficient and effective processes.

It was in a similar context that Toyota pioneered a revolutionary business approach, in the 40s. In reaction to the business challenges, its stakeholders considered applying concepts developed by Henry Ford in their production processes. This was when the foundations of lean management were created. The implementation of this philosophy developed by Toyota was a success, since the company returns to markets competitively stronger.

The Lean Management begins to take shape worldwide mainly thanks to Womack (1990), who resumes this management methodology in two main concepts: value and waste. It is based on the elimination of waste over the value stream of a product or service that the principles of Lean Management are established. To accomplish the customer's concept of value, it is necessary to define it, establish its stream for each product or service, make it flow smoothly, enabling the customer to pull it and keep in mind continuous improvement.

Surrounding these principles, various techniques have been developed. Choosing which is the most appropriate depends on the characteristics and objectives of the organization that intends to apply Lean Management.

This philosophy eventually extends to various industrial sectors fighting their own difficulties. Several examples are found in the literature, including in the healthcare sector.

In Portugal, the National Health Service ensures the provision of health care, in a moderate way, to the entire population. The government assumes the role of financier, whose funds are obtained through general tax collection. It also assumes the role of provider through a well-defined hierarchy. The funding rules are outlined by the Contract Program and objectives monitored through the Performance Plan. In some cases the government establishes public-private partnerships in order to increase efficiency in the allocation of public resources and the qualitative improvement of the service.

It is intended that this Enterprise Project develops in the Department of Cardiology of Hospital Beatriz Ângelo (Lisbon). It was considered appropriate the choice of the cardiology department due to the relevance of the associated diseases in population health. The truth is that the first cause of death of Portuguese people is due to heart diseases, so it matters to provide the best quality cardiology services, in a sustainable way.

It is the purpose of this study to apply Lean Management in the Department of Cardiology and analyze its effects, converging to the main question of this study: What is the impact of Lean Management in the healthcare services provided by HBA's Cardiology Department?

Specifically, this research aims to identify the predisposition for change, the opportunities for improving processes and the results of an implementation of this type. Therefore the research methodologies and methods to be applied are specified according to the characteristics of the department and its objectives.

Thus the Cardiology Department's Organizational Culture and Leadership are set up through surveys answered by the team of Cardiology. After analysis, the results show an organization sufficiently aligned whose leader is adequately charismatic to be considered possible changes in work processes of employees.

Workflows are characterized by direct and indirect observation in order to identify opportunities for improvement. Initially the Workflow Diagram technique is used allowing the team to detect a number of causes of waste and prioritizes them.

The team realized that the workflow should be divided for a more detailed analysis, such as in the flow related to the execution of examinations in inpatient episodes. Several parameters are considered in order to populate the Value Stream Mapping in the current state of the Department.

Evidence suggests that the movement time of resources is absolutely unnecessary especially when the patient has no limitations to be taken to an examination room. However before implementing this solution, data is simulated for a feasible future situation. As the results are promising they serve as encouragement for the implementation itself. Findings show that the time that the patient stays in the system decreases and employees expressed more comfort working with this implementation.

Finally, Cardiology Department must consider further opportunities for continuous improvement. It is also suggested the implementation of Lean concepts in other departments, so that the advantages of this methodology becomes transversal to the entire institution.

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Introduction

Not only economists but, more importantly, politicians and health professionals have been aware that the specificity and industry developments in Healthcare impose more rigorous knowledge of the mechanisms that explain the increased difficulties of managing this sector. These difficulties are manifested by increased spending at a rate greater than the wealth created in society, for non-equivalent gains in the population's health. Putting into question the economic performance of governments, this has been considered one of the greatest challenges facing today's balanced growth of the economies, after unemployment and deficit financing of social security systems (Béresniak, et al., 1999).

In fact, in countries where there is an Healthcare system, there is a political interest in maintaining the commitment of providing health services to the population, however, according to the basic theorem of the economy, resources are scarce (Robbins, 1932).

In Portugal, in 1976, the right to health was guaranteed to all by 64th Article of the Portuguese Constitution (Moniz, 2008). Although in the first decade the care providers solved the population health problems without concerning costs, it was soon realized that this mentality would be unsustainable. This issue was worsened because not only increased the life expectancy (Instituto Nacional de Estatística, 2012) and as a consequence, the population seeking health care, but also most of the nowadays diseases are chronic (World Health Organization, 2012 a), involving prolonged treatments and long term costs.

With the second constitutional revision, in 1989, the first principle of the 64th Article is replaced by the concept that national healthcare service tends to be free, according to the economic and social conditions of citizens. The second principle, abandons the radical version of socialized medicine and medical-drug sector, to limit the provision of the costs of medical care and medicines. In consequence, taxes were implemented in the healthcare system.

According to 2010 data from the World Health Organization (WHO) and OECD (The Organisation for Economic Co-operation and Development, 2012), in terms of health spending in Total Health Expenditure on GDP, Portugal is clearly above other similar European countries, with participation of about 11% of GDP, as shown in Appendix 1.

In part, this table may reflect the aging population in relation to other European countries. The fact that the healthcare sector in Portugal is becoming increasingly misaligned with respect to other countries, compromises its competitiveness in global terms.

For these reasons, it interests ensuring the efficient use of resources and the economic and financial sustainability of the Portuguese Health Service (Serviço Nacional de Saúde – SNS), guaranteeing coverage and equitable access to appropriate and quality healthcare services.

In the opinion of Fernando Sollari Allegro, in an interview in March 9, 2012 to Deco Protest (Allegro, 2012), despite the efforts to efficiently control healthcare costs, for example, by applying reorganization models of hospital care, the truth is that there is no guarantee that the application of resources is reduced and efficiency improved. Part of healthcare costs comes from prescriptions of hospitalization, medication and examinations (Instituto Nacional de Estatística, 2012). It is legitimate to believe that some of these prescriptions would be prevented by improved communication within the SNS, with regard to the patient's clinical information. The monitoring of medical procedures performed in patients ensures that there is no duplication of medical acts when there is no clinical need.

According to the magazine (Lee, 2012) the author proposes to increase the competitiveness between the various institutions providing healthcare in order to not only reduce the costs of various types of prescriptions, but also monetize them.

The author (Lee, 2012) refers that also the increase of medical specialties decentralizes the user of a single clinical speaker. This situation carries, in addition to a complex network of communication between the various parts, an inconsistency or even contradictory information, leading to processing delays and redundancies or even clinical errors, which results in more costs.

The healthcare costs also increased with growing percentage of elderly and chronically illnesses, since these cases have a high rate of readmission and increased problems associated with the primary diagnosis. One way to adapt to new diseases of society is, in the first case, to create conditions for palliative care being performed mainly at home and, in the second case, to create centers of excellence specializing in pathology, with a comprehensive range of specialties that address the collateral damage associated with chronic diseases (e.g., loss of vision in diabetes).

It is important to find solutions to sustain and maximize use of available resources. Providing reasons that contribute to the establishment of priorities and decision making is crucial for the sustainability of the healthcare sector. In this sense, the economic evaluation of various alternatives is of considerable importance to maximize the health product for a given budget or to minimize the costs for a given result. These evaluations are a useful tool for decision making in allocating healthcare resources, when combined with the use of clinical knowledge, communication with patients and consideration of heterogeneity in institutions and diseases (Drummond, et al.). This principle is based on the idea that appropriate structural changes may lead to the improvement of health care services at a lower cost. However, it is complex to manage change, especially when different health care systems have different basic structures and methods of calculating costs. Therefore establishing the same rules regarding the evaluation of costs will improve the way patients choose some units over others. Thus competitiveness becomes more just and decisive in the success or failure of a particular health service.

It is in this context that it is relevant and necessary to conduct more research to estimate the quality of health services provided to long-term and the costs inherent, since they are likely to vary depending on the efficiency of processes. One of the major causes of inefficiency in processes is related to waste.

Therefore, the objective of this work is to introduce techniques used to identify and eliminate waste and demonstrate their benefits, in terms of quality and productivity efficiency.

It was chosen the department of Cardiology, Hospital de Loures, not only because they have kindly offered to contribute to this study but because this department deals with the main cause of morbidity and mortality in Portugal. Its quality and efficient functioning is therefore a major contribution to improving the overall health and sustainability of the sector itself.

It is a matter of vital importance against these times of cost containment across the country and given the weight they represent in health expenditure. It is pretended to contribute with theoretical and practical solutions to improve the quality of health care in order to present reasons to expand the concept to other areas of health in Portugal.

1. Lean Management

Given the circumstances, it is urgent to find methods that reduce waste, maintaining or even improving quality, through the optimization of processes. It is in this context that the Lean Management arises.

This philosophy (Graban, 2009) is defined as the key managerial values and attitudes needed to sustain continuous improvement in the long run. This core management base is articulated around two ideals: relentless elimination of waste and engagement in long term relationships based on continuous improvement and mutual trust.

1.1 Origins

In 1945, Toyota was forced to improve quality, while rising productivity and reducing costs, since the company had small market share in the automobile Japanese market and was very cash poor. Toyota had to be creative and innovative to face crisis by that time. With the help of Japanese engineers Taiichi Ohno and Shigeo Shingo, inspired by concepts developed by Henry Ford (Lean Enterprise Institute, 2012), the first steps of Lean concept were taken. The terms not only described the results, but also introduced the word as a description of the method. This was set to explain a system that achieves products with less defect and safety incidents thru sustainable use of physical space, human effort, capital investment, and inventory. Naturally, defining and implementing a new production system was not immediate but ensured the company's outstanding return to the automotive market.

The spread of Lean began in the automotive industry because one would expect the same and immediate results. Moreover, at that time this sector needed urgent measures for process improvement and cost containment. Although Toyota shared its tools and results through publications and open tours, even to direct competitors, the management system was too specific to Toyota's reality and turned out to be harder to apply the same measures. Furthermore, it was necessary to introduce the spirit of change in their management systems and processes, which made it more difficult to implement.

Lean thinking got its name from a 1990's best seller called *The Machine That Changed the World: The Story of Lean Production* by Professors Womack and Jones of

Massachusetts Institute of Technology (MIT). The book records the transformation of automobile manufacturing from craft production to mass production to lean production.

Then in 1996 the same authors published *Lean Thinking* that explored the main Toyota Production System (TPS) ideas and laid down the lean principles used today (Womack, et al., 1990) (Emiliani, 2006) (United States Environmental Protection Agency, 2012).

Lean overcomes the limits of the automotive sector at the time that other sectors have started to implement this method. It was then realized the transversely of this system, covering all aspects involved in the business including product design, supplier management, production, and sales.

1.2 Concepts

There are two main concepts in Lean Management: waste and value.

Waste

It can be defined as problems and annoyances that constantly appear, interfering with our work. Ohno (Ohno, 1988) defined seven types of waste, while later publications list nine types of waste (Hohmann, 2012).

1. Defects: related to the time spent doing something incorrectly, inspecting for errors, or fixing errors.
2. Overproduction: doing more than what is needed or doing it sooner than needed.
3. Transportation: unnecessary movement of the product in a system.
4. Waiting for the next event to occur or next work activity.
5. Inventory: in excess it involves unnecessary financial costs, storage and movement costs, spoilage, and wastage.
6. Motion: unnecessary movement by employees in the system.
7. Over processing: doing work that is not valued by the customer, or caused by definitions of quality that are not aligned with patient needs.
8. Human Potential: not using people to the best of their unique abilities and loss due to not engaging employees, not listening to their ideas, or not supporting their careers.

9. Waste of opportunities: Keep up to date and informed about the market where it operates and align strategies in order to have a competitive performance on it.

Value

It is a vaguer concept than waste, since it varies according to the type of service that is being provided and depends on a number of circumstances. But, in general, is defined by the customer willing to pay to get it (Liker, 2004).

There are three types of activities involved in providing services: value-added (VA), necessary non-value-added (NNVA) and unnecessary non-value-added (UNVA).

NNVA activities are those who are required by law, statute or contract. Such requirements may not be under the control of the organization or department and must be respected (examples include data protection, consumer credit act) or are necessary to keep the organization running (for example recruitment, vehicle maintenance, training).

When an activity is considered as a business requirement it does not exclude improvement efforts. It might have some mandatory requirements but being composed by non-value-added (NVA) activities that could be eliminated or amended to streamline the process, does not eliminate the applicability of Lean Management thinking.

The Lean methodology gives us some specific rules to use in determining what activities are VA or NVA. The three rules that must be met for an activity to be considered VA are:

1. The customer must be willing to pay for the activity.
2. The activity must transform the product or service in some way.
3. The activity must be done correctly the first time.

All three of these rules must be met or the activity is NVA.

1.3 Principles

Lean Management is not focus on directly cutting costs, but instead optimizing the processes in order to eliminate waste and improve the quality of service. To do so, in Lean Management five principles (Womack, et al., 2003) must be considered: Value, Value Stream, Flow, Pull and Continuous Improvement towards perfection.

The authors state “precisely specify value by specific product, identify the value stream for each product, make value flow without interruptions, let the customer pull value from the producer, and pursue perfection”.

To accomplish the customer’s value concept, actions can be taken from different points of view. For example, from the Department’s point of view, value-added steps between department boundaries are achieved by eliminating steps that do not create value. From the workflow’s point of view, the process must flow smoothly so that causes of delay are eliminated, such as batches and quality problems. Also from work chain’s point of view, letting work and supplies be pulled as needed, avoids passing work to the next process or department. Ultimately, enterprise pursues perfection through continuous improvement in order to be acknowledged as center of Excellency.

With globalization, the statement of a company in the market as a center of Excellency becomes even more challenging because the organizations no longer compete only within the country. Therefore, it is important to improve the quality of services in an effective and sustainable way.

Thus, the organization’s goal should be implementing guidelines to enable it to effectively manage the provision of high quality services. In addition, to becoming known for its high standards and commitment to continually review and update the best practices according to tested and evaluated indicators. This way, customers can be sure that they receive the most modern and efficient service and therefore, provided of high quality.

The intention is to manage toward perfection so that the number of steps and the amount of time and information needed to create and deliver this product or service.

But for this, it is necessary to develop an organizational culture where resources are involved and motivated to remain attentive to the best ways to provide services and are interested in their continual improvement.

The truth is that an entity is only able to achieve this goal if all stakeholders are aware of the importance of quality and are strategically involved along the way to reach the status of Excellency. It is necessary to develop an organizational structure that

supports this demand and that leads to the definition and unanimous awareness of best practices. This can be possible by establishing an environment of sharing experiences and making better use of information. Moreover, it is intended that learning occurs with practice and that the different providers together share their experiences so that everyone can appreciate and apply best practices.

Recently the original Lean Principles have been redefined into a new holistic Framework – The eight Principles of Lean Business System (Hines, 2012):

1. Purpose – in order to align the organization with the purpose of an activity it is crucial to understand it, before starting it.
2. Process – it is through the improvement of processes that a company may achieve some cost reduction. But this is only possible when innovation and order are considered as benefits reaped in the business.
3. People – The organization's leader should have the power of persuasion to make its objectives, the objectives of its employees. A focused and charismatic leadership along with strong values with minded knowledge-sharing is the best way to move an entire organization. The pairing of the leader with employees is essential for the model of organizational culture to approaching the desired situation. The organizational culture is therefore how the employees understand the organization and in accordance to this, will act in a certain way. Explaining why some changes are going to happen in the organization and involving employees in decision making shows respect for people.
4. Pull – considers three areas:
 - a. Pull Based Delivery – Firstly it is important to understand the customer and their pull-based demands. Second, to find ways in reducing variability of demand or increasing the effective volume of demand. At last, to establish the appropriate type of supply system for the resulting product or service.
 - b. Pull Based Improvement – Improvement activity must be transversely linked to the needs of the business, the customers, the employees or wider society
 - c. Pull Based Training – in this approach, training is undertaken according to the needs of the local team and is decided by consultation of the team leader. It is based on the team's skills and competence needs in order to make their contribution the business success.

5. Prevention – Includes tools destined to prevent variation, problems and subsequent rework or quality failures to the customer. They are intended to standardized and stabilize processes and must be balanced with the working habits that are already established.
6. Partnering - Extending the Lean Thinking to other departments and suppliers in order to align all involved in the service or product cycle.
7. Planet – as Jim Womack considered at the turned of the millennium, “Lean Thinking must be “green” because it reduces the amount of energy and wasted byproducts required to produce a given product... Indeed, examples are often cited of reducing human effort, space, and scrap by 50 percent or more, per product produced, through applying lean principles in an organization...this means that... lean’s role is to be green’s critical enabler as the massive waste in our current practices is reduced”.
8. Perfection – every organization should develop a vision of their specific perfection, defining feasible steps and establishing their own roadmap to reach it. Along the Lean journey both what and how is being measured must be considered in order to create a learning organization that has the capability in maintaining the gains and so pursuits continuing improvements.

These principles ensure an efficient and effective system of production, with minimization of costs related to lack of quality. Also stimulates resources to be committed to the core business with reduced levels of burnout and therefore motivated and engaged employees in converting the organization in a center of Excellency.

1.4 Techniques

For any organization, regardless the area to which it belongs, there isn't a single approach for implementing Lean methods. Every organization has its own starting point, its own culture, and its own goals. The best attitude is to keep learning, monitoring, and thinking.

The direct observation can be extremely eye opening for employees and managers. The first ones are often too mired in the details of their daily work to see waste. Managers often have not had firsthand visibility to the problems that their employees struggle with every day. Therefore, it is important to have the notion of the implications of certain resources daily tasks. At least, because the resources that are being followed are the ones who deliver the customer service and it is desirable to ensure that this service presents the highest quality.

The way of working should be analyzed and standardized according to the best practices. More consistent practices lead to more consistent quality. Managers must directly observe and audit to see if standardized work is being followed, but taking into account that it is not permanent and it must be improved upon over time.

It is often to focuses on doing the value-added work in a faster or more efficient way. The analysis of activities related to the final product in Lean Management is also helpful because it focus on wastes in the involved processes. So, the first focus is on the waste, since there can be a greater, and more realistic opportunity to reduce it instead of trying to reduce, for example, the value-added time.

Technical tools are very helpful and necessary in analyzing and diagnosing processes and eliminating waste, as they allow us to turn philosophy and concepts into action. Examples of such tools in Lean management implementations are described below.

The goal of ***visual management*** (Hohmann, 2009) is to make waste, problems, and abnormal conditions readily apparent to employees and managers. It is more a mindset, than a specific technique. The important thing is to ensure that the information flows within and between departments through scoreboards, graphs, tables or other displays. This way everyone is aware of what is expected, when, who performs and whether the objective is being achieved. This technique gives also prevalence to teamwork and brainstorming, giving the possibility of sharing ideas, identifying root

causes and proposing countermeasures. Visual Management facilitates communication when there is no opportunity to do so in person, organizes tasks and allows sharing of the results by the whole team.

5S (MLG Management Consultants, 2012) it's a Japanese methodology that intends to reduce waste through improved workplace organization and visual management. It means Sort (*Seiri*), Store (*Seiton*), Shine (*Seiso*), Standardize (*Seiketsu*), and Sustain (*Shitsuke*). By identifying and storing items, maintaining the area clear, having work practices consistent and standardized and sustaining the new order, it can be offer efficiency and effectiveness to processes. Frequently, this technique also considers the costs associated to safety of workers, identifies and addresses business risks and employee satisfaction and engagement.

In continuous improvement activities ones have to ensure that standards are maintained. Training plays a key role when changes appear in a 5S program, such as new equipment, new products or new work rules

Kanban (Crisp AB, 2012) (Accounting for Management, 2012 b) is a Lean method that was build upon the concepts of standardized work, 5S, and visual management to give organizations a simple, yet effective, method for managing supplies and inventory. A *kanban* is most often a physical signal, a paper card or a plastic bin, that indicates when it is time to order more, from whom, and in what quantity. It can also be an electronic signal that is sent by a cabinet or computer system. The *kanban* approach is sometimes mistakenly thought as a system that just focuses on low inventory levels when its goals are actually to support the customers and the employees. This is possible by ensuring that needed supplies are in the right place, in the right quantity, at the right time. Ensure materials availability with the lowest required inventory levels.

Kaizen (United States Environmental Protection Agency, 2011 b) is the Japanese term for continuing improvement, through detection and elimination of waste. The kaizen philosophy implies that small incremental changes routinely applied and sustained over a long period, resulting in significant improvements. Waste is eliminated throughout the organization, reducing costs and increasing efficiency. Product or service quality is improved and monitored on a continuous basis.

The term kaizen includes in the early stages sharing ideas in the resolution of business problems. It may involve a process redesign, a speed improvement, a cycle time reduction or any other reducing waste in a manufacturing process.

This technique helps to increase employee motivation, but it does not provide innovative steps. Also, fails in involving personnel in a quick kaizen event which can potentially result in changes that do not satisfy applicable environmental regulatory requirements.

Kaizen often results in new ways of working or conducting business, so, procedures, tasks, duties and sequences may be altered. It is usually necessary that teams work with their positions affected by kaizen implementation until all work becomes standardized. If this is not ensured, old practices will be restored. As this process continues, an organization will eventually produce much more with the same amount of employees.

Value Stream (VSM) was defined by Womack and Jones (Womack, et al., 2003) as “the set of all the specific actions required to bring a specific product, whether a good, service, or, increasingly, a combination of the two, through the three critical management tasks of any business: the problem-solving task, the information management task, and the physical transformation task”.

A VSM is a structured diagram that was conceived by Toyota, in the 1980s, initially called Material and Information Flow Mapping. These diagrams are typically created by a cross-functional team of people who are dedicated to the mapping processes effort, from 2 days of cycle (a smaller and limited-scope VSM) to 2 weeks (for a full product/service flow VSM).

Drawing the VSM is just a starting point. The maps themselves are not useful unless the organization use them to prioritize or drive improvements. When creating a current state VSM, the team has to identify problems that need fixing, such as a long waiting time between steps in the process or high amounts of rework.

To identify waste and improvements, a firsthand observation is critical in terms of process (activity itself) and in terms of personal perspective (the way of doing work). At this point the team needs to start prioritizing problems based on the impact on clients or other stakeholders. Sometimes, problems can be solved immediately after applying VSM. In other cases, specific follow-up on problems may need to be defined as a formal improvement project to be done later. It is important to recognize that some value stream

problems cannot be fixed in the short term, due to cost, timing, or technology constraints. But, those temporary constraints are no reason for stop improving.

After identifying improvements, the team should also create a future state VSM that illustrates how the process should work if redesigned. Typically, a future state VSM shows a dramatically smaller number of process steps, as the process is simplified and waiting times between steps are shorter, as the workflow is improved. The future state VSM can have two versions: the ideal state (how things should work) and the practical state (what can be done).

FMEA (Failure Mode and Effects Analysis) (Miller, et al., 2006) is used to prioritize potential defects based on their severity, expected frequency, and likelihood of detection. It highlights weaknesses in the current process design. This tool prioritizes and organizes continuous improvement efforts on areas which offer the greatest return.

Work cells (Womack, et al., 1990), is a streamlined arrangement (usually in a U-shape) of sequential operations where single-piece flow can occur and workers can be effectively shared. This technique eliminates NVA activities and unnecessary handling. It improves parts movement, set-ups time, reduces waiting time between operations and facilitates the communication among team mates inside the cell. However, different work cells can require the same machines and tools resulting in methods duplication, possibly causing a higher investment of equipment and lower machine utilization.

Just-in-Time Production (Accounting for Management, 2012 a) is a concept of a production schedule which guarantees that item necessary for designing a product is available at the time needed. With this the necessary material is allocated to the relevant site and the remaining materials stored in an appropriate place. As a consequence there is a more effective and efficient use of space and production time reduced, resulting in more production and less waiting time for the customer. However, any disruption can lead to the production to cease in very short notice.

Point of Use Storage (Gamble, 2010) is a technique that guarantees that raw material is stored in right-sized quantities at the workstation where it is used, eliminating waiting and unnecessary handling. However the system is inflexible and when schedules

are increased or decreased on certain products, storage space requirements change. Thus, this technique does not ensure optimum use of space.

Total productive maintenance (United States Environmental Protection Agency, 2011 a) maintains systematically equipment to keep it operational, thus minimizing disruptions. In one hand, it emphasizes employee involvement and preventive maintenance, plus eliminates waiting times. On the other hand, it increases investment in diagnostic equipment and in staff training.

Poka Yoke (Robinson, 1997) is a Japanese term for mistake proofing. It shapes the operation such that it can only be performed the right way, focusing on prevention and detection of defects rather than their correction. It eliminates defects and provides the highest level of quality. This method reduces defects but cannot guarantee zero defects and a short time of discovery of defect and countermeasures.

Workflow diagram (spaghetti diagram) (Ross, 2010) shows the movement of material, identifying areas of waste. This technique aims that teams plan future improvements in each piece flow or work cells. It helps eliminating unnecessary handling and movement. But as with most data collection methods, the quality of the data collected depends heavily on the accuracy of the information provided by participating employees.

There are numerous techniques that can be applied and its use will always have the same purpose: eliminate waste. There is no better technique than the other, since the choice of the most appropriate will depend on the concerning organization and its set of circumstances. Nevertheless, nothing prevents the use of several.

2. Literature Review

Because every type of organization should be concerned with cash flow, customer satisfaction, and quality, many industries start applying Lean to their core processes. As explained in the first chapter, lean started within the automobile industry spreading then to the manufacturing industry in general. Today is distributed through all kinds of business. Some of the most known lean enterprises (McGivern, et al., 2008) are:

- Automotive Industry: Toyota Motor Company - Toyota Production System, Ford Motor Company - The Ford Production System, Chrysler - Chrysler Operating System., Porsche - The Porsche Improvement Process and General Motors - NUMMI joint venture with Toyota.
- Other Industries: TESCO PLC, Textron Inc., Stanley Black & Decker, Inc., Nike, Inc., Boeing Company, Parker-Hannifin Corporation and Steelcase Inc.

2.1 General Applicability

There are also some studies (United States Environmental Protection Agency, 2011 c) on developing an efficient management of organizations through Lean, whose results are described below:

- Apollo Hardwoods Company
 - Reduced the number of trees and energy to produce the same amount of product;
 - Adapted technology to the use of smaller pieces of wood, reducing wood scrap and freeing the need to harvest large-diameter of mature trees.
- Baxter Healthcare Corporation
 - By using value stream maps (VSM), an interdepartmental team developed an implementation plan that saved 170,000 gallons of water per day and over \$17,000 over three months, with little or no capital investment.
- Boeing Everett
 - Increased productivity of resources between 30-70% by Lean initiatives;
 - Reduced 350 cubic feet of cardboard and bubble wrap packing material per 747 wing panel set;
 - Minimized the chemicals usage per airplane by 11,6%.

- Boeing Auburn
 - In five years, defects were reduced from 12% to less than 3%;
 - Gained space usage by 200,000 square feet.
- Canyon Creek Cabinet Company
 - Reduction in lead time, work in progress, defects, overproduction, downtime, time travel operator, and material losses and damages;
 - Reduction of the licensing requirements;
 - Resulted in savings of almost \$1.5million annually.
- Columbia Paint & Coatings
 - 15.000 lbs of paint solids were removed from wash water and 2.820 lbs of hazardous materials from the waste stream;
 - Improvements in working conditions saved 18.000 lbs of shrink wrap.
- DuBois – JohnsonDiversey and Steelcase
 - Energy savings of 60% reduction in the required BTUs;
 - Reduction of water consumption by 80%;
 - Waste stream was cut by 85 to 95 percent.
- General Electric (Peebles, Ohio Facility)
 - Reduced its greenhouse gas emissions, while also producing significant cost savings;
 - Reduced fuel consumption for GE90 engine testing from 20,000 gallons to 10,000 gallons;
 - Decreased GHG emissions from the GE90;
 - Achieved cost savings of \$1,000,000 due to fuel use reduction;
 - Reduced GHG emissions from the CFM testing cycle by 1,600 metric tons annually;
 - Streamlined engine balancing processes and troubleshooting techniques.
- NBC & Universal Studios – The Treasure Hunt Model
 - Emissions reduction of over 250,000 metric tons of GHGs;
 - Gained over \$14 billion dollars in revenue from new products and services.
- General Motors
 - The Implementation of the process called *Saturn Kanban* saved 17 tons per year in air emissions, eliminated 258 tons per year of solid waste and

reduced hazardous waste generation from 9.0 pounds per car to 3.2 pounds per car in four years;

- At GM's Fairfax Assembly Plant, the purge solvent used was reduced by 369 tons in the first year;
- Lean Supply Chain Development itself helped to eliminate 7 tons per year of volatile organic compound (VOC) emissions, hazardous wastes, and transportation-related impacts by working with suppliers to eliminate a painting process step.
- Goodrich Aerostructures
 - Lean Chemical Management at California Facilities reduced by 5,000 gallon tanks containing methyl ethyl ketone, sulfuric acid, nitric acid, and trichloroethane;
 - Also eliminated the potential for large scale spills and the need to address risk management planning requirements for these.
- JEA
 - Process improvement efforts achieved a utility-wide cumulative cost savings of \$579 million;
 - Avoided an impact of millions on the utility's budget from projects specifically focused on cost reduction;
 - Saved cost per customer and avoided rate increases per month directly related to process improvement efforts;
 - Increased the ratio of completed projects.
- Lasco Bathware
 - Reduced production bottlenecks and implemented cleaner and more organized work areas;
 - Decreased variability in spray operations;
 - Reduced energy use and FRP wastes;
 - Reassigned over 1,900 annual labor hours to other value-added activities.
- Lockheed Martin
 - Reduced hazardous waste resulting in cost savings due to the elimination of RCRA permit requirements
 - Reduced facility size by 1/3
 - Reduced chemical storage capacity in 2% of it's original size

- Plymouth Tube
 - Reduced lubrication usage by 1400 gallons, decreasing in lube costs and recycling fees;
 - Completely eliminate a costly hazardous waste stream of ink by changing their printing process.
- Rejuvenation
 - Increased quality control everyone's job, allowing quicker identification of problems and reducing rework;
 - Cut work-in-progress on the floor from seven to eight days to about one and a half days.
- Robins U.S. Air Force Base
 - Waste Collection Process reduced the lead time to collect and haul away hazardous waste on schedule;
 - "Point-of-Use" Distribution of Hazardous Materials instituted point-of-use cabinet systems for distributing "right-sized" quantities of hazardous materials/chemicals for use on the shop floor.
- 3M
 - Reinvigorate its highly successful pollution prevention program by training employees and involving them in improvement projects that often have environmental benefits;
 - Exceeded its corporate Environmental Goals in five years, reducing volatile organic compound (VOC) emissions by 61%, Toxic Release Inventory releases by 64 %, waste generation by 30 % and energy use by 27 %.

In Portugal, this application extended to the National Air Force (Salvada, 2011), resulting in reduced aircraft downtime in planned and unexpected maintenance and decreased of the associated costs with sustain of the Weapons Systems.

Given these examples, the gains for companies are evident when Lean mindset is induce in resources and processes, as the results clearly benefit organizations. Obviously, each case is a case. Analyzes conducted within each company showed different types of wastes and different strategies were implemented. There is no standard solution, but several intuitive alternatives that must involve employee's opinion and

participation. Its implementation must take into account the implications in resources and in final customers. The goal is to improve processes, eliminating waste and respecting people.

So, in general, Lean Management implementations are based in its three pillar structure, shown in Figure 1:



Figure 1: The three pillar of Lean Management – Source (Graban, 2009)

According to this diagram, human resources safety and morale, quality improvement in shorter delivery time of products or services and costs reduction should be the organization's primary goals. It is achievable through process efficient flow, people training in standardized work and focus on continuous improvement.

2.2 The case of Healthcare

Since it appears that this philosophy is transversal to any kind of organizations, it should be applied in Healthcare, considering the specificities of the sector. And it makes sense, as many hospitals are struggling under the actual circumstances:

- The cost of providing care is going up, but payers do not always want to pay more and authorities are not in a position to increase reimbursements (World Health Organization, 2012 a).
- Waste is a present reality in most activities (Cabral, et al., 2012).
- Patient injuries and deaths due to preventable errors occur far too often throughout the world (World Health Organization, 2012 b).
- Lastly, healthcare professionals are frequently frustrated with their daily problems, ending up leaving their profession (Wood, et al., 2007).

Analyzing the examples described above, Lean is:

1. A methodology that reduces errors and waiting times, allowing hospitals to improve quality of the provided care.
2. A system that reduces waste and energy, therefore leading to reduced operation costs.
3. An approach that can support healthcare professionals, eliminating working barriers and allowing them to focus on providing care.
4. A long term system that allows hospital organizations to reduce costs and risks while also facilitates growth and expansion.
5. Simplifies communication between departments allowing different hospital departments to work better together for the patients benefit.

By reducing waste, improving workflows, increasing quality and respecting the human resources Lean becomes a toolset, a management system, and a mindset that can change the way hospitals are organized and managed.

In healthcare organizations the division of labor is different from the one seen in other types of organizations. There isn't a specific and standardized way of performing a given task, because healthcare professionals are highly skilled and autonomous, therefore they are the best persons to define and decide how to perform those tasks.

According to organizational structure of Mintzberg, a health organization is typically governed by a professional bureaucracy, as the functions of each resource are defined at once by their own qualifications. Thus, the interaction between different functions is characterized by standardizing skills and mutual adjustment. The decision-making are incremental and emerging based on the result to be achieved.

One Lean transformation challenge in hospitals is to reconcile vertical departmental organization structures with the horizontal flow of a patient's treatment, as shown in Figure 2.

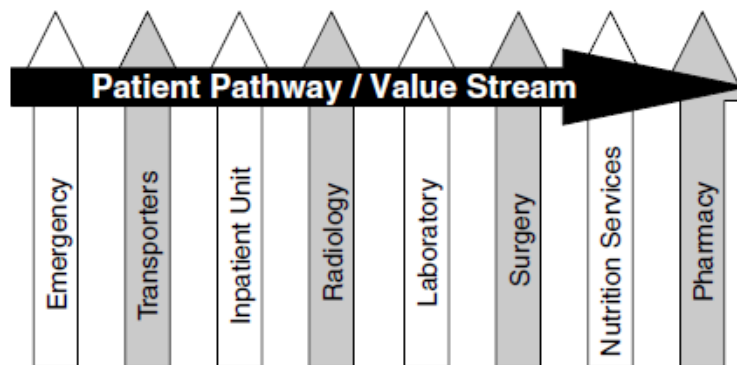


Figure 2: Lean Management as Transversality Solution – Source (Grabán, 2009).

While this vertical organization structure has its own purposes such as the development of specialized technical skills and for employee career paths, its transversal structure leads to dysfunctions. So the real challenge would be giving employees a holistic view of processes, contributing to better cooperation across departmental boundaries and avoiding delays for patients at points of transfer between departments.

The application of economic reasoning to the healthcare sector (Drummond, et al.) although growing, is controversial and often poorly accepted by health professionals. It is common to use expressions such as "health has no price" or "if your child needs medical care urgency, will you discuss the price of the ambulance?" However, the most significant events in the health sector are far from the limit situation mentioned in the second statement quoted above. The choices are particularly delicate in this sector due to its sensitivity (issues of equity, value of life, among others). The uncertainty about the possibility of an episode of illness causes feelings of both fear and neglect as a tendency to exaggerated measures. The mindset of health providers is not adapted to economic issues such as costs of services provided. However, the weight that health represents in today's GDP (Appendix 1) doesn't allow us to ignore it and not make rational decisions

and practices in healthcare. There are at least four fundamentals for applying economic reasoning to this sector:

- Specific agents - public and private hospitals, clinics and health centers;
- The interactions occur in a specific market - health;
- Resources are scarce;
- Government regulations are applied.

Considering the basic concepts of the economy, scarcity of resources to the needs of societies requires the issuing of choices and setting priorities by stakeholders, such as politicians, managers, administrators, among others, it makes sense to apply them to health.

However Lean Management applied to hospital may help soften the impact of measures that have to be taken in order to accommodate the need of cost containment while providing the best possible health care.

According to Coons some hospitals started experimenting with Lean methods in the 1990s (Coons, 2009).

Meanwhile, Mazzocato et al. (2010) have demonstrated the applicability of Lean Thinking in the healthcare sector and nowadays we can observe many Lean practices that lead to successful goals. As a sample, Lean methods have resulted in:

- Reduced turnaround time for clinical laboratory results by 60% without adding head count or new instrumentation – *Alegent Health, Nebraska* (USA) (VanRooy, 2012).
- Reduced patient deaths related to central-line-associated blood stream infections by 95% – *Allegheny Hospital, Pennsylvania* (USA) (VanRooy, 2012).
- Reduced patient waiting time for orthopedic surgery from 14 weeks to 31 hours (from first call to surgery) – *ThedaCare, Wisconsin* (USA) (VanRooy, 2012).
- Saved \$7.5 million from Lean Rapid Improvement Events in 2004 and reinvested the savings in patient care – *Park Nicollet Health Services, Minnesota* (USA) (VanRooy, 2012).

- Reduced 53% of the inventory; 41% of Floor Space; 72% of product distance; 82% of setup time. – Virginia Mason Medical Center in Seattle, Washington (USA) (Institute for Healthcare Improvement, 2005).
- Started 2007, reduced average wait times in the orthopedics department by 45%. – Beth Israel Deaconess Medical Center, Boston Massachusetts (USA) (Hollmer, 2007).
- Relocation of services and staff to improve patient flow, by schematic design determining where services will go in the building and what services need to be located next to each other. – Children's Hospital of Saskatchewan (USA) (Saskatoon Health Region, 2012).
- Demonstrated the valuable difference lean operations can make in the health sector in South Africa – St Luke's Hospice in Cape Town (South Africa) (University of Cape Town, 2004).
- Improved service delivery in the Triage section of the Accident and Emergency Unit. – G.F. Jooste Hospital in Cape Town (South Africa) (Faull, 2007).
- Lean Thinking was applied in order to reduce waiting times in the emergency department and gains were obtained in triage selection. Preliminary work has begun on extending the program to other areas. – Dunedin Public Hospital (New Zealand) (McLean, 2009).
- Lean changes saved money and doubled the time nurses spend with patients. Patient safety improved through a decrease in human errors –Middlemore Hospital in Auckland (New Zealand) (Borley, 2008).
- Project to cut down on paperwork improved medical service and has even increased the number of discharged patients from 8 % to 50 % before noon. – Siriraj Hospital in Bangkok (Thailand) (Sarnsamak, 2008).
- Improvements in waiting and lead times (19-24%) were achieved and sustained in the two years following lean-inspired changes to employee roles, staffing and scheduling, communication and coordination, expertise, workspace layout, and problem solving. – Astrid Lindgren Children's hospital, Stockholm (Sweden) (Mazzocato, et al., 2012).
- Two of the consequences of incorporating the principles of lean management were the number of endoprosthesis surgeries increased from 1494 in 2003 to

2740 in 2007 and the length of stay was reduced. Patients attend for review two weeks before the operation and most are operated on the day of arrival and the average length of stay reduced to three days – COXA Hospital (Finland) (Dowdeswell, et al., 2009).

- In a NHS hospital, the number of steps for cataract operations was reduced from 42 to 35 at most. Waiting times for cataract operations were reduced in 60%. – National Health Service (United Kingdom) (Patel, 2008).
- Starting in 2007, the number of patients waiting over 11 weeks for in-patient planned treatment fell from 261 to 9 and patient cancellations have been reduced by 30%. – The Royal Liverpool Hospital (United Kingdom) (Williams, 2008).
- Benefits include a 64 % reduced time to prepare IV medication, a 33 % increase in treatment room capacity in emergency medicine and a 33 % increase in radiology throughput. – Stockport NHS Foundation Trust (United Kingdom) (The Manufacturing Institute Practice Leaders).
- Started in 2008, achieved in Biochemistry and Endocrinology service, Work processing steps decreased from 22 to 12 by consolidating 70% of high volume work. – Sullivan Nicolaidis Pathology (Australia) (Australasian Association of Clinical Biochemists, 2008).
- The average time spent in the emergency department fell 25% and the number of patients leaving the department without seeing a doctor was reduced in 41%. – Flinders Medical Centre, Adelaide (Australia) (Jones, et al., 2006) (Ben-Tovim, et al., 2007).
- In 2005, five Canadian hospitals began a Lean journey that resulted in decreased emergency wait times, decreased patient length of stay, improved operating room usage, more radiology procedures per time period and better infection control outcomes. – Toronto General Hospital (Canada) (Fine, et al., 2009).
- Started in 2006, the lab increased capacity by 30%, and turnaround time for test results was decreased by an average of 25%. – Kingston General Hospital (Canada) (Lefteroff, et al., 2008).

- Lean initiatives have been taken in order to optimize the Operating Room and Outpatient and improve efficiency and quality in Logistics Services, Supply and Pharmacy – Centro Hospitalar do Porto (Portugal) (Matos, et al., 2010).
- The restructuring of the central warehouse and building warehouses peripherals seamlessly integrated circuit defined, and computerization of the supply chain distribution thus reducing the number of such requests and reducing the stock. Obtaining gains of € 800 000 in 3 years and a half. The OR management was also changed, from planning and booking of rooms, to the preparation of instruments and medical devices to be used in every surgery. – Hospital de São Bernardo Setúbal (Portugal) (Cabral, et al., 2012).

Therefore, the Lean Management applied to healthcare appears to be a method which improves efficiency, attempts to identify waste in order to reduce / eliminate it and improve quality of processes. Gains inherent in its implementation are typically detectable in the short term.

3. From National Health Service to study focus

According to the statement of APEG SAUDE President, Eng. Carlos Tomás, waste observable in the Portuguese public health system is at least 50%." However, Dr. Jose Carlos Freixinho, Executive Member of the Board of Centro Hospitalar de Setúbal, assumes that the waste exists but should not exceed 20%. Debate held during the conference "Setúbal Lean Health – Mudar a forma de pensar usando ferramentas simples 30/01/2012". Either way, the percentages represent costs too high in a country suffering an economic crisis today, and whose sustainability of the healthcare sector depends on the way Government and members responsible for healthcare manage the sector.

It is legitimate to believe, after so many successful examples presented in the previous chapter, that Lean Management can make a strong contribution to cope with the adversities that the Portuguese Health Sector is presently facing.

According to Jornal de Notícias (Soares, 2012), the results recently presented by the Portuguese Minister of Health, in the context of hospital reform, stated that it is possible to get savings, through fighting waste, in the order of 700 to 800 million euros. However, one of the main difficulties in the processes inherent to reformulation through the implementation of Lean Philosophy is related to Managing Change.

The purpose of this study is to demonstrate that it is possible to apply Lean Management in Portuguese Healthcare. The case study will be the Cardiology Department of a recent hospital in Lisbon (Portugal), Beatriz Ângelo Hospital, being the goal to improve quality, ensure patient safety, reduce time and cost and recover the resources commitment.

At this point, it is important to understand in which context they fit, particularly in what concerns to the healthcare system to which it belongs and how they get their funding from. Then it will be clear, in an environment where resources are scarce, the importance of considering waste minimization, process optimization and improvement of quality of health services. Consequently, the working and environment conditions are improved, best practices and patient safety are ensured more effectively and the country will provide health services in a competitive market that is increasingly global.

3.1 Portuguese National Healthcare Service

In general, a Health System is composed by the financer, the provider and the user.

To contain the growth of public spending there have been introduced in Portugal some rules in the sector, concerning to models of resource allocation in order to discipline the market. It began by separating the state's role as financier from the provider, creating hierarchical entities that would allow a more efficient and effective SNS (Administração Central de Serviços de Saúde, 2012 a).

According to the Law on Basis of Health (Moniz, 2008), the National Health Service (SNS) is overseen by the Minister of Health and is administered within each health region by its board of directors of Regional Health Administration (ARS) (Ministério da Saúde, 2012). In each sub-region there is a sub-regional coordinator of health and in each county one health commission district council.

The Central Administration of the Health System (ACSS) (Administração Central de Serviços de Saúde, 2012 a) has the responsibility of managing human and financial resources, facilities, equipment and information/technology systems of the SNS. In addition, it promotes the organizational quality of health care providers, as well as sets and implements policies of standardization, regulation and health planning. All these actions are carried out in their areas of intervention, in coordination with the regional health administrations.

The Health Regulatory Entity (ERS) (Entidade Reguladora da Saúde, 2012) appears as an entity that regulates and supervises the sector provision of health care, performing its functions independently. Its tasks are developed in key areas related to access to health care, to the measurement of quality levels and to safety assurance. This way, it ensures that the rules of competition between all operators are respected as well as the rights of patients.

On the other hand, the General Directorate of Health (DGS) (Direcção-Geral da Saúde, 2011) has as main mission the study and support to setting, development and implementation of the health policy. It also directs, coordinates and supervises the activities of health promotion, disease prevention, provision of health care and supports, technically, the international cooperation.

This way, the government wanted the healthcare to be distributed effectively, with quality and equity, while activities, productivity of service providers and utilization of

resources were controlled. To this end, there were defined the dimensions of analysis of the contracting process, covering the areas of negotiation of Inpatient, Outpatient, Day Hospital, Operating Room and Emergency.

Contractualization Process

Contracting in the healthcare sector is the process by which, starting from the needs assessment in health and health services, it is established the negotiation mechanisms for allocation of resources to healthcare providers, on the basis of explicit criteria of accessibility, appropriateness and effectiveness (Antunes, et al., 2011) (Administração Central do Sistema de Saúde, 2012 b)

The Contractualization Model consists in contractual culture, evaluation mechanisms, clarification of objectives and resources, planning and funding model, where there are entities responsible for. This process is based on two forecasting instruments: Performance Plan and Contract Program.

Performance Plan (PP) (Lourenço, et al., 2009)

This is a document tailored to the strategic guidelines for contracting the period to which it relates, which allows data collection of institutions providing the level of activity and structure (infrastructure, technical and human resources). Although it is recognized that the content goes beyond the needs of information strictly for the Process Contractualization, its use is justified because it constitutes the only way to collect information systematically and consistently to all hospitals at national level.

In a previous moment, the PP provides a unique opportunity for reflection and knowledge about the organization itself, which is the base to the first proposal of the provider, which in turn is to be examined by the buyer, providing the basis for the negotiation process.

The PP is organized into nine major areas: Characterization, Strategic Lines, Business Plan, Training Plan, Equipment Map, Map of Human Resources, Performance Indicators, Investment Plan and Budget.

Activity is agreed by defining a portfolio of basic services, split over large areas, followed by intervention areas by activities / health care provided, ending up in the definition of performance indicators. The indicators are based on the resident population or the registered users, and can refer to processes, coordination of care (between providers of the same or different levels of care), and quality of results or records.

Contract Program (CP) (Administração Central do Serviço de Saúde, 2010)

The CP is the document that providers sign with the ARS and is aligned with the provisions of PP. Through it the commitment between the parties is set, clearly identifying the obligations and the rights of both parties, and the rules of assessment and monitoring of the activities to be undertaken by providers.

The objectives and targets expressed in CP do not necessarily correspond to any performance indicators presented in PD.

Additionally, it should be considered that indicators of regional areas shall be selected according to locally defined health priorities.

The incorporation of regional and local priorities is a fundamental aspect for achieving health gains that, in most cases can only be achieved with attention to the specific population in a given territory.

Financing of the healthcare service in Portugal

In order to finance healthcare providers, the SNS acquires budget mainly by funds derived from general tax collection, via the State Budget (Associação Portuguesa de Economia da Saúde, 1997). The contribution to taxes is made in accordance with the income of individuals and companies, and according to the expense. It is a mandatory contribution, not being specific to healthcare sector. In Portugal, the main tax revenue is caused by indirect taxes, contrary to a number of EU countries, where direct taxes are the main source of state revenue (Comissão para a Sustentabilidade do Financiamento do Serviço Nacional de Saúde, 2007).

Moderating fees are a tool, which helps streamline and regulate access to healthcare providers, while ensuring the effective strengthening of the principle of social justice within the SNS. The law predicts that only users who are in critical clinical situations, or that belong to social groups at risk or who are financially disadvantaged are exempt from payment of fees.

There are other small sources of funds, usually associated with an implicit insurance system, in which the citizen does not make payments at the time of consumption of healthcare services. Examples are non-profit institutions serving households, social security funds and other public and private institutions.

To ARS it is given the administrative, financial and patrimonial autonomy, within its own budget that is negotiated / set annually with the Ministry, which includes operating expenses and capital expenditures. Given that, it is due to ARS defining and implementing their regional strategies for health. It is at this level that the strategic areas of investment to be made in providers must be set, considering and reconciling the various funding sources available. These can be own funds or funds of others, including those obtained from the application of Community programs or Healthcare programs.

Payment to Providers

The payment to providers is always followed by the process of monitoring by the ARS and that includes production, fixed costs and marginal production, convergence / incentives, specific programs, among other activities.

Production Payment: It includes the payment per production line where it is necessary to identify the user, the financial institution responsible for the production, the advanced payment of hospitalizations and outpatient coded in good time. The episodes of hospitalization are classified by Homogeneous Diagnosis Group (GDH) (Administração Central do Sistema de Saúde, 2012 c), which allows defining operationally the products of an hospital, which are the set of goods and services that each patient receives according to their needs and pathology, that led to the hospitalization, as part of the treatment process defined. To each group it is assigned a weighting coefficient that reflects the expected cost to treat a typical patient clustered in GDH, expressed in relative terms, compared to the average cost of a typical patient at national level. The ratio between the number of equivalent patients, weighted by the relative weight of the respective GDH, and the total number of equivalent patients, is not more than casemix index (MCI) of a hospital.

Marginal Production Payment: Among the main aspects related to the payment of marginal production, it is noted that:

- In case production exceeds the contracted one, payment will be made up to 10% of the activity contracted in different production lines, with the exception of outpatient and surgery scheduled, that will not be subject to any limit;

- The payment will not be made if the units have less than 50% of the contracted amount, per production line;
- Only in the Urgency case the payment of 50% of the fixed costs of contracted units that did not produce as agreed will be made, recognizing that the healthcare provider has to ensure the availability of a fixed structure and has little flexibility to control the seeking for medical care, so, may not achieve the contracted volume production;
- Payment of surgical production, performed in outpatient or inpatient, is ensured in accordance with the price list in place for payment of production to be undertaken by private entities under the management system for users registered for surgery (SIGIC). This, taking into account that the payment of the assigned drugs in ambulatory is a financial responsibility of the hospital and will be limited to the amount stipulated in the contract.

Convergence: To calculate the values of convergence per hospital it is adopted the methodology used in previous years (difference between total operating expenses and total operating income), adjusted by the total amount available. The total operating income used to determine the value of convergence includes the value of contracted activity and the income from third parties, among others. The values calculated for the convergence of SNS hospitals are the difference between total costs and operating income adjusted for the overall amount foreseen in the state budget. The regional totals are allocated to their institutions in accordance with the regional / local program and negotiated contracts.

Specific programs: Payments that include technical assistance, medical care abroad, participation in international conventions, Retinopathy illnesses, Lysosomal diseases, Religious Orders, Transplants, and Training Research.

Others: Payment of health plans such as dialysis, HIV / AIDS, Prenatal Diagnosis, IVG, Cancer Registries and Continuous Care.

The objectives of this process include monitoring the rate of production contracted per production line and the economic-financial quality and efficiency, through the contractually indicators. The monitoring phase is the longest and probably most

crucial, since, the definition of objectives together with an explicit commitment to monitor and evaluate the performance of the institutions is a central aspect of the entire contracting process.

Public Private Partnership

The SNS has allowed a huge improvement in the quality the life of the Portuguese, in their 30 years of existence. However, rising costs, far above the growth of the economy, threatens its quality and universality.

To ensure these principles, the government has to reduce expenses. It is, therefore, essential that the available resources are better utilized, avoiding waste, by improving management, transparency and accountability for the use of public money.

The purposes of the Public Private Partnerships (PPP) are the increase of efficiency in the allocation of public resources and the qualitative and quantitative improvement of the service. It is applicable to projects whose development requires, on the partners side, high financial, technical and managerial resources and maintenance of appropriate conditions for sustainability during the life of the contract.

The launch and hiring of public-private partnership suppose a clear enunciation of the objectives of the partnership. It allows defining desired outcomes and an appropriate allocation of responsibilities of the parties. It also requires the development of studies that demonstrate the advantages over alternative ways of achieving the same ends. Simultaneously allows private partners to expect adequate return to the amount invested with a premium to compensate the degree of risk they incur in.

In Portugal, there is a National Health Service that ensures the provision of health care, in a moderate way, to the entire population. The government assumes the role of financier, whose funds are obtained through general tax collection. It also assumes the role of provider through a well-defined hierarchy. The funding rules are outlined by the Contract Program and objectives monitored through the Performance Plan. In some cases the government establishes public-private partnerships in order to increase efficiency in the allocation of public resources and the qualitative improvement of the service.

3.2 Beatriz Ângelo Hospital

The Beatriz Angelo Hospital (HBA) (Espírito Santo Saúde - SGPS, 2012) is a new public hospital that opened doors to the public on the 19th January 2012. It belongs to the Portuguese National Health Service and therefore, is subject of the rules set out for the Contractualization Process agreements with the Portuguese Government.

This hospital is a key milestone to restore the balance of supply in health care in the Lisbon and Tagus Valley region. Located in Quinta da Caldeira, Loures, is a completely new hospital, designed to fill a long recognized need in the provision of hospital care for the people of the region. The HBA will serve a population of about 278,000 residents in the municipalities of Loures, Mafra, Odivelas and Sobral.

HBA is the object of a partnership agreement between the Portuguese Government, the Managing Society of Loures Hospital (SGHL – Sociedade Gestora do Hospital de Loures, SA) and Building Management Society (HL – Sociedade Gestora do Edifício, SA). The contract foresees that the delivery, design, construction, financing, conservation and maintenance of the hospital is from the responsibility of HL while the management of hospital and health care are provided by SGHL.

In HBA's contract management (Contrato de Gestão, 2009) it is taken into account the commitments made, in terms of production, between the SGHL and the Portuguese State.

The inpatient episodes (surgical or medical), outpatient surgery episodes, clinical episodes, emergencies, outpatient visits by specialty and day hospital sessions (psychiatric sessions, among others) are considered part of the production. Their accounting is done by number of episodes in Diagnosis Related Groups (DRG) in the first three cases and number of attendances, number of consultations and number of sessions for the three latest cases, respectively. For each area of hospital activity there are complementary means of diagnosis and therapeutic, supporting services, medications and patient transport.

There are two types of production considered in the contract: the Expected and Effective. The first is agreed between the parties taking into account the overall capacity, the level of activity and case mix index of the hospital. The second one represents all healthcare services provided in the hospital.

Both are intended for statistical purposes, verification of Performance Parameters and the settlement of the expected value and the effective portion to be paid by the SNS.

However, it is necessary to take into account the following:

- The number of inpatient episodes, outpatient surgery episodes and clinical episodes should not be, in each semester, less than:
 - 50% of the total number the episodes recorded for the population of the area of influence of the establishment;
 - 25% of the production expected for this kind of episodes.
- The number of outpatient visits by specialty, should not be, in each semester, less than 25% of the production expected.
- The number of inpatient episodes, outpatient surgery episodes, clinical episodes and outpatient visits should not, in each semester, exceeds 75%of the production expected for this type of episodes.
- Unless prior authorization, the SGHL cannot include in the Effective production, in relation to number of inpatient episodes, outpatient surgery episodes, clinical episodes, outpatient visits and day hospital sessions, in a percentage higher than 10% of Expected Production given to users who do not belong to the population of the area of influence hospital. In the event the entity should refer the patients.
- It cannot be accounted for more than one session in the Effective production of the day hospital or one specialized consultation for the same patient on the same day.

In case of failure of the points mentioned above, the SGHL must provide a diagnosis of the situation, its causes and a corrective action plan to implement.

As a vision, HBA aims to be a reference operator in the provision of healthcare through the practice of medicine of high quality and the excellence in coordination and integration with all levels of care.

The hospital's mission is to provide health care to the population within its area of influence, in absolute respect for the individuality and needs of patients, and based on principles of effectiveness, quality and efficiency, contribute to the development of research and training professionals in their area of activity.

The culture of the employees of the HBA is based on eight core values: pursuit of results, intellectual rigor, constant learning, personal responsibility, respect and humility, positive Attitude, integrity and team spirit.

The HBA intends to provide healthcare services of Excellency, by focusing on the needs of each patient and provide medical care in accordance with the technical and the latest scientific knowledge, maintain a solid and transparent relationship to all its patients.

The hospital quality strategy involves the organization as a whole, the different areas having impact in the customer satisfaction and, consequently, in the reputation and future of the hospital.

Providing a proper health care, patient safety and equity of care strategy are their basis of clinical quality. This is assessed using indicators, tested and internationally recognized, some inherent to specific situations, others more general. These indicators examine the treatment process, its impact and its results, reflecting the achievement of best practices. Examples of these indicators are the rates of morbidity, mortality or readmission of patients, the incidence of complications or adverse events potentially preventable, among others.

To ensure the quality of services available to patients, the HBA, both by conviction and contractual reasons, must certify 13 services until January 19, 2013. In January 19, 2014 it is expected to have the entire hospital accredited by the Joint Commission. This will require a greater involvement of physicians and nurses in this field and so, there are already a number of committees working for this purpose.

3.3 Cardiology Department Characteristics

Cardiology is the field of medicine that studies the cardiovascular system under the morphological, functional and pathological point of view. Its purpose is the diagnosis and treatment of diseases affecting the heart and the other components of the circulatory system. The most common diseases treated in this area include atherosclerosis, hypertensive heart disease and coronary heart disease, which can cause many serious health problems such as stroke or myocardial infarction.

The importance of the struggle against cardiovascular disease is widely recognized, since these diseases are the leading causes of death in Portugal and are also a major cause of disability (according to data from the INE, in 2006 about 32% of deaths were due to diseases of the circulatory system). In this sense, the 2004-2014 National Health Plan provides a set of strategic priority guidelines, in order to obtain health gains in the area of cardiovascular diseases. In particular, there are defined as necessary interventions of promotion of healthy lifestyles, early intervention in people with lipid risk profile, improved knowledge on morbidity and mortality, revitalizing cardiac transplantation and optimizing the coordination of interventions, including practical implementation of the National Program for Prevention and Control of Cardiovascular Diseases and its intersection with the hospital referral networks.

It is a medical-surgical specialty, under which the care occurs in various degrees of complexity, both in terms of human and material resources, and different degrees of urgency, including medical therapy in cardiology, cardiac surgery, interventional cardiology and pediatric cardiology.

At HBA, the Cardiology Department consists of a team of five cardiologists, five CardioPneumology technicians (CPL) and one nurse, who provide daily care and consultations that include specialty examinations, such as:

- Transthoracic Echocardiography
- Doppler Echocardiography
- Pharmacological Stress Echocardiography
- Transesophageal Echocardiography
- Resting Electrocardiography
- Stress Electrocardiography
- Holter Electrocardiography

- 24-hour Blood Pressure Monitoring (MAPA)

In addition to consulting and specialty examinations are performed some surgical procedures such as pericardiocentesis, placement of temporary pacemakers, catheterizations, among others.

By belonging to the HBA, Cardiology's department is subject to the assumptions agreed with the Portuguese state. The Expected Production for this department has estimated 1200 consultations for 2012, which results in 60 consultations per week.

Given the importance of this area in the health system and given the fact that resources are limited, to ensure optimization of processes carried out, reduce waste and guarantee the quality in this department matters.

4. Methodology

The users' access to health care can be measured in multiple dimensions. One of the methodologies (Entidade Reguladora da Saúde, 2009) used to assess it, is built upon the definition of two "stages" in the provision of health care: potential providing care, i.e., the one that would satisfy all the needs of the population, and care effectively provided that is, the one that actually is delivered to users. The evaluation of access can be done by reviewing the barriers that prevent full transformation of "potential" care in "provided" care.

Beginning with the current state of how services flow and then drawing a leaner future state of how they should flow, allows the creation of an implementation plan with a timetable. As soon as the direction is established, the lean plan should immediately begin, preferably with the most important and visible activities. Having simultaneous results helps all employees involved to carry the plan forward. At any time there is room for improvements and changes can be replicated to other areas.

After the good results obtained in various healthcare institutions worldwide as mentioned in the second chapter, Lean Management became a promising concept in this sector by optimizing processes flow and by that, improving the delivery of health services and reducing waste.

Hence, it was reasonable to develop an Enterprise Project in HBA's Cardiology Department in order to find the answer for the following main research question:

What is the impact of Lean Management in the healthcare services provided by HBA's Cardiology Department?

Since every individual or institution embarking on a lean journey will have different challenges based on their particular set of circumstances, deeper questions arise:

1. Is the Department of Cardiology prepared for change?
2. What are the improvement opportunities in Cardiology Department processes?
3. What consequences will Lean Management bring to Cardiology Department?

To answer these questions, research methodologies were established to characterize the Cardiology team, describe their work processes and extract the results

obtained by Lean Management implementation in their department during the current year.

On one hand, Interpretative paradigm (Blumberg, 2008) was present in the characterization of the Cardiology Department's Organizational Culture and Leadership and description of the established workflows, leading to an interpretative methodology in qualitative data treatment. On the other hand, since it was intended to measure results of Lean Management through objective facts, Positivism paradigms were also expected.

4.1 Methods

To answer the mentioned above questions, it was intended to provide a description of the current situation in terms of actual Organizational Culture, Leadership perspective and waste inherent in work processes implemented in the service, followed by a verification of the changes incurred after implementing Lean thinking.

The focus was to find out who, what, where and when Lean Thinking was affecting through its concepts, principles and techniques. In fact, in this study it was established that Cardiology Department Human Resources meant to apply them in their working processes in providing health services and comprehend its consequences, during this current year. Therefore, this study can be categorized as descriptive.

Hence, the target population of this study encompasses cardiologists and CardioPneumology technicians (CPL) deployed to perform their duties solely in the cardiology department. Since it is finite, it is feasible to study the entire population, thus not being necessary to apply sampling techniques and methodologies.

Since it was intended to analyze different components, the study was divided three parts, according to the questions listed above.

Before starting a self-diagnosis and making changes in the work process, it was necessary to consider the mindset of the Cardiology's Department, fulfilling one of the principles of Lean Management - Respect for people.

Since this department belongs to a health organization whose division and combination of labor is very specific (Mintzberg, 1982), each profile was analyzed individually, along two dimensions: Organizational Model and Leadership.

After guaranteeing that the department's mindset was oriented to change, the goal was the analysis improvement opportunities.

Subsequently it was needed to prioritize those improvement opportunities, find solution to remove waste and implement them. Monitoring the consequences of Lean implementation reveals its success, encourages employees and helps to readapt if necessary to obtain better results.

To perform this particular investigation, it was necessary to understand work processes and access the duration of each involved activity in this department, so interpretative and comprehensive methods were used by the author.

In general this is a qualitative method that includes descriptive studies and comprehensive/ interpretive studies once qualitative and quantitative components are present in this investigation.

4.2 Data Collection

In order to assess individual leadership and organizational culture, surveys developed by Quin (Quin, 1998) and adapted by Martins (Martins, 2010) listed in Appendix 2 were used. These instruments were useful in determining profiles of leader competencies and organizational culture and provided guidance to align all profiles in the vision of HBA. They were successfully applied last year for a population very similar to the concerning population, being considered suitable for this study (Castro, et al., 2010).

The surveys were applied to the target population, because it is finite and feasible concerning the number of individuals. Observation by survey (Tuckman, 2000) is applied to cardiologists and CPL and the goal was to understand the readiness of these resources towards changing processes, i.e., the application of Lean Management in Cardiology Department.

In the survey of organizational culture, it was intended that each respondent distributed a value from 0 to 100% for all four statements of every questionnaire item. The total of each item could not exceed 100%. For each profile, the average of each statement was calculated and its value corresponded to a specific quadrant of Organizational Culture Models: Model of the Human Relations Model of Open Systems, Internal Processes Model and Model of Rational Targets.

For the survey applied to evaluate the Department's Leadership, from the Leader's perspective and from the perspective of the followers, the purpose was to assign a value from 1 to 7 to each of the 16 statements. Afterwards average values are assigned according to the following combinations: Q7/Q16, Q1/Q10, Q4/Q12, Q3/Q13, Q6/Q15,

Q5/Q11, Q8/Q14, Q2/Q9. Finally, medium values for each profile were transferred to a diagram and all points connected to each other, giving the results in terms of leadership typology.

Once validated, surveys answered by four CPL and one physician, were considered for the analysis. Moreover, the average of each profile was considered (Appendix 3) to analyze the organizational culture and leadership from the leader's perspective and the perspective of the followers. The findings were extrapolated for the entire population and the corresponding qualitative data were discussed.

To comprehend work processes, data collection is made by Interrogation (Blumberg, et al., 2008). This implies observing through direct or indirect questions the referred population while on duty, in order to obtain responses which can be subject to qualitative analysis. Since data is limited to the Cardiology team, this method is more appropriate. However, this implies the extraction of primary data, which requires the cooperation of the individuals observed. Along this procedure there were used Qualitative methods such as author's observation and expert interviewing (Blumberg, et al., 2008).

To access the duration of each activity, before and after implementing Lean Management, it is taken the advantage of the information systems linked to this department, Soarian[®]Clinicals and syngo[®]Dynamics (registered trademark of Siemens Medical Solutions USA).

Today it is uncommon an organization that does not have information systems and HBA and its cardiology department are no exception. It's always interesting to praise the importance and flexibility of information systems, as they guarantee consistency of data throughout the institution in which they are installed. Beyond that, they can be implemented in any area where there is a database and an interface through which information can be inserted.

Such implementations provide indicators of quality and performance of health service providers, enabling the institution to monitor productivity and the occurrence of errors, thus ensuring process efficiency and effectiveness of treatments. This way, the study uses also quantitative information.

Although being a newly opened hospital, available data – before and after the implementation of Lean Management – was considered acceptable to draw conclusions for this study. It would be considered the average time for each process and the average waiting time that precedes it (Appendix 5), taking into account the variance of the data.

In this part of the study, data collection is made by using direct observation is used in terms of workflows and access to information in databases available in the department.

Within the various Lean Management Techniques available this study focuses on Workflow Diagram (Ross, 2010) and Value Stream Mapping (Womack, et al., 2003) due to its suitability according to the team under analysis. Both these techniques are explored with further detail in the next chapter.

5. Results and Discussion

Cardiology's team mindset will be studied, through its Organizational Culture and Leadership from the perspective of each member, to realize how far they are prepared to implement change. By confirming this predisposition, the team will have to review their work processes in order to identify waste through Lean techniques and eliminate it.

As mentioned in the previous chapter, the organizational culture and leadership will be determined using surveys. The workflow will be obtained and described based on interviews and direct observation. The data that will populate the used Lean techniques is extracted from information systems and the average times for each activity and associated waiting time will be considered.

So, in this chapter it will be verified the response to the questions that were set out to be answered in the previous one.

5.1 Cardiology Department readiness for change

Culture plays a key role in an organization, making it possible to implement changes quickly and successfully (Cameron, et al., 2006). Each successful amendment strengthens the will to make new changes within the organization. It is extremely important that all elements of an organization have the same organizational culture, because everyone will be walking in the same direction: the goals of the organization. Otherwise, not only it is hard to follow the company's vision but sense of frustration and burn-out also increase.

The type of commitment that every resource has with the organization helps or harms the achievement of its goals. So, it's important to respect every one's point of view, needs and functions in order to guarantee that all are engaged in the accomplishment of the organization's objectives.

Besides the importance in having the same organizational culture across the whole department, the leader's role is essential in achieving the department's objectives, vigorously and effectively. In a changing situation, it is of great importance a charismatic leadership.

Charismatic leadership and transformational leadership are two similar concepts that have been used differently in the literature. Some authors consider them as the same, others distinguish them (Pierce, et al., 2011).

With regards to the definition of charismatic leadership by Max Weber (Weber, 1993), leaders are described as being “supernatural”. There seems to be a connection with charismatic leadership and the “great man” theories (Kirkpatrick, et al., 1991), because once more the traits and psychological characteristics of the leader are the main focus.

However, scholars emphasize the importance to understand the whole leadership process, comprised by the leader, follower and their relationship even when analyzing situations of charismatic leadership (Howell, et al., 2005).

With respect to transformational leadership, Bernard Bass (Bass, 1985) defines it as opposed to transactional leadership, where a leader inspires his/her followers as opposed to offer rewards in exchange for followership.

Respecting this perspective, the leader emerges as a team driver.

The method of team management is complex and multifaceted, which requires the training of middle management in the sense that they gain skills to diagnose levels of performance of each employee, outlining strategies and corrective action, plan activities in dynamic teams, assess and motivate each employee, taking into account the achievement of organizational objectives.

Above all, it is important to determine whether the led ones reveal, or not, involvement, commitment and mutual cooperation, concern for others and the ability to sacrifice for the collective. These principles are of decisive importance for a team or an organization having success.

According to Peter Drucker (Drucker, 2007), leading a team is no more than express confidence otherwise there won't exist followers.

Therefore, first will be studied Organizational Culture and Leadership of the department of Cardiology and the results of the questionnaires will be presented and discussed separately by profile.

Organizational Culture in the perspective of Physicians

This profile, as shown in Figure 3, was less directed to the model of human relations. That reflected a relatively unified group, compromising the accomplishment of tasks. The high self-comprehension as well as interpersonal communication, contribute very positively to the decision-making. Also the deep knowledge of this group may contribute for participatory decision making, thus to its development. Therefore it was an area to develop within the team cardiology.

As for the model of open systems there was a growing spirit for change and innovation assigning an increasing adaptability to future conditions.

In the model of internal processes it was given some relevance to hierarchy, rules and routines. There was certain concern regarding the organization of information and planning tasks.

With regard to the model of rational objectives, there was a great awareness to achieve results established in the Cardiology Department.

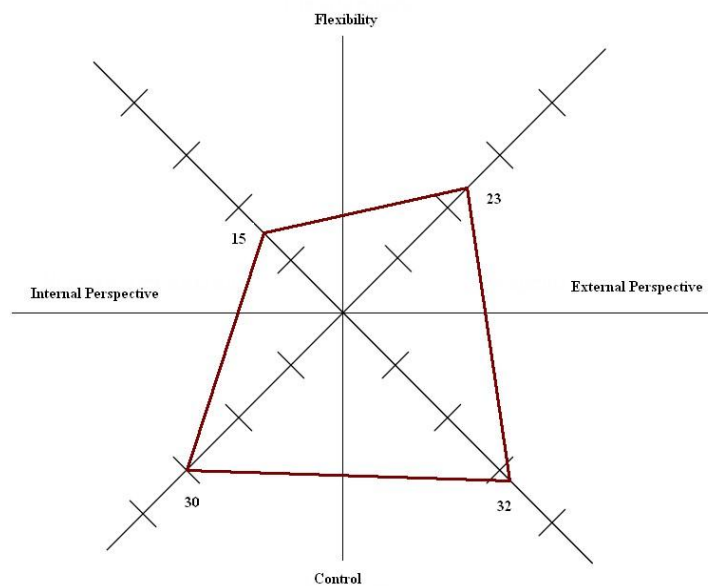


Figure 3: Model of Organizational Culture in the perspective of Physicians.

Organizational Culture in the perspective of CPL

According to Figure 4, there was a low relationship between other people and the CPLT team, probably due to the specificity of the functions that each employee performs in the department. It was important to take into account the contributions of human resources development, training and moral cohesion, in achieving the goals of the department. Therefore, it was an issue to improve.

With regard to the open systems model, it presented a positive sense of innovation, with adaptability and responsiveness. It will be important to give greater emphasis to emerging realities through self-overcoming.

In the model of rational objectives this profile paid substantial attention to results established in the Cardiology Department, having great bearing on the productivity, efficiency, planning and setting objectives.

In the model of internal processes it was observed that this group gives importance to hierarchy, rules and obligations, information management, communication, stability and control.

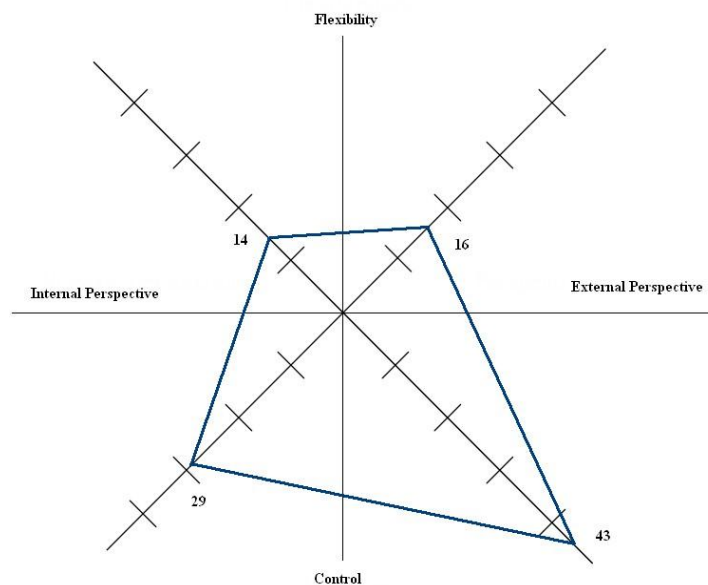


Figure 4: Model of Organizational Culture in the perspective of CPL Technicians.

Leadership from the Leader's perspective

The person subjected to our study was precisely the Clinical Director of Cardiology Department.

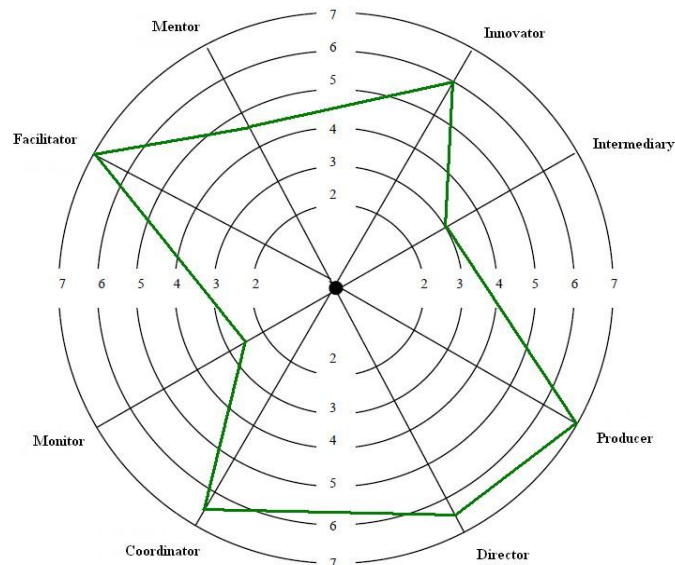


Figure 5: Leadership from the perspective of the Leader.

As shown in Figure 5, the leader presented himself enough Facilitator, which indicates being encouraging for effort, cohesion and teamwork, as well as in managing interpersonal conflict.

This leader also showed himself as Innovator, as he allowed adaptation and change, conceptualizing and designing the necessary changes. He assumed a well-defined role as Producer, since he was task-oriented and committed to the implementation of activities showing motivation, energy and personal dynamics.

The role of Director was also present, in that clarifies expectations by planning methods and designating targets.

But, he considered himself a weak Intermediate, which lead to less concerning in maintaining the authenticity. Yet, he reinforced his role as Mentor, i.e., was very active in the team's development and the progression of his individual features, using an empathic attitude.

The leader also had a small role as Monitor, which resulted in low efficiency in terms of time management and lean operation. This made process control, error detection and application of quality tools to become a challenge. But this was compensated by the strong presence of the role as Coordinator.

Leadership from the Physician's perspective

Looking at Figure 6, the leadership from Physicians perspective apparently presented itself quite balanced.

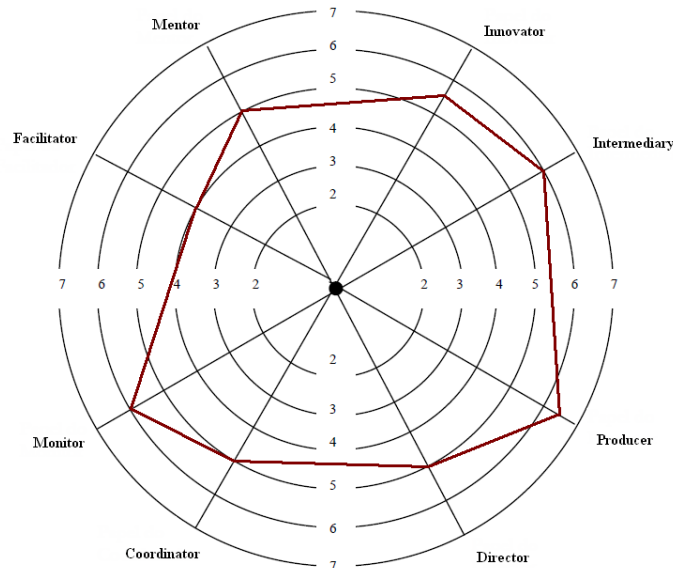


Figure 6: Leadership from the perspective of the Physicians.

Regarding the role of Mentor, the Physicians attributed similar values comparing to the values given by the leader. In their opinion the leader played as mediator in interpersonal disputes, helping them to develop their individual training plans, a fact that helped to gain confidence. They characterized him as a person quite fair, accessible and helpful by taking into account the moral development of each person.

With regard to the role of Facilitator, the values were lower against the perspective of the leader. Physicians consider that he could improve cohesion, moral and human resource development.

As Monitor, the difference between the values assigned by physicians and the values given by the Leader were greater. For Physicians, the leader is organized, in a way, that information circulates efficiently inside the department and showed some concern with regard to compliance.

Once again, physicians attributed lower values in the Leader's role as Coordinator. They have the conviction that the leader was careful regarding management systems and monitoring performance. The support that he provided on the delivery and coordination of projects and in designing tasks, had been shown sufficient.

Physicians believe that the leader played a balanced role as Director. Hence, they characterized him as being an organized and active person, having in mind the planning and establishment of objectives, as well as the definition of tasks, selection of new alternatives when necessary, as well as performance evaluation.

Regarding the role of Producer, Physicians assigned a value near the one given by the Leader. They claim that he had a great sense of direction for the execution of tasks, revealing highly motivated and dynamic staff, encouraging them to maintain a high productivity rate.

As Intermediary, this profile considered the Leader very slick and powerful. They consider that his image, appearance and reputation are much respected.

Finally regarding the role of Innovator, there are no major differences between the values presented by the leader and the values presented by the Physicians. They believed that the leader allowed constant adaptation and change based on a form of imaginative and creative thinking.

Leadership from CPL's perspective

From the CPLT point of view, Figure 7, we obtained a leader with a role of Innovative and Producer well marked. Innovative, because he facilitated adaptation to change as well as conceptualized and planned the necessary changes. In the role of the Producer, CPLT saw him as task-oriented, dedicated in the performance of activities, motivated, energetic and determined in the execution of functions.

On the other hand, the role of Facilitator was less marked, in respect of the encouragement of group effort, establishing cohesion and teamwork.

For this profile, the leader was much considered as Mentor, Intermediate and Monitor. As Mentor, the leader was accessible to the participation of everyone, so that all achieve their targets. The leader helped all group members to express themselves and feel supported. In the role of Intermediary, the leader was concerned in establishing and maintaining a basis of power in concluding agreements, commitments, negotiating and selling ideas. As Monitor, the leader presented a reasonable role in respect of orientation and information's organization, evaluating and responding to department's routine.

The leader as a Director should have taken the initiative not only in solving problems but also in progressing in new projects, setting goals, covering well defined objectives and delegating effectively to those eligible.

In the role of Coordinating the leader should have plan, organize and control all internal processes of the organization.

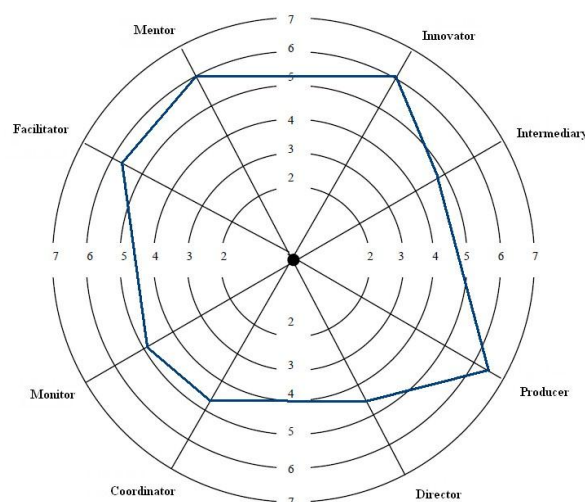


Figure 7: Leadership from the perspective of CPLT.

Findings

It could have been performed further analysis in relation to the Models of Organizational Culture detected in different profiles. It could even be proposed some changes of posture, procedures and work rules in order to align all perspectives.

While there will be different values, conflict is imminent or, in worse cases, achieved. The idea is that organizational culture is aligned in all profiles, with the vision of the Department of Cardiology and, ultimately, with HBA's vision.

To this end, how different professionals understand the organization, will lead them to act on that sense. As a consequence, the organization ends up changing in the same direction. From operational point of view, even small changes in the performance of professional have a significant impact on organizational performance.

However, this study intended to verify if the team was prepared for the change and if the leader had attitude to guide the team throughout the change.

In fact, in organizational terms, the cardiology department had a culture fairly balanced and much aligned, especially oriented to results, growth and adaptation. As it could be seen from the above analyzed results, the different subordinates consider the leader charismatic since he demonstrated adaptability and speed of response and gave emphasis to the relationship through open dialogue. Moreover, emphasized the emerging reality through self-overcoming. These are essential ingredients when changes lie ahead.

Furthermore, this is extremely important to compensate the fact that the Department of Cardiology, just like health facilities in general, is considered as a Loosely Coupled System (Orton, et al., 1990). Thus, the professional differences are compensated by the complementarities between the various functions, under the direction of an innovative leader, respected and engaged.

Therefore, we are able to start the Lean Action Plan in the Department of Cardiology, with guaranteed participation of all involved, so that everyone leads the department to Excellency in providing healthcare services of quality, in a sustainable way and with respect for all employees.

5.2 Processes improvement opportunities

When initiating a Lean Action Plan (Hines, et al., 2000), it is crucial to find an agent of change or a leader who will take personal responsibility for the lean transformation. It is important that he or she is entirely involved in lean purposes, techniques and implementation, considering it transversal to all systems and not confined to an isolated program. All employees must be aware of the intended transformation and actively participate in its design. Everyone's role is crucial for the success of Lean Implementation and it must be kept in mind that, for a limited period, all will have to increase their working efforts, but soon, will have a working environment optimized and with greater quality.

Since there are considerable differences between healthcare systems and departments, there have been implemented specific solutions tailored to the needs of HBA's cardiology department.

Verifying the department's readiness for change, the project took the advantage of the weekly team meetings to raise awareness of the concepts, principles and techniques of Lean Management. That was when it was established that the Clinical Director would lead this implementation in the department and the Lean strategy was planned (Appendix 4) and discussed.

Considering the various value points of view, the cardiology department wanted to provide value added activities in the different fronts that will meet customer perspective:

- The customer is willing to pay for a cardiology medical acts of quality;
- The cardiology department wants to eliminate unnecessary steps that cause too much wear and stress on human resources;
- The cardiology implemented workflow is intended to ensure elimination of delays, by organizing and standardizing the way services are provided;
- The work chain must guarantee that the allocation of work is realistic and achievable, avoiding passing work to the next shift or department.
- The Enterprise wants to make cardiology department a center of Excellency that provides effective, efficient and quality services, considering continuous improvement and respect for people.

The NNVA activities must be minimized to the least possible and the UNVA activities must be removed. So Lean Techniques must be applied to Cardiology's work processes in order to detect waste.

Find waste through Workflow diagram

Workflow diagram (spaghetti diagram) became more intuitive, for the cardiology team, in reflecting and analyzing their work processes. These were followed by the team from start to finish, with intent to identify improvement opportunities lying in their wastefulness and eventual lack of fluidity. Its design was used to represent all steps executed in providing cardiology services – consultations and examinations. From the patient point of view, every time he or she needs cardiology care, it might occur in three different situations:

1. **Emergency:** When a patient goes to the emergency room, after Manchester triage, is routed to an emergency appointment. Depending on the patient's clinical situation, the physician may prescribe a cardiology examination. After knowing the results, the patient can be submitted to a cardiology consulting, where a new examination can be prescribed. The technician or the cardiologist performs the examination. The technician initiates the report, which will be validated by the cardiologist. In the end, the patient may be referred to a cardiology inpatient episode or outpatient cardiology consultation.
2. **Inpatient:** Whenever a patient is hospitalized, inpatient consultations occur periodically, which may involve acts of Cardiology medical specialty, according to the priority of the medical act and availability of human resources and equipment. Some examinations might require some preparations like a period of fasting (six hours), and the presence of a nurse. For cardiology examinations, providers will need to move to the patient's bed and depending on the time of entry of various prescriptions inpatients, may have to travel the same path several times. The technician or the cardiologist performs the exam, the technician starts the report and the cardiologist validates it. There may be a need to repeat the examination or it may have a certain recurrence during hospitalization of the patient. In the end, the cardiologist may refer the patient to a consultation after discharge.

3. External/Follow-up: Outpatient clinic provides a total of 60 consultations per week that may include all kind of examinations. Therefore, at the time of consultation, it may be prescribed an examination that could be realized at the time or subsequently. Some examinations might also require some preparations like a period of fasting (six hours) and the presence of a nurse. When the time comes, the physician or the technician performs the examination, the technician starts the medical report and the physician validates it.

The team collected data in order to design the workflow in the patient movement perspective, along these three different medical episodes. Each one contains working cells that were eye opening for the team in detecting waste, as showed in Figure 11.

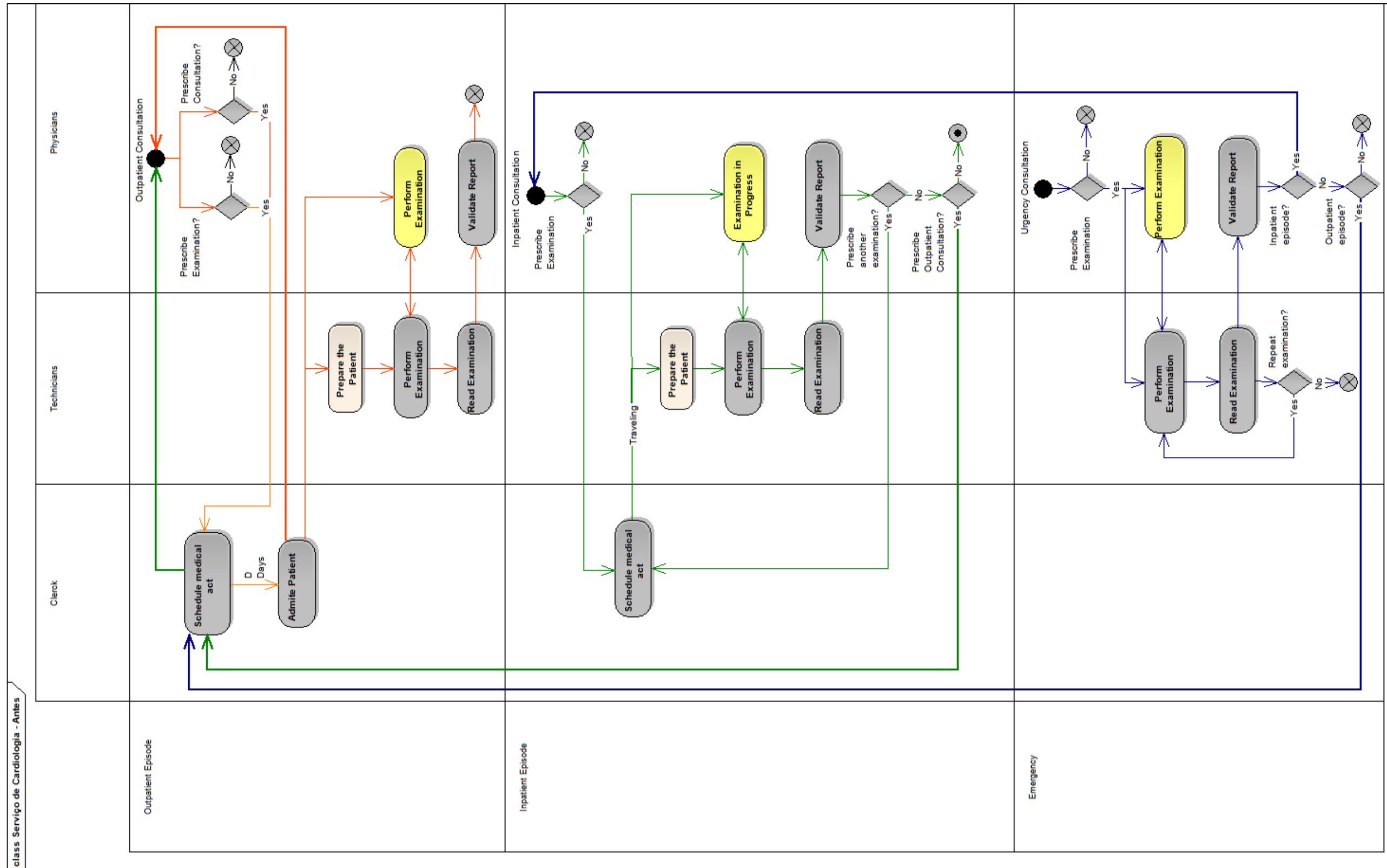


Figure 8: Cardiology Department Workflow Diagram

From the Workflow diagram, the team registered several wastes in the department, according to Lean philosophy perspective, which were:

- Patient waiting time (for treatment, for discharge, for diagnostics, etc.).
- Replacements not covered by bad scheduling;
- Demand for equipment / material;
- Errors (in use of equipment, etc.);
- Motion of human resources and equipment towards the patient;
- Human Potential (patient preparation is usually done by the auxiliary staff).

The use of this technique orients users to plan future improvements in each flow piece. To begin, the team decides to check in more detail the processes involved in conducting examinations in hospitalized patients.

Find waste through Value Stream Mapping

Since the concept of a Lean organization is that it has minimal unnecessary ‘fat’ built in and Value Stream Analysis (VSA) techniques are considered the key tools in developing such organizations, Value Stream Mapping (VSM) was the Lean technique used for this specific scenario.

Since VSA (Porras, 1987) is based on the idea that each service provided consists of a sequence of activities, each of them is designed to add some value to it as it moves towards the customer. However, there is also a component of waste associated with each activity and with the flow through the department, which also adds cost and unnecessary activities to the processes.

VSA involves drawing up a flow chart of the department’s workflow and then asking, at each stage whether cost, waste or value is being added, including the stages between activities. This often highlights unnecessary space, distance traveled, processing inefficiency, etc.

The main strength of VSA is that it quickly focuses on where change is needed and throws up opportunities for change. Another great characteristic of this technique is its versatility. It can be applied equally well to production activities as to services, making it more reliable and perfectly applicable to our case study.

The 4 key objects in the VSM are:

- Supplier - where orders enter the value stream;
- Inventory - where work waits to be processed;
- Process - where work is processed,
- Customer - where the value stream ends and is delivered to the customer.

After building the specific map of the workflow implemented in inpatient examinations, the whole team must agree on problems that occur between stages before starting any change for the improvement of the current situation.

So, the cardiology team designed, in more detail, the inpatient scenario workflow using this objects and inserting the corresponding parameters involved in providing particular healthcare services – inpatient examinations. The following parameters were considered for VSM:

- Frequency per shift – number examinations per shift;
- Distance item moved - movement of resources to achieve the patient our equipment;
- Value-Added time – time related to VA activities in the customer perspective;
- Cycle time – total time of an examination;
- People required – human resources involved in each activity;
- Preparation time – patient preparation duration that includes lying down the patient, preparation for the exam, in case it is necessary the introduction of anesthesia or contrast, among others.
- Throughput/time – total time to dispatch work.
- Waiting time between activities.

These variables allow the detection of NVA and resources actions. After analysis, it is possible to find out where these actions can be optimized through time-saving and cost-saving improvements. A secondary benefit of timing the process steps and measuring the rate of throughput is the identification of bottleneck step(s).

These can be redesigned to lift their capacity and so increase the output rate of the whole process. The variables are measured in each step, considering the lowest, average and highest value. Their variation is recorded and not just the average, because the

presence of variability offers great opportunity for improvement. This variability is represented by a normal distribution.

The actual state VSM was obtained for inpatient examinations, as showed in Figure 9.

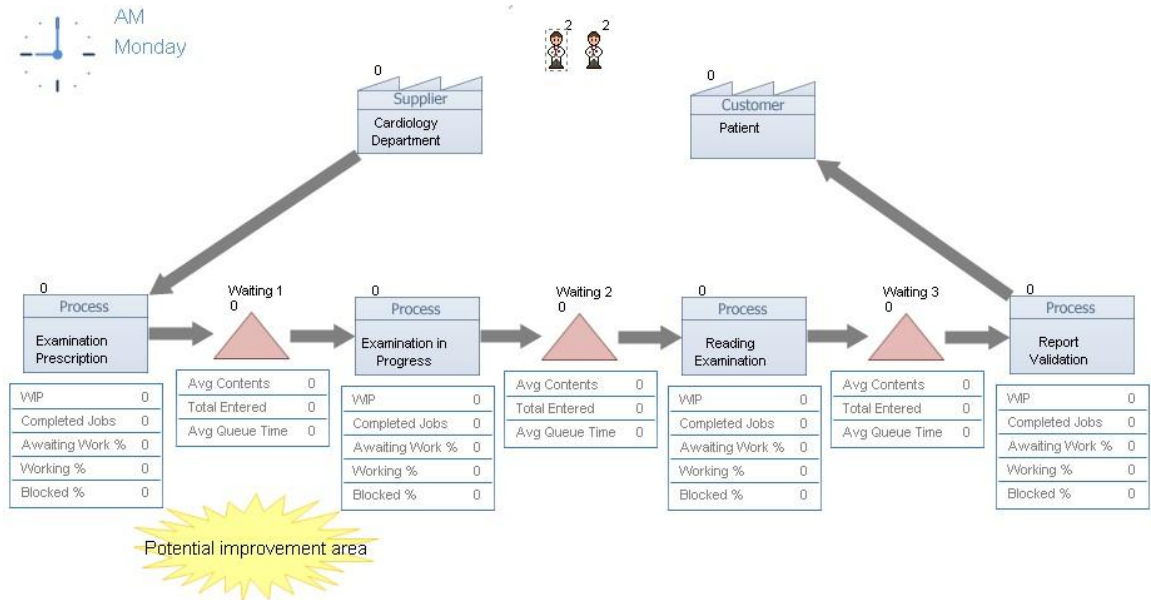


Figure 9: Actual State VSM.

The team establishes priorities, considering the most immediate improvement opportunity to take into account is the motion by human resources to provide healthcare services. This will be the first to undergo changes in order to reduce waste and the analysis will fall especially on it to highlight the consequences of implementing Lean Management.

The team agrees that traveling time can be reduced by allocating transportable inpatients in fixed examination rooms, every time this medical act is prescribed. This is especially important in the sense that performing the examination is dependent on the availability of resources and is not good practice to postpone it.

So, the team institutes that the inpatients that do not have clinical limitations to be transported will be forwarded by the auxiliary staff of the respective floors to an examination room, where they'll met all the human and physical resources needed to provide this cardiology service.

Findings

The Lean Action Plan was well planned since the Cardiology Team identified the leader of the project, became involved as a whole and predicted all necessary steps and their precedencies to ensure a correct diagnosis and practical results.

The choice of workflow diagram was pertinent because using this technique they had a more holistic view of all types of waste that were affecting their work processes. The limitations related to the fact that quality of the data collected depends on the accuracy of the information provided by participating employee were safeguarded by the involvement of the whole team.

The processes in health are very complex. Understand and decompose them simplifies their analysis. This is the reason for transiting from the workflow diagram to the Value Stream Mapping (VSM).

Creating a VSM for inpatients scenario, allowed the team to study in detail all the activities involved and more quickly detect the most critical and those that can be eliminated.

Given the physical and human resources available in the hospital without increasing additional costs, the team decides to adjust the workflow scenario-based inpatient and take advantage of examination rooms available in inpatient floors to centralize the examinations whenever it is clinically possible for the patient.

Set the appropriate solution in order to eliminate the motion of human resources, reduces the patient's waiting time to receive them and allows clinicians to focus their activities on providing healthcare services.

5.3 Lean Management consequences

Since Lean results can be obtained quicker and to a greater extent through the use of simulation technology (ProModel Corporation, 2012), it was used the Simul8[®]2012 software (all rights reserved to SIMUL8 Corporation), which allows simulations through dynamic value stream maps. This enables a real understanding of the department's processes and their implications, giving the chance to identify waste elimination opportunities by replacing user time estimation for time prediction, taking into account the random variation of reality.

Simulation also prevents negative effects on budgets and patient care, by making evidence based decisions with simulation. This methodology also enables to:

- Detect consequences of a planned change.
- Demonstrate that an investment will work before spending its costs.
- Gain insights into why the process behaves the way it does.
- Evaluate the cost saving that will come from changing the process.
- Find more suitable changes.
- Avoid experimental costs associated.
- Predict, in an accurate and detailed way, the cost savings through waste reduction.
- Identify the resources most critical in the working system at its best.
- Understand exactly how small changes impact the entire system's performance.
- Test out any number of changes and compare the results.
- Foresee the improvements in patients and in staff.
- Obtain visual and numerical feedback on the improvement idea's effectiveness.

Results of simulated data

To access to Data related to duration and frequency of examinations along and between workflow steps, was intended use databases available in the Cardiology's Department. Unfortunately, it would be necessary to perform specific queries so that they make sense for the study. Since it was not possible to perform it, given time constraints, it was decided to estimate these values. However, it must be taken into account that there were a considerable variability of execution and reading examination times, since they depend on the type of examination that is being considered.

However, as the time to perform the examination and reading are considered VA and the aim is to eliminate the NVA, it is interesting to study the trend of these results.

Shifts and human resources available in the inpatient episode were defined in the simulation according to the provisions of the Hospital. Data were simulated for a week's work, where the values of frequency subject to a normal distribution. VA and NVA activities were analysed through time graphics for the actual state, considering the estimated values in Appendix 5.

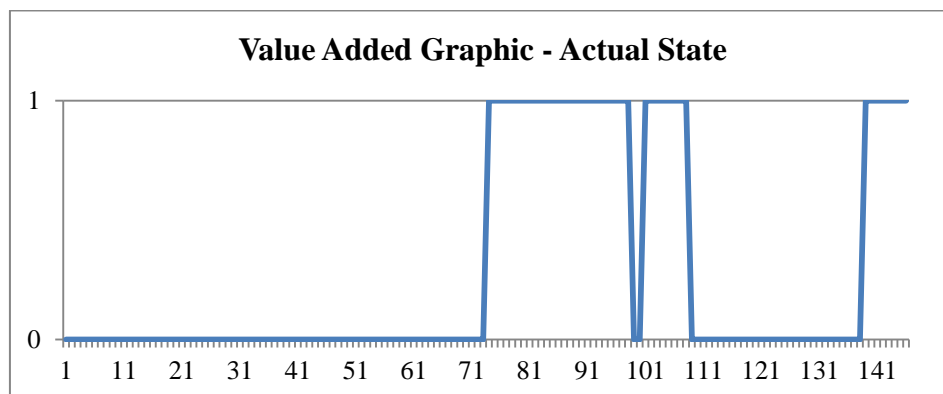


Figure 10: Value Added Graphic – Actual State.

As it can be seen in Figure 10, in the Actual State only 41 minutes represent value for the patient in the 145 minutes that lasts all the delivery and diagnostic examination's process provided to inpatients. This represents 28,3% of Throughput time.

Once again through the previous conditions of simulation, it was analyzed the impact of removing the travel time of resources (Waiting 1) towards the patient, whenever an examination is prescribed. In reality this would be possible by allocating transportable inpatients to examination rooms. VA and NVA activities were analysed through time

graphics for the future state, considering the estimated values in Appendix 5 except Travel Time (Waiting 1).

The future state was obtained, as presented in the following graphic VA:

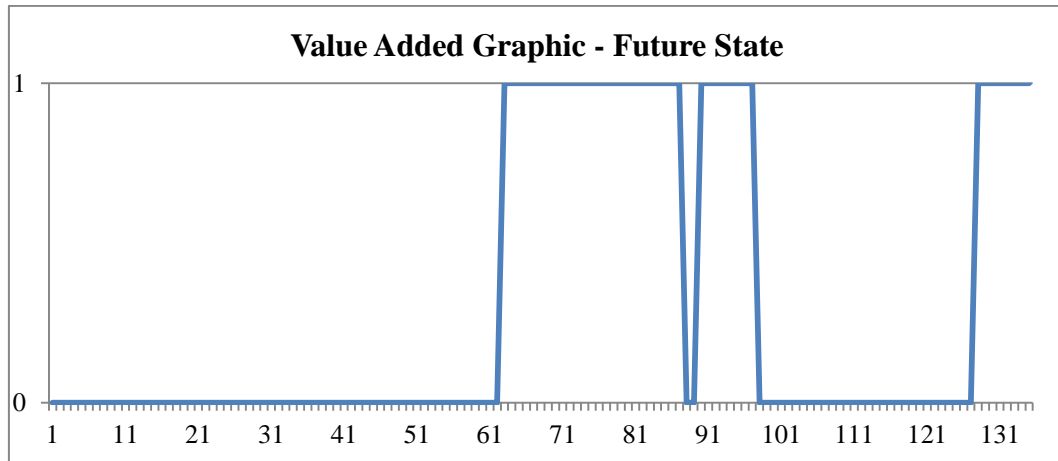


Figure 11: Value Added Graphic – Future State.

Looking at Future State, Figure 11, the total time to execute and diagnose an inpatient examination decreases to 135 minutes. Maintaining the 41 minutes that represent value for the patient, they now represent 30.4% of Throughput time.

Consequently, VA time increased 2.1% in relation to the total time of the medical procedure. With this change, it can be considered that for the patient the cardiology services are provided with greater efficiency and quality, since this change lead to patient time reduction in the system.

Also for the human resources, the fact that they won't have to travel the same path multiple times to provide care, decreases their fatigue and stress and allows them to devote more of their time in providing care.

As it can be seen in greater detail in the simulation reports of current state (Appendix 6) and the future state (Appendix 7), with this NVA time reduction, it is possible to increase the number of examinations per week. This means that the patient can be admitted to an examination earlier, with the implementation of this change.

Real Results

Without any finance charge and without risk inherent in finding the most appropriate solutions for achieving a leaner process, thanks to simulation, the team decides to implement it. Once the whole team has mobilized to allocate physical and human resources to examination rooms, qualitative results were immediately felt by the performers in the provision of health services.

Through phone calls and with the help of the auxiliary staff of the respective floors, the team could accept the entry of inpatients in the examination room whenever they were available instead of wasting time travel towards them. If for each patient travel decreased by at least 10 minutes of at the end of the week more patient will be received medical care.

In fact, it was also interesting to detect an increasing productivity along the months.

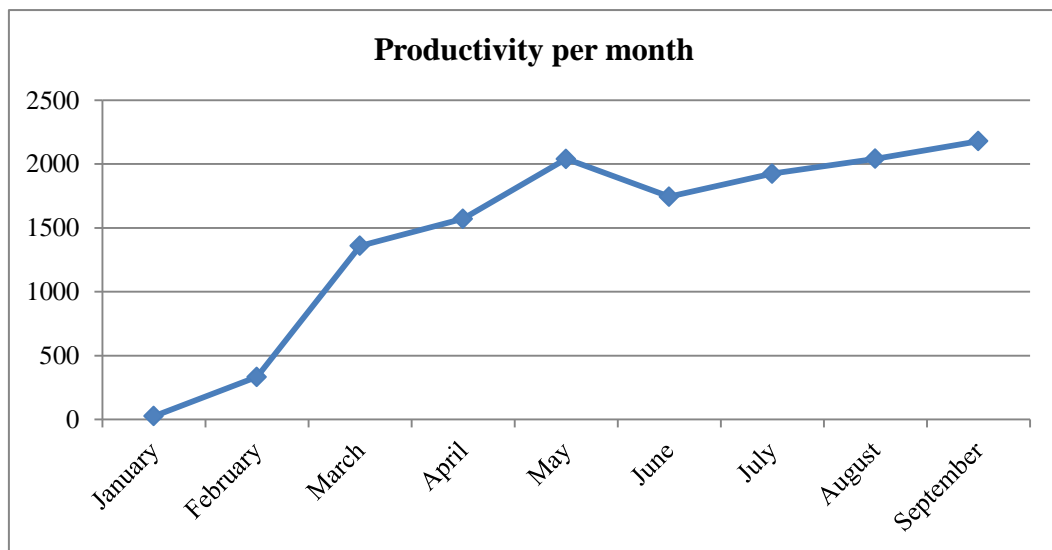


Figure 12: Cardiology's Department Productivity per month

Nevertheless, it must be considered that the trend is for the hospital to increase the number of users in the first opening months or even years, until it begins to stabilize. Also productivity is affected by seasonal hospital admission, for example, during summer most of the patients leave the city and during the winter there is a higher inflow in hospitals due to flu.

The fact is that there are more improvement opportunities and more analysis to be done in order to conduct Cardiology Department to a centre of Excellency.

Findings

Introducing simulation in this project was vital to not incur unnecessary risks and give users enough freedom to find the best solution to their case.

Despite the existence of information systems, it would be necessary spending some time to prepare the data acquire information related to execution and reading time of each type of examination. To get around this, there were used estimated data, running the risk of these not being accurate.

Lean Management is focus on wastes involved in processes and the evidence showed that removal of travelling times translates into lower patient handling in the system and a favourable ratio of VA time on the total cycle time.

In reality, the consequences of the implementation of Lean Management in cardiology service were detected in the qualitative sense of the processes. Indeed, brought to human resources the change to dedicate more of their time in providing care.

Although there may be several reasons for increasing on productivity, the simulation reports also reveals that resources are able to execute more inpatient examinations when eliminating wasting steps.

Conclusions and future developments

The aim of this study, introduction and analysis of Lean Management in Cardiology Department of a Portuguese Hospital, was reached. Indeed, the five principles were followed and accomplished during this project:

- Customer value was taken into account,
- Steps that were not creating value were eliminated,
- Processes involved in providing examinations in inpatients flow smoothly, since one of the causes of delay – traveling time – was eliminated,
- The resources and equipment were available as needed and
- People were aware and engaged in continuous improvement towards Excellency.

This concept has reinforced its usefulness in the Portuguese SNS by increasing productivity, optimizing processes and improving healthcare services quality, both for who provides and who receives cardiology services.

As it was demonstrated, the used approach has the great advantage in detecting improvement opportunities in any healthcare institution or department, with high accuracy. Through Workflow Diagrams and Value Stream Mapping (VSM) wastes were detected allowing team involved in the Lean project to proceed with effective solutions that increased the quality of services and the commitment of human resources. Moreover, Lean Management inspires all the involved ones in creating a center of Excellency in providing Healthcare services.

As it was described in the first chapter, the world is experiencing a global crisis and all actions for reducing waste are of relevant application. This is the reason why, their detection is of limited value nowadays. Since every institution, department or individual reacts in different ways there is no stipulated solution when applying Lean Management.

VSM presented itself as a flexible technique that gave the possibility to study processes and related variables that lead to some conclusions about the state of the cardiology department. It provided very important information about waiting times, unnecessary space, distance traveled, processing inefficiency, among others, and how they can adversely affect fluidity and efficiency of workflow.

So, this technique allowed the detection of data in terms of quality, beyond quantity, that until now were studied:

- Activities which were designed to add some value as they move towards the customer;
- Necessary non-value-added activities that should be minimized to the least possible and
- Unnecessary non-value-added activities that must be removed from the processes of providing healthcare services

Since change strategies were established by the team of Cardiology, one of recent principles was also considered– Respect of People. This way all working levels provided the best working conditions for the operating center professionals. This is extremely relevant because those are the ones that ultimately serve the customer, and who are likely to turn this department a national reference in differentiated cardiology services applied to adults.

Therefore, the research question was answered. The impact of Lean Management in the healthcare services provided by HBA's Cardiology Department was very positive since waste was detected and solutions were applied to eliminate it. The consequences of this implementation resulted in optimizing processes and increasing service quality.

To achieve this goal, three conditions were confirmed:

1. The readiness of the team for change, confirmed via analysis of Organizational Culture and Leadership.
2. Opportunities for improvement by detecting waste.
3. Monitoring the result from the elimination of waste.

However, there were some limitations in terms of methodology. Most of the study was based on estimated data when actual data would bring more credibility to the results achieved. The simulated data show a good influence of the elimination of waste but was not given the real impact of this change. Despite the examinations that are performed in the department of cardiology have very different durations and so the average is strongly influenced by non-standard values, they are always considered VA activities. Therefore, eliminating travel time will always result in a good impact for the staff and for patients who are awaiting their arrival.

An innovation used in this study was simulation. This allowed the test of the proposed solution without incrementing costs and transmit the necessary security to the team apply it in reality. This will enable them to discover and test the best solutions for future improvements.

The cardiology department detected more steps that must be changed and should pursue for even more NVA in order to follow continuous improvement of their processes in providing healthcare services. These improvements must always be applied over time considering proper and effective adaptation of all people involved as new rules, techniques and methods will arise with developments in the sector.

The Beatriz Ângelo Hospital as a whole must have in mind how these tiny and simple changes made so significant differences in processes in one single department, highlighting where unnecessary losses arise in weaknesses, especially in relationships between departments. So, stakeholders should overcome boundaries and extend Lean Management to other departments, in order to establish strategic improvements throughout the institution and becoming more competitive in the Portuguese National Healthcare Service and abroad. To do so, they must guarantee that information is prepared and centralized for this kind of analysis. They also have to praise this kind of initiatives and do everything under their control to involve employees and assure their engagement, even under their scarce labor availability. This way Partnering Principle is also achieved.

Indeed, Lean consciousness and methods are promising in converting healthcare institutions in Center of Excellency and just needs followers to accomplish this noble goal.

References

- Accounting for Management** Just in Time (JIT) Manufacturing and Inventory Control System [Online]// Accounting for Management. - 2012 a. - May 2012. - www.accountingformanagement.com/just_in_time.htm#Disadvantages%20of%20Just%20in%20Time%20Manufacturing%20System.
- Accounting for Management** Kabans [Online]// Accounting for Management. - 2012 b. - April 2012. - www.accountingformanagement.com/kanbans.htm#Advantages%20of%20Kanban.
- Administração Central de Serviços de Saúde** ACSS [Online]. - 2012 a. - August 2012. - <http://www.acss.min-saude.pt>.
- Administração Central do Serviço de Saúde** Contrato-Programa 2011 - Metodologia para definição de preços e fixação de objectivos. [Online]// ACSS. - November, 2010. - August 2012. - http://www.acss.min-saude.pt/Portals/0/14_12_2010_Metodologia%20HH_ULS%202011.pdf.
- Administração Central do Sistema de Saúde** Cuidados Primários de Saúde - Metodologia de Contratualização [Online]// ACSS. - Março 2012 b. - August 2012. - http://reap.ina.pt/bitstream/10782/582/1/Contratualizacao%20em%20saude%20_%20efectividade.pdf.
- Administração Central do Sistema de Saúde** Portal da Codificação Clínica e dos GDH [Online]. - January 2012 c. - 2012 August. - <http://portalcodgdh.min-saude.pt>.
- Allegro F.** Ranking dos Hospitais [Artigo]// Deco Proteste. - March de 2012. - March.
- Antunes Edite [et al.]** Contratualização em saúde – Efectividade do Sistema de Incentivos [Conference]// 8º Congresso Nacional de Administração Pública. - Lisbon : INA, 2011. - pp. 191-217.
- Associação Portuguesa de Economia da Saúde** Financiamento da Saúde em Portugal [Report] : Documento de Trabalho 4/97. - Lisbon : APES, 1997.
- Australasian Association of Clinical Biochemists** Proceedings of the Australasian Association of Clinical Biochemists [Conferência]// 46th Annual Scientific Conference. - Adelaide, AU : [s.n.], 2008.
- Bass B. M.,** Leadership Performance Beyond Expectations. [Livro]. - New York : Academic Press, 1985.
- Ben-Tovim David I. [et al.]** Lean thinking across a hospital: redesigning care at the Flinders Medical Center. [Jornal]// Australian Health Review. - Adelaide, AU : Csiro Publishing on behalf of the Australian Healthcare and Hospitals Association , 1 de February de 2007. - Vol. 31. - pp. 10-15.
- Béresniak Ariel e Duru Gérard** Economia da Saúde [Livro]. - Lisbon : Climpesi Editores, 1999.
- Blumberg B., Cooper D.R. e Schindler S.** Business Research Methods [Livro]. - [s.l.] : McGraw-Hill Higher Education, 2008. - 2th.
- Borley Craig** Hospital's shake-up gives nurses more time [Journal]// The New Zealand Herald. - Auckland, NZ : APN News & Media, March 12, 2008.
- Cabral A. [et al.]** Setúbal Lean Health [Conferência]// Setúbal Lean Health. - Setúbal : Associação Portuguesa de Engenharia e Gestão da Saúde, 2012. - CHS Hospital S. Bernardo.
- Cameron Kim S. e Quinn Robert E.** Diagnosing and Changing Organizational Culture [Livro]. - San Francisco, CA : Jossey-Bass, 2006.

- Castro Carolina, Nunes Rita and Pires Susana** Gestão das Unidades de Saúde e Liderança - Diagnóstico da Clínica ABC. - Lisbon : non published, 2010.
- Comissão para a Sustentabilidade do Financiamento do Serviço Nacional de Saúde** Relatório Final [Report] / Ministério da Saúde. - Lisbon : Ministério da Saúde, 2007.
- Contrato de Gestão** Contrato de Gestão // Hospital de Loures em regime de parceria publico-privada. - Lisbon : [s.n.], December 31, 2009. - pp. 1-176.
- Coons Jason A.** Beginning the Lean Improvement Journey in the Clinical Laboratory. - [s.l.] : Institute of Industrial Engineers, April de 2009.
- Crisp AB** Kaban [Online]. - April de 2012. - www.crisp.se/kanban.
- Direcção-Geral da Saúde DGS** [Online]. - 2011. - August 2012. - www.dgs.pt.
- Dowdeswell Barrie e Vauramo Erkki** EUREGIO III [Online] // Coxa Hospital, Tampere, Finland. - Euregio III, 2009. - June de 2012. - http://wiki.euregio3.eu/download/attachments/7209067/EUREGIO+III_+Krakow+WS_Coxa+hospital+case+study.pdf.
- Drucker Peter** Essential Drucker [Book]. - Oxford, UK : Butterworth-Heinemann, 2007.
- Drummond M. [et al.]** Methods for the Economic Evaluation of Health Care Programmes [Book]. - [s.l.] : Oxford University Press. - 3rd.
- Emiliani M.L.** Origins of lean management in America: The role of Connecticut businesses [Jornal] // Journal of Management History. - 2006. - 2 : Vol. 12. - pp. 167-184.
- Entidade Reguladora da Saúde ERS** [Online] // Caracterização do Acesso dos Utentes a Consultas de Cardiologia. - February 2009. - September 2012. - http://www.ers.pt/uploads/writer_file/document/84/Relatorio-Acesso-Cardiologia.pdf.
- Entidade Reguladora da Saúde ERS** [Online]. - 2012. - August de 2012. - www.ers.pt.
- Espírito Santo Saúde - SGPS** Hospital Beatriz Ângelo [Online]. - 2012. - September 2012. - <http://www.hbeatrizangelo.pt/pt/>.
- Faull Norman** Lean healthcare: learning via action research [Conferência] // POMS 18th Annual Conference. - Dallas, TX : Production and Operations Management Society (POMS), 2007.
- Fine Ben [et al.]** Leading Lean: A Canadian Healthcare Leader's Guide [Jornal] // Healthcare Quarterly. - Toronto : Rotman School of Management - The Collaborative for Health Sector Strategy, 2009. - Vol. 12. - pp. 26-35.
- Gamble TaShaunda** Standardized Work and Point of Use Storage [Conference] // ASQ Hudson Mohawk - Professional Development Meeting. - 2010.
- Grabam M.** Lean Hospitals – Improving Quality, Patient Safety and Employee Satisfaction [Book]. - [s.l.] : CRC Press, 2009.
- Hines Peter e Taylor David** Going Lean - A Guide to Implementation [Livro]. - Cardiff, UK : Cardiff Business School, 2000.
- Hines Peter** The Principles of the Lean Business System [Online] // Association for Tertiary Education Management. - Association for Tertiary Education Management, 2012. - September 2012. - www.atem.org.au/uploads/publications/-The_Principles_of_The_Lean_Business_System.pdf.
- Hohmann Chris** 7, 8 or 9 types of Waste [Online] / ed. Online HC. - 2012. - September 2012. - membres.multimania.fr/hconline/lean/9types_wastes.pdf.
- Hohmann Chris** Guide pratique des 5S pour managers et encadrants [Livro]. - [s.l.] : Edition d'organisation, 2009. - 2nd.
- Hollmer Mark** Lean production techniques gain traction at hospitals [Jornal] // Boston Business Journal. - Boston, MA : The Business Journals, September de 2007.
- Howell Jane M. e Shamir Boas** The role of followers in the charismatic leadership process: relationships and their consequences. [Artigo] // Academy of Management Review. - 2005. - Vol. 30. - pp. 96-112.

- Institute for Healthcare Improvement** [Online] // Going Lean in Health Care. IHI Innovation Series white paper / ed. Improvement Institute for Healthcare / prod. Miller D.. - Miller, D., 2005. - March de 2012. - <http://www.ihl.org/knowledge/Pages/IHIWhitePapers/GoingLeaninHealthCare.aspx>.
- Instituto Nacional de Estatística INE** [Online]. - 2012. - April 2012. - www.ine.pt.
- Jones Daniel and Mitchell Alan** Lean Thinking for the NHS [Book]. - London : NHS Confederation, 2006.
- Kirkpatrick Shelley A. e Locke Edwin A.** Leadership: Do traits matter? The Executive [Artigo] // Academy of Management Executive. - 1991. - Vols. 5, No.2. - pp. 48-60.
- Lean Enterprise Institute** Lean Enterprise Institute [Online]. - 2012. - April de 2012. - www.lean.org/whatslean/history.cfm.
- Lee T.** Fixing Health Care [Article] // Harvard Business Review. - April 2012. - pp. 49-73.
- Lefteroff Lewis e Graban Mark** Lean and Process Excellence at Kingston General [Jornal] // Lean Manufacturing. - Kingston, Ontario : SME, 2008. - pp. 53-57.
- Liker K.** The Toyota Way: 14 Management Principles from the World's Greatest Automaker [Livro]. - New York : McGraw-Hill, 2004. - pp. 28-29.
- Lourenço Alexandre [et al.]** Plano de Desempenho dos ACES [Online] // MCSP. - November 2009. - August 2012. - http://www.mcsp.min-saude.pt/Imgs/content/page_46/planodedesempenhoaces_2010.pdf.
- Martins Luís** Estratégia Participativa, Gestão de Unidades de Saúde. - Lisbon : ISCTE – IUL INDEG Business School (non published), 2010.
- Matos Luís, Esteves Simão e Romão José** Fórum Melhoria Continua na Saúde [Conferência]. - Lisboa : [s.n.], 2010.
- Mazzocato P. [et al.]** Lean thinking in healthcare: a realist review of the literature [Journal]. - [s.l.] : BMJ Quality & Safety, August 2010.
- Mazzocato Pamela [et al.]** How does lean work in emergency care? A case study of a lean-inspired intervention at the Astrid Lindgren Children's hospital, Stockholm, Sweden. [Livro]. - Stockholm : BioMed Central, 2012.
- McGivern Michael and Stiber Alex** Lean Manufacturing Techniques. - [s.l.] : Development Dimensions International, 2008.
- McLean Elspeth** Challenge to meet emergency dept goal [Journal] // Otago Daily Times. - Dunedin, NZ : [s.n.], September 9, 2009.
- Miller Richard e Behring Dade** Failure Mode and Effects Analysis (FMEA, FMECA) [Conferência]. - [s.l.] : Clinical and Laboratory Standards Institute, 2006.
- Ministério da Saúde** Ministério da Saúde [Online]. - 2012. - August 2012. - <http://www.min-saude.pt>.
- Mintzberg Henry** Structure et dynamique des organisations [Livro]. - Paris : Editions d'Organisation, 1982.
- MLG Management Consultants** 5S - The Housekeeping Approach Within Lean [Online]. - 2012. - April 2012. - www.mlg.uk.com/html/5s.htm.
- Moniz H.** Legislação de Direito da Medicina [Livro]. - [s.l.] : Coimbra Editora, 2008.
- Ohno Taiichi** Toyota Production System: Beyond Large-Scale Production [Book]. - [s.l.] : Productivity Press, 1988.
- Orton J. Douglas and Weick Karl E.** Loosely Coupled Systems: A Reconceptualization [Article] // Academy of Management Review. - Briarcliff Manor, NY : Academy of Management, April 1990. - Vol. 15. No.2. - pp. 203-223.
- Patel Sunil** The Evolution of Lean Thinking in the NHS [Online] // Atos Consulting & Technology Services. - Atos Healthcare, 2008. - June de 2012. -

<http://www.uk.atosconsulting.com/NR/rdonlyres/90311656-63FE-4FFB-B43E-1111B35F6402/0/21350608LeanThinkingintheNHSWP.pdf>.

Pierce Jon L. and Newstrom John W. Leaders and the Leadership Process: Readings, Self-Assessments and Applications [Book]. - Burr Ridge, IL : McGraw-Hill Higher Education, 2011. - 6th.

Porras Jerry Stream Analysis: A Powerful Way to Diagnose and Manage Organizational Change [Livro]. - Cambridge, UK : Prentice Hall, 1987.

ProModel Corporation Simulation and the Lean Enterprise [Online]. - 2012. - September de 2012. - https://www.promodel.com/challenge/WP_Lean.pdf.

Quin Robert E. Beyond rational management: mastering paradoxes and competing demands of high performance. [Conferência]. - S.Francisco : Jossey-Bass Pub, 1998.

Robbins L. An Essay on the Nature and Significance of Economic Science [Book]. - [s.l.] : Macmillan, 1932.

Robinson Harry Using Poka-Yoke Techniques for Early Defect Detection [Conferência] // Sixth International Conference on Software Testing Analysis and Review (STAR'97). - San Jose, CA : [s.n.], 1997.

Ross Graham Leankaizen [Online] // The Spaghetti Diagram. - 2010. - May 2012. - www.leankaizen.co.uk/spaghetti-diagram.html.

Salvada Pedro F-16 com gestão Lean. - Lisbon : Força Aérea Portuguesa, 2011.

Sarnsamak Pongphon Hospital management to become lean and mean [Journal] // The Nation. - Bangkok, Thailand : NMG News Co., September 2008.

Saskatoon Health Region The Region Reporter [Online]. - February de 2012. - May de 2012. - <http://regionreporter.wordpress.com/2012/02/07/1543/>.

Soares Lisa Combate ao desperdício na Saúde pode gerar poupança de 700 a 800 milhões de euros. [Article] // Jornal de Notícias. - Lisbon : [s.n.], January 17, 2012. - Global Notícias.

The Manufacturing Institute Practice Leaders Case Study Lean Transformation - Stockport NHS Foundation Trust [Online] // The Manufacturing Institute. - June de 2012. - <http://manufacturinginstitute.com/uploads/Stockport%20NHS%20Trust.pdf>.

The Organisation for Economic Co-operation and Development OECD Health Data 2012 [Online]. - 2012. - Fevereiro de 2012. - www.oecd.org/document/60/0,3746,en_2649_33929_2085200_1_1_1_1,00.h.

Tuckman B. Manual da investigação em educação [Book]. - Lisbon : Fundação Calouste Gulbenkian, 2000.

United States Environmental Protection Agency EPA [Online] // Lean Home. - 2012. - February 2012. - www.epa.gov/lean.

United States Environmental Protection Agency EPA [Online] // Lean Thinking and Methodst - Kaizen. - 2011 b. - April 2012. - www.epa.gov/lean/thinking/kaizen.htm.

United States Environmental Protection Agency EPA [Online] // Lean Thinking and Methods - TPM. - 2011 a. - May de 2012. - www.epa.gov/lean/environment/methods/tpm.htm.

United States Environmental Protection Agency EPA [Online] // Lean Manufacturing and Environment - Case Studies & Best Practices. - 2011 c. - May 2012. - www.epa.gov/lean/environment/studies/index.htm.

University of Cape Town University of Cape Town – Newsroom and Publications [Online] // Landmark institute for lean operations a first for Africa. - October 2004. - May 2012. - <https://www.uct.ac.za/mondaypaper/archives/?id=4822>.

VanRooy Donna Implementing Lean in Healthcare [Conferência]. - Ohio : Baldwin-Wallace College, 2012.

Weber Max The Theory of Social and Economic Organization [Livro]. - New York : Oxford University Press, 1993.

Williams Liza Follow Royal's Example on waiting lists, hospital told [Journal] // Liverpool Daily Post. - Liverpool : [s.n.], June 13, 2008. - <http://www.liverpooldailypost.co.uk/liverpool-news/regional-news/2008/06/13/follow-royal-s-example-on-waiting-lists-hospitals-told-64375-21067421>.

Womack J. e Jones D. Lean Thinking: Banish Waste and Create Wealth in Your Corporation [Livro]. - New York : Free Press, 2003.

Womack J., Jones D. and Roos D. The Machine That Changed the World [Book]. - New York : Rawson Associate, 1990.

Wood Ben D. e Killion Jeffrey B. Burnout Among Healthcare Professionals [Artigo] // AHRA - Radiology Management. - [s.l.]: The Association for Medical Imaging Management, November/December de 2007. - pp. 30-37.

World Health Organization WHO [Online]. - 2012 a. - Abril de 2012. - www.who.int.

World Health Organization WHO/Europe home page [Online] // Patient safety. - 2012 b. - May 2012. - <http://www.euro.who.int/en/what-we-do/health-topics/Health-systems/patient-safety/facts-and-figures>.

Appendix 1

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
United States	13,7	14,3	15,2	15,7	15,7	15,7	15,8	16,0	16,4	17,4	
France	10,1	10,2	10,5	10,9	11,0	11,1	11,0	11,0	11,1	11,8	
Germany	10,3	10,4	10,6	10,8	10,6	10,7	10,6	10,5	10,7	11,6	
Switzerland	10,2	10,6	10,9	11,3	11,3	11,2	10,8	10,6	10,7	11,4	11,6
Austria	9,9	10,1	10,1	10,3	10,4	10,4	10,3	10,3	10,4	11,0	
Denmark	8,7	9,1	9,3	9,5	9,7	9,8	9,9	10,0	10,3	11,5	
Canada	8,8	9,3	9,6	9,8	9,8	9,8	10,0	10,0	10,3	11,4	11,3
Belgium	8,1	8,3	8,5	10,0	10,2	10,1	9,6	9,7	10,1	10,9	
Portugal	9,3	9,3	9,3	9,8	10,1	10,4	10,1	10,0	10,1		11
Netherlands	8,0	8,3	8,9	9,8	10,0	9,8	9,7	9,7	9,9	12,0	
New Zealand	7,6	7,7	8,0	7,9	8,3	8,7	9,1	8,8	9,6	10,3	
Sweden	8,2	8,9	9,2	9,3	9,1	9,1	8,9	8,9	9,2	10,0	
Iceland	9,5	9,3	10,2	10,4	9,9	9,4	9,1	9,1	9,1	9,7	9,3
Italy	8,1	8,2	8,3	8,3	8,7	8,9	9,0	8,7	9,0	9,5	9,6
Spain	7,2	7,2	7,3	8,2	8,2	8,3	8,4	8,5	9,0	9,5	
United Kingdom	7,0	7,2	7,6	7,8	8,0	8,2	8,5	8,4	8,8	9,8	
Ireland	6,1	6,7	7,1	7,4	7,6	7,6	7,5	7,7	8,8	9,5	
Australia	8,0	8,1	8,4	8,3	8,5	8,4	8,5	8,5	8,7		
Norway	8,4	8,8	9,8	10,0	9,7	9,1	8,6	8,9	8,6	9,6	
Japan	7,7	7,9	8,0	8,1	8,1	8,2	8,2	8,2	8,5		
Slovenia	8,3	8,6	8,6	8,6	8,4	8,4	8,3	7,8	8,4	9,3	
Finland	7,2	7,4	7,8	8,2	8,2	8,4	8,4	8,1	8,4	9,2	8,9
Slovak Republic	5,5	5,5	5,6	5,8	7,2	7,0	7,3	7,7	8,0	9,1	
Israel	7,5	8,0	7,9	7,9	7,8	7,8	7,6	7,6	7,7	7,9	
Chile	6,6	6,8	6,7	7,5	7,1	6,9	6,6	6,9	7,5	8,4	
Hungary	7,0	7,1	7,5	8,3	8,0	8,3	8,1	7,5	7,2	7,4	
Czech Republic	6,5	6,7	7,1	7,4	7,2	7,2	7,0	6,8	7,1	8,2	
Poland	5,5	5,9	6,3	6,2	6,2	6,2	6,2	6,4	7,0	7,4	
Luxembourg	7,5	7,4	8,3	7,7	8,2	7,9	7,7	7,1	6,8	7,8	
Korea	4,5	5,1	4,9	5,2	5,3	5,7	6,0	6,3	6,5	6,9	7,0
Estonia	5,3	4,9	4,8	5,0	5,1	5,0	5,0	5,2	6,1	7,0	
Turkey	4,9	5,2	5,4	5,3	5,4	5,4	5,8	6,0	6,1		
Mexico	5,1	5,5	5,6	5,8	6,0	5,9	5,7	5,8	5,8	6,4	6,1
Greece	7,9	8,8	9,1	8,9	8,7	9,6	9,6	9,6			

Source: OECD Health Data 2011.

Appendix 2

AVALIAÇÃO DOS MODELOS DE GESTÃO

Adaptado de
Robert E. Quinn
Beyond rational management:
mastering the paradoxes and competing
demands of high performance
(Capítulo 9, pp. 144 a 147)
Jossey-Bass Pub., S. Francisco, 1998

INSTRUÇÕES

Cada item apresenta quatro descrições de organizações. Distribua 100 pontos pelas quatro descrições tendo em conta a semelhança da descrição apresentada com a da sua organização. Nenhuma das descrições é melhor do que as outras, são apenas diferentes. Para cada questão, utilize o máximo de 100 pontos.

Na questão 1, por exemplo, se a organização A parece similar à sua, se a B parece um pouco semelhante e se a C e a D não são nada parecidas, pode atribuir 70 pontos à A e dar os restantes 30 à B.

QUESTIONÁRIO SOBRE MODELOS DE GESTÃO

1. Características dominantes (distribua 100 pontos)

- a) A organização de saúde A é muito pessoal. É como uma grande família. As pessoas estão dispostas a partilhar os seus problemas.
- b) A organização de saúde B é muito dinâmica e empreendedora. As pessoas estão dispostas a correr riscos.
- c) A organização de saúde C é muito estruturada e formalizada. Os procedimentos burocráticos regem normalmente o que as pessoas fazem.
- d) A organização de saúde D está muito orientada para os resultados. A maior preocupação consiste nos resultados/números alcançados. Os indivíduos são orientados para o desempenho e produtividade.

2. Líder organizacional (distribua 100 pontos)

- a) O líder da organização de saúde A é geralmente considerado como sendo um mentor, um facilitador, uma pessoa atenta aos problemas humanos do seu pessoal.
- b) O líder da organização de saúde B é geralmente considerado como um empreendedor, um inovador ou um indivíduo que aceita desafios.
- c) O líder da organização de saúde C é normalmente designado como sendo um coordenador, um organizador ou um profissional eficiente.
- d) O líder da organização D é de uma maneira geral considerado como um grande director, produtivo e competitivo, orientado para os resultados.

3. Princípio organizacional (distribua 100 pontos)

- a) A base sobre a qual se mantém a organização A, é a lealdade e a implicação. A coesão e o trabalho de equipa são característicos desta organização.
- b) A base sobre a qual se mantém a organização B é a preocupação com o desenvolvimento e inovação.
- c) Os princípios que regem a organização C são os princípios formais, regras e procedimentos detalhados. É importante manter um funcionamento regular.
- d) A preocupação com a produção e a consecução de objectivos, são os princípios fundamentais que regem a organização D. Enfatiza-se um posicionamento centrado nos números/resultados.

4. Clima organizacional (distribua 100 pontos).

- a) O clima da organização A é agradável e participativo. Existe uma grande abertura e confiança.
- b) O clima da organização B caracteriza-se pela inovação, criatividade e vontade de enfrentar novos desafios. Privilegia-se a mudança e o desenvolvimento.
- c) O clima da organização C caracteriza-se pelo rigor e clareza. Os procedimentos são claros.
- d) O clima da organização D é competitivo e conflituoso. Dá-se ênfase aos resultados alcançados

5. Critérios de sucesso (distribua 100 pontos)

- a) A organização A define o sucesso com base no desenvolvimento dos recursos humanos, no trabalho em equipa e na preocupação com as pessoas.
- b) A organização B define o sucesso com base na posse de competências únicas e capacidade de desenvolver acções que outros serviços similares não fazem . É inovadora e em certas áreas de actuação é referenciada como a melhor do género em Portugal.
- c) A organização C define o sucesso com base na manutenção da actividade diária, evitando sobressaltos. O cumprimento das normas e rotinas é assegurado e são os pontos chave desta organização.
- d) A organização D determina o sucesso com base no número de actos praticados e no número de doentes tratados .Os objectivos numéricos a alcançar norteiam toda a actividade do serviço.

6. Estilo de Gestão (distribua 100 pontos)

- a) O estilo de gestão na organização A é caracterizado pelo trabalho de equipa, consenso e participação.
- b) O estilo de gestão na organização B caracteriza-se pela iniciativa individual, inovação, liberdade e originalidade.
- c) O estilo de gestão na organização C é caracterizado pela manutenção da actividade normal sem sobressaltos, cumprimento das rotinas e assegurando a previsibilidade.
- d) O estilo de gestão na organização D é caracterizado por uma forte competitividade, produção e desempenho centrado nos resultados.

Avaliação dos Comportamentos Empresariais: A Perspectiva Pessoal

Adaptado de
Robert E. Quinn
Beyond Rational Management:
Mastering the Paradoxes and Competing
Demands of High Performance
(capítulo 9, pp. 127-130)
Jossey-Bass Pub., S. Francisco, 1988

GC.E.008

INSTRUÇÕES

Na lista seguinte são descritos alguns comportamentos de gestão. A sua tarefa consiste em indicar até que ponto se enquadra nesses comportamentos.

Utilize uma escala de sete pontos, a seguir apresentada, para responder a cada questão, tendo em conta que 1 corresponde a “muito raramente” e 7 corresponde a “muito frequentemente”.

QUESTIONÁRIO

Ao executar o meu trabalho, eu:

- | | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|
| 1. | Escuto os problemas pessoais dos subordinados. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 2. | Revejo meticulosamente relatórios detalhados. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 3. | Influencio as decisões tomadas nos níveis superiores. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. | Resolvo os problemas de uma forma inteligente e criativa. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 5. | Defino claramente áreas de responsabilidade para os meus subordinados. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 6. | Envolve-me de modo sincero e pessoal no trabalho. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 7. | Facilito a criação de consensos nas reuniões de trabalho em grupo. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8. | Garanto a boa continuidade das operações diárias. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9. | Comparo registos, relatórios, etc. com o objectivo de neles detectar alguma discrepância. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 10. | Mostro empatia e preocupação ao lidar com os meus subordinados. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 11. | Estabeleço objectivos claros para a minha unidade de trabalho. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 12. | Procuro inovações e potenciais melhorias. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 13. | Preocupo-me em manter uma rede de contactos influentes. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 14. | Procuro que o meu ritmo de trabalho não seja interrompido. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 15. | Procuro demonstrar uma grande motivação no desempenho das minhas funções. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 16. | Encorajo a participação nas tomadas de decisão nas reuniões de trabalho em grupo. | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Avaliação dos Comportamentos Empresariais: A Perspectiva dos Outros

Adaptado de
Robert E. Quinn
Beyond Rational Management:
Mastering the Paradoxes and Competing
Demands of High Performance
(capítulo 9, pp. 130-132)
Jossey-Bass Pub., S. Francisco, 1988

GC.E.009

1

INSTRUÇÕES

No questionário seguinte são descritos alguns comportamentos de gestão. A sua tarefa consiste em pedir aos seus subordinados que indiquem até que ponto você se enquadra nesses comportamentos.

Os inquiridos deverão utilizar uma escala de sete pontos, a seguir apresentada, para responder a cada questão, tendo em conta que 1 corresponde a “muito raramente” e 7 corresponde a “muito frequentemente”.

Appendix 3

Organizational Culture - CPL Technicians

Profile	Question	Value	Profile	Question	Value	Profile	Question	Value	Profile	Question	Value		
CPL 1	1.A	30	CPL2	1.A	5	CPL 3	1.A	0	CPL 4	1.A	5		
	2.A	10		2.A	10		2.A	0		2.A	5		
	3.A	10		3.A	15		3.A	0		3.A	5		
	4.A	40		4.A	20		4.A	0		4.A	10		
	5.A	30		5.A	20		5.A	0		5.A	30		
	6.A	40		6.A	20		6.A	0		6.A	10		
	Mean	27		Mean	15		Mean	0		Mean	11	Mean - A	14
	1.B	40		1.B	5		1.B	0		1.B	5		
	2.B	10		2.B	30		2.B	50		2.B	5		
	3.B	40		3.B	15		3.B	0		3.B	5		
	4.B	20		4.B	20		4.B	20		4.B	30		
	5.B	20		5.B	20		5.B	0		5.B	5		
	6.B	15		6.B	10		6.B	0		6.B	10		
	Mean	24		Mean	17		Mean	12		Mean	10	Mean - B	16
	1.C	15		1.C	50		1.C	30		1.C	10		
	2.C	40		2.C	30		2.C	50		2.C	5		
	3.C	20		3.C	35		3.C	40		3.C	20		
	4.C	20		4.C	30		4.C	20		4.C	10		
	5.C	30		5.C	30		5.C	30		5.C	15		
	6.C	40		6.C	40		6.C	50		6.C	30		
	Mean	28		Mean	36		Mean	37		Mean	15	Mean - C	29
	1.D	15		1.D	40		1.D	70		1.D	80		
	2.D	40		2.D	30		2.D	0		2.D	85		
	3.D	30		3.D	35		3.D	60		3.D	70		
4.D	20	4.D	30	4.D	60	4.D	60						
5.D	20	5.D	30	5.D	70	5.D	50						
6.D	5	6.D	30	6.D	50	6.D	50						
Mean	22	Mean	33	Mean	52	Mean	66	Mean - D	43				

Organizational Culture - Physicians

Profile	Question	Value
Physician	1.A	10
	2.A	10
	3.A	10
	4.A	10
	5.A	10
	6.A	40
	Mean – A	15
	1.B	10
	2.B	30
	3.B	10
	4.B	40
	5.B	50
	6.B	0
	Mean – B	23
	1.C	40
	2.C	30
	3.C	50
	4.C	10
	5.C	30
	6.C	20
	Mean – C	30
	1.D	40
	2.D	30
	3.D	30
	4.D	40
	5.D	10
	6.D	40
	Mean – D	32

Leadership in perspective of others - CPL Technicians

Profile	Question	Value	Profile	Question	Value	Profile	Question	Value	Profile	Question	Value	Mean
		7 6			7 6			7 4			7 6	
		16 7			16 6			16 4			16 7	
	Facilitator	6,5		Facilitator	6		Facilitator	4		Facilitator	6,5	5,75
		1 7			1 7			1 4			1 6	
		10 7			10 7			10 4			10 6	
	Mentor	7		Mentor	7		Mentor	4		Mentor	6	6
		4 6			4 7			4 5			4 6	
		12 7			12 7			12 5			12 5	
	Innovative	6,5		Innovative	7		Innovative	5		Innovative	5,5	6
		3 4			3 3			3 7			3 3	
		13 6			13 4			13 6			13 5	
CPL1	Intermediary	5	CPL2	Intermediary	3,5	CPL3	Intermediary	6,5	CPL4	Intermediary	4	4,75
		6 7			6 7			6 5			6 7	
		15 7			15 7			15 5			15 7	
	Producer	7		Producer	7		Producer	5		Producer	7	6,5
		5 6			5 7			5 3			5 4	
		11 6			11 7			11 5			11 6	
	Director	6		Director	7		Director	4		Director	5	5,5
		8 6			8 7			8 5			8 6	
		14 5			14 7			14 3			14 6	
	Coordinator	5,5		Coordinator	7		Coordinator	4		Coordinator	6	5,625
		2 5			2 7			2 5			2 7	
		9 6			9 6			9 5			9 6	
	Monitor	5,5		Monitor	6,5		Monitor	5		Monitor	6,5	5,875

Leadership in perspective of others – Physicians

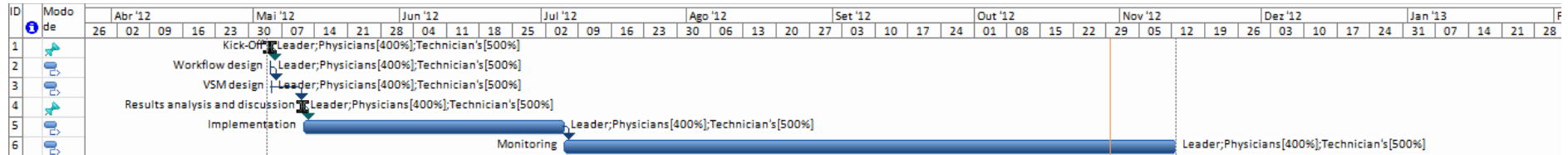
Profile	Question	Value
Physician		7 4
		16 4
	Facilitator	4
		1 4
		10 6
	Mentor	5
		4 4
		12 7
	Innovative	5,5
		3 6
		13 6
	Intermediary	6
		6 7
		15 6
	Producer	6,5
		5 4
	11 6	
Director	5	
	8 5	
	14 5	
Coordinator	5	
	2 6	
	9 6	
Monitor	6	

Leadership in personal perspective

Profile	Question	Value
Leader		7 7
		16 7
	Facilitador	7
		1 5
		10 6
	Mentor	5,6
		4 5
		12 7
	Innovative	6
		3 3
		13 3
	Intermediary	3
		6 7
		15 7
	Producer	7
		5 6
	11 7	
Director	6,5	
	8 6	
	14 7	
Coordinator	6,5	
	2 3	
	9 2	
Monitor	2,5	

Appendix 4

Lean Project Plan



Appendix 5

Provider	Frequency per shift – unpredictable
Process - Examination Prescription	Distance item moved - 0 min
	Cycle time – 2 min
	Value-Add time – 0 min
	People required – 1 Physician
	Preparation time – 0 min
Waiting 1	Waiting Time - 60 min
	Travel Time - 10 min
Process - Examination	Distance item moved - 10 min
	Cycle time – 25 min
	Value-Add time – 25 min
	People required – 1 Physician, 1 CPL Technician
	Preparation time – 10 min
Waiting 2	Waiting Time - 2 min
Process - Examination Reading	Distance item moved - 0 min
	Cycle time – 8 min
	Value-Add time – 8 min
	People required – 1 CPL Technician
	Preparation time – 0 min
Waiting 3	Waiting Time - 30 min
Process - Report Validation	Distance item moved - 0 min
	Cycle time - 8 min
	Value-Add time – 8 min
	People required – 1 Physician
	Preparation time – 0 min

Appendix 6

Report – All Objects Results Before Lean Thinking Implementation

Start Points														
		Number Entered	Number Lost	Net Number Entered										
Cardiology Department	79	0	79											
Activities														
	Waiting %	Working %	Blocked %	Stopped %	Number Completed Jobs	Minimum use	Average use	Maximum use	Current Contents	Change Over %	Off Shift %	Resource Starved %		
Examination Prescription	93,245	6,755	0	0	79	0	0,063	1	0	0	0	0		
Examination in Progress	30,141	33,044	0	0	77	0	0,325	1	0	0	0	36,815		
Reading Examination	44,772	25,719	0	0	77	0	0,252	1	0	0	0	29,509		
Report Validation	42,968	27,524	0	0	76	0	0,285	1	0	0	0	29,509		
Queues														
	Minimum queue size	Average queue size	Maximum queue size	Minimum Queuing Time	Minimum (non-zero) Queuing Time	Average Queuing Time	Average (non-zero) Queuing Time	Maximum Queuing Time	Number of non zero queuing times	% Queued less than time limit	"Queued less than" time	St Dev of Queuing Time	Current Contents	Items Entered
Waiting 1	0	2,01	3	60	60	61,633	61,633	69,83	77	0	10	3,001	2	79
Waiting 2	0	0,063	1	2	2	2	2	2	77	100	10	0	0	77
Waiting 3	0	0,421	1	10	10	13,655	13,655	22,968	76	0	10	3,681	1	77

Ends

	Average Time in System	Number Completed	"In System less than" time	% In System less than time limit	St Dev of	Maximum Time in System	Minimum Time in System
Patient	111,168	76	10	0	5,622	127,023	95,932

Resources

	Utilization %	Minimum Use	Current Use	Average Use	Maximum Use	Traveling %
CPL Technicians	52,232	0	0	0,588	1	0,004
Cardiologists	53,836	0	0	0,606	2	0,004

Appendix 7

Report – All Objects Results After Lean Thinking Implementation

Start Points														
	Number Entered	Number Lost	Net Number Entered											
Cardiology Department	81	0	81											
Activities														
	Waiting %	Working %	Blocked %	Stopped %	Number Completed Jobs	Minimum use	Average use	Maximum use	Current Contents	Change Over %	Off Shift %	Resource Starved %		
Examination Prescription	93,262	6,738	0	0	81	0	0,065	1	0	0	0	0		
Examination in Progress	27,013	32,871	0	0	79	0	0,319	1	0	0	0	40,116		
Reading Examination	40,619	26,51	0	0	79	0	0,246	1	0	0	0	32,871		
Report Validation	42,185	24,944	0	0	78	0	0,26	1	0	0	0	32,871		
Queues														
	Minimum queue size	Average queue size	Maximum queue size	Minimum Queuing Time	Minimum (non-zero) Queuing Time	Average Queuing Time	Average (non-zero) Queuing Time	Maximum Queuing Time	Number of non zero queuing times	% Queued less than time limit	"Queued less than" time	St Dev of Queuing Time	Current Contents	Items Entered
Waiting 1	0	2,058	3	60	60	61,515	61,515	72,064	79	0	10	2,672	2	81
Waiting 2	0	0,079	1	2	2	2	2	2	79	100	10	0	0	79
Waiting 3	0	0,425	1	10	10	13,409	13,409	24,386	78	0	10	3,983	1	79

Ends

	Average Time in System	Number Completed	"In System less than" time	% In System less than time limit	St.Dev of	Maximum Time in System	Minimum Time in System
Customer 1	109,081	78	10	0	6,544	121,774	96,283

Resources

	Utilization %	Minimum Use	Current Use	Average Use	Maximum Use	Travelling %
CPL Technicians	59,381	0	0	0,594	1	0
Cardiologists	57,815	0	0	0,578	1	0