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**THE APPLICATION OF LEAN PHILOSOPHY IN THE
MANAGEMENT OF ELDERLY PATIENTS BY HEALTH
INSURANCE COMPANIES: A CASE STUDY**

Rio de Janeiro

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Master's Dissertation presented to the Instituto Coppead de Administração, Universidade Federal do Rio de Janeiro, as part of the mandatory requirements in order to obtain the degree of Master of Business Administration (M.Sc.).

Supervisor: Claudia Affonso Silva Araújo

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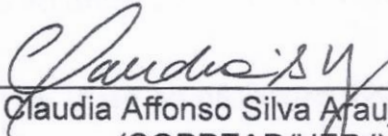
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ABSTRACT

Figueiredo, Alvaro H. P. D.. **The Application of Lean Philosophy in the Management of Elderly Patients by Health Insurance Companies: A Case Study.** Rio de Janeiro, 2019. Master Dissertation in Business Administration – Coppead Graduate School of Business, The Federal University of Rio de Janeiro, Rio de Janeiro, 2019.

In the context of the rising healthcare costs and the ageing of the population in Brazil, the objective of this dissertation is to understand how lean philosophy principles can be applied in the management of elderly patients by health insurance companies. Currently, Brazil has a significant portion of its population insured by private healthcare companies, which haven't been willing to create health insurance products for the elderly segment of the population. On the other hand, the demand for healthcare for the elderly has been growing as the Brazilian population has been ageing rapidly. Although there has been research regarding lean thinking applied to healthcare in Brazil, there haven't been studies applying it to the management of elderly patients. In order to look for a solution for the complex problem of the rise in the healthcare costs and growth in the elderly population, while filling this gap in the literature, this research has investigated how the lean principles from Womack and Jones (1996) can be applied in the management of this older public through a case study in one Brazilian health insurance company based in São Paulo. This company was chosen because it is an exception in the industry as most of its clients are elderly and have individual insurance plans. Additionally, this company has been adopting lean thinking techniques on its operation with the support of its CEO. This case study has been constructed mostly through interviews with this company's employees. In these conversations, these employees were able to describe the implementation of lean principles in the company and their perception regarding the benefits and the problems that their adoption can bring. This study concluded that lean thinking principles can be applied in the management of elderly patients by these companies as these principles generally increase the value of the service delivered to the elderly patient while maintaining costs under control and insurance premia affordable.

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Summary

1. Introduction	7
1.1 The dissertation and its objectives	7
1.2. Questions to be answered by this Research	7
1.3 Context and Relevance of this study	9
1.3.1 The Context	9
1.3.2 The Relevance of the study	13
1.4. Delimitation of the study	14
1.5. Dissertation structure	15
2. Literature Review	16
2.1 Delimitation of the Literature Review	16
2.2 Ageing Population and Healthcare	16
2.2.1 Ageing Society	16
2.2.2 Anti-Ageing Medicine and Quality of Life	18
2.2.3 Health insurance worldwide	18
2.2.4 Elderly Care Growing Costs	20
2.3 The Lean Concept	22
2.4 From Lean Thinking to Lean Healthcare	28
3. Research Method Discussion	35
3.1 Definition of a research question	35
3.2 Research Method	36
3.3 Case selection	36
3.4 Data Collection	37
3.5 Limitations of the method	39
4. Case description	40
4.1 The company	40
4.2 Lean Thinking in Present Senior	40
4.2.1 Lean thinking dissemination in Prevent Senior	40
4.2.2 Examples of lean initiatives in Prevent Senior	42
4.2.3 Perception of Lean philosophy principles within the company	46
5. Case Analysis	50
5.1 The use of the lean principles in Prevent Senior	50

5.2 Additional Analysis of Lean Practices at Prevent Senior 53

6. Conclusion and recommendations 57

6.1 Summary of the Research 57

6.2 Conclusions 57

6.3 Theoretical and Managerial implications 60

6.4 Future Research 61

References 63

1. Introduction

1.1 The dissertation and its objectives

This study discusses the use of the lean thinking philosophy in the management of elderly patients by a health insurance company in Brazil, that has been extensively applying lean philosophy on its operations.

Elderly people are a different age cohort from a healthcare perspective, as chronic diseases are common to be present. This type of disease requires long term treatment and is not unusual to see elderly with multiple chronic diseases. The different nature of disease and treatments bring higher costs. Thus, the ageing of a population represents an increasing trend in healthcare costs (VERAS, 2011).

The continuous growth of healthcare costs is an issue that is relevant to any country with an ageing population like Brazil. At the same time, healthcare is a kind of service that can be improved by the introduction of lean techniques according to previous studies (DANNAPFEL *et al.*, 2014; GUPTA *et al.*, 2016). The lean philosophy can be responsible for successful cost reductions with parallel improvement of service quality in healthcare (ARAÚJO *et al.*, 2009). Talking about financially sustainable alternatives for this problem is essential and this dissertation will illustrate this through a case study of a company that has tackled the high health care costs in one innovative way.

On the following paragraphs of this introduction, a brief description of the Brazilian demographic and health care status quo will also be given so that the context where the lean philosophy is being applied in this study can be better understood.

The ultimate objective of this dissertation is to understand how lean philosophy principles be applied in the management of elderly patients in a health insurance company, and also more broadly, how this philosophy can be applied to improve the delivery of services in other industries.

1.2 Questions to be answered by this Research

This study will address mainly how a health insurance company can use lean thinking in the management of elderly patients. In order to understand this possibility, this study will begin

by discussing the relationship between the ageing of a population and the increase in health care costs briefly. As lean thinking is an approach that can bring more efficiency to services, this study will then analyze whether the implementation of lean thinking has been successful in the studied company and also the main factors contributing to the achievement of the company's goals.

Thus, this dissertation will be a case study on a health insurance company, Prevent Senior, that has had a different approach with the elderly in comparison to its bigger competitors and that appears to illustrate a possible alternative to the health care sustainability for an ageing population. The study of this company will make it possible to link the lean healthcare concepts with the current private health care context in Brazil.

Additionally, this dissertation has the objective of understanding whether this health insurance company presents a viable alternative to the way health insurance companies have been dealing with the Brazilian ageing population or its experience is very restricted to its current market.

Also, this dissertation tries to illustrate how the application of lean philosophy in a service industry can bring more efficiency and other improvements to a business.

Ultimately, this dissertation hopes to answer the following main question: *How can lean philosophy principles be applied in the management of elderly patients in a health insurance company?* In order to answer this main question, this study will start by answering to these more specific questions below, which are in accordance to the five main principles of lean thinking from Womack and Jones (1996) in the context of healthcare.

1. *How to identify value?* i.e. understanding how the real demands of patients are identified and how it is determined if a procedure is adequate to a patient.
2. *How to identify the value chain?* i.e. understanding how the patient is monitored during treatment and how repeated or redundant procedures are avoided.
3. *How to develop a production flow?* i.e. understanding how the processes for exams and procedures are developed and how communication between different departments is done.

4. *How to establish “Pull” production?* i.e. understanding how the patient is stimulated to comply with prevention and treatments and how the company avoids having the hospitals overloaded with patients in unnecessary visits.
5. *How to maintain a continuous search for improvement?* i.e. understanding whether there is standardization of treatments and procedures between different care units and how quality is maintained, and continuous improvement achieved.

1.3 Context and Relevance of this study

1.3.1 The Context

Brazilian Demographic Context

Brazil is a country that has been ageing very fast and its elderly population is expected to grow at a very fast rate in the next decades. According to the last population projection report from IBGE (2018), the Brazilian population is expected to peak by the year 2047 at 233 million, from the current 208 million. At the same time, it is expected that the total fertility rate will continuously decrease to a number below 1,7. While this happens, life expectancy at birth is expected to grow to almost 80 years old by 2040 from the current 76 years seen in the current population. Because of these factors, among others, the mean age of the Brazilian population is expected to grow from 32,5 (2018) to 40 (2037) in less than 20 years. In addition to these figures, Elderly dependency ratio (population aged 65 or more / population aged 14-65) will increase from less than 13% to approximately 40% by 2060. These statistics illustrate the significant demographic shift that Brazil will go through in the next three decades.

As per the report *Idoso bem Cuidado* (ANS, 2016), the ageing of a population commonly results in the growth of chronic diseases which require long term treatments, which consequently end up increasing health care costs. Brazil has gone through an epistemological change, where it has changed from a majority of acute diseases to a majority of chronic diseases. Unfortunately, the healthcare system these days has been built around the treatment of acute symptoms of diseases. The treatment of the elderly needs to be different in order to make the costs sustainable. There have already been some initiatives to change this approach in treatments, but these have only been few.

Brazilian Healthcare Context

Now looking at the side of the providers of healthcare, Brazil is a country that has universal public healthcare – Sistema Único de Saúde (SUS), which the majority of the population depends on, and also a smaller but very significant private healthcare structure, organized around private hospitals, clinics and health insurance companies.

SUS gives access to healthcare to the Brazilian population that is unable to afford private health insurance but also to those that have private insurance. It was created in the 1980s after the democratization of Brazil, with the assurance of healthcare access to all citizens by the 1988 constitution and became law in 1990. SUS is primarily maintained and financed by taxes paid to federal, state and municipal government.

One of the great pillars of the SUS has been Brazil's Family Health Strategy. The program originated in the 1990s in the state of Ceará and has evolved to a nationwide program, reaching 120 million in 2014. This strategy is mainly based on household visits to evaluate people's health (MACINKO; HARRIS, 2015).

Brazil, as it was shown in the previous paragraphs, has two relevant types of health coverage for its population. One that includes all citizens and private insurance that covers between 20-25% of the country's population (ANS,

2018). Currently private health insurance operators follow the rules defined in the 1998 law that regulated the market and also gave the directions set by the governmental agency responsible for regulating this market – Agência Nacional de Saúde Suplementar (ANS).

In Brazil the health insurance plans have existed since the 1940s (MALTA *et al.*, 2015). The first companies selling health insurance appeared in the 1950s (ANS, 2018). The market developed mainly in big cities with big multinational private companies, especially in the city of São Paulo and its suburbs (SALM, 2005). In the 1960s and 1970s, during the dictatorship years, private health insurance spread firstly sponsored by private companies (SALM, 2005). In the mid-seventies, the population covered reached almost 5 million, with more than 70% of those covered in São Paulo. (VIANNA, 1998). Cechin and Badia (2009) say that the growth of private insurance continued throughout the 1980s, even during the recession years, reaching 15 million by the end of this decade. In the 1990s, the growth in

health insurance coverage slowed down with only single digit growth (ANDREAZZI; KORNIS, 2008). Individual health insurance plans only became relevant in the 1980s (SALM, 2005), which was accelerated by the perception of the middle class that public health care was insufficient and in order to avoid financial catastrophe in the event of diseases, according to this author. Before the new private health insurance law (lei 9.656/1998), health insurance plans had very distinct coverages and expectations of clients, that led to frequent judicial battle, often based on the new consumer protection code (CDC) created in the 1990s (ANDREAZZI, 2002). Only after this new law that there was specific legislation for the private health insurance segment.

According to Malta *et al.* (2015), a bit more than a quarter of the Brazilian population had access to some sort of private health insurance. Also, there was a strong correlation between education and having access to private health insurance, i.e., people with more years of education were more likely to be insured. These data were in line with the statistics presented by the governmental agency responsible for private healthcare – ANS. More recent data (ANS, 2018), points out to a decline in the share of the population of those privately insured. The growth in unemployment and the recession are pointed out as the key causes for this.

According to Veras *et al.* (2007), the highest levels of coverage among the elderly in Brazil were in the cohorts between 70-79 years old and above 80 years old. This population was also concentrated in the Southeast and South of Brazil. Those in the highest economic pyramid were those more likely to receive the coverage too. Although the elderly were usually covered by insurance with extensive coverage, this didn't mean that they were receiving the adequate care and attention for their age.

Currently, the health insurance plan sector in Brazil has more than 47 million people insured (ANS, 2018) and is responsible for around R\$ 150 billion direct expenditures in healthcare. Most of the people insured by these companies have a contract that is associated to their employer or their profession. A minority of the people insured has access to individual private healthcare plans which have become very rare in the market after legislation from the late 1990s. The main companies in this industry are Amil, Bradesco Seguros, Sul América and the local medical associations called Unimed.

This group of big health insurance companies have their clients concentrated at the lower part of the age structure (ANS, 2018) as all of them have fewer than 15% of their clients being more than 60 years old. More importantly, these companies make it difficult for older people to become clients and also make them likely to lose insurance while they are aging because of the way the majority of health insurance plans are priced.

In this context of a growing elderly population in Brazil with health insurance companies having difficulties in dealing this group, this study will discuss how these two stakeholders have been interacting and how they could deal with each other in a better way.

Health Insurance Solvency in Brazil

The financial problems and bankruptcies of healthcare operators is of great concern to beneficiaries and it has been a problem fairly common in the last two decades in Brazil (BARROS; BEIRUTH, 2016). The authors point out that several studies in Brazil have presented the continuous increase in healthcare costs that have been leading to insolvency among health insurance companies. Data from 2002 to 2012 showed 182 bankruptcies of healthcare operators among a cohort of less than 1,400 operators. Shareholder's equity was found to be a good indicator to measure insolvency probabilities. Thus, regulators should use models that look at this variable in order to manage financially and strategically the sector, minimizing the number of bankruptcies and their harmful effects. (BARROS; BEIRUTH, 2016).

Guimaraes and Nossa (2010) looked at the solvency but also at the liquidity and profitability of the health insurance operators in Brazil. The study looked at financial information of more than 621 health insurance companies and showed that working capital structures could significantly impact measures of liquidity, profitability and solvency of these operators. Structures where financial current assets exceeded onerous current liabilities and where cyclical current assets exceeded cyclical current liabilities were associated with better financial performance indicators.

In order to contextualize the financial situation of the company studied in this dissertation, the following table compares the main indicators for solvency, liquidity and profitability of the company subject of this case study, Prevent Senior, and three other private health

insurance operators in Brazil. These other three companies were selected for the comparison because they are the biggest for-profit private publicly traded health insurance companies in Brazil. Financial data for the full year of 2018 were not yet available by the time this dissertation was published. Data from Prevent Senior was available at ANS website and the data for the other companies was obtained of their respective Investor Relations websites.

	LIQUIDITY		SOLVENCY		PROFITABILITY	
	CURRENT RATIO		DEBT-TO-EQUITY		ROE	
YEAR	2016	2017	2016	2017	2016	2017
Sul América	1,41	1,55	25%	28%	14%	14%
Notre Dame	1,00	1,20	59%	110%	8%	18%
HAPVIDA*	0,85	0,83	0%	0%	89%	138%
PREVENT SENIOR	1,10	1,07	8%	2%	67%	48%

* The company didn't have debt on its balance sheets for 2016 and 2017.

As it can be seen from the table, Prevent Senior has a favorable liquidity situation, with more current assets than liabilities while not having solvency problems as it has almost no debt. The profitability is high, although the comparison between the companies might be distorted because of different growth cycle stages and capital structures.

1.3.2 The Relevance of the study

Firstly, the relevance of this dissertation is related to its approach to a problematic situation that has been strongly debated in the last years in Brazil and worldwide. As pointed out by a 2018 release from IBGE, the Elderly dependency ratio will grow significantly in Brazil in the next thirty years. According to a former health care executive from Amil, “Brazil is a country ageing very fast that will have to deal with an elderly population before it becomes developed and rich”. Thus, it is extremely relevant to understand how the healthcare private sector will deal with this context as public healthcare has significant deficiencies in Brazil.

In the current decade, the legislation for healthcare insurance plans has been continuously debated by congress and new approaches have been proposed such as the “Plano de Saúde Popular” that have a more restricted coverage (KOIKE; TAIAR, 2017). The ANS has also proposed to introduce the concept of copayments in the realization of exams and other hospital services to insured clients which was heavily criticized (MELO, 2018; AGÊNCIA

O GLOBO AND VALOR, 2018). These facts illustrate how policymakers have been concerned with the sustainability of private health care in the country.

Also, looking at different alternatives to the current private health care model, with very big operators insuring mostly employed people during their working lives, new private companies have been founded in Brazil in order to supply minimum private care for the not so well-off population. This is the case of initiatives like Dr. Consulta, a company providing medical consultation for affordable prices. Additionally, healthcare has been receiving major investments from financial markets (PRIVATE EQUITY NO BRASIL, 2017). The successful IPOs of the health insurance companies Hapvida and NotreDame Intermédica illustrate these market conditions. (FILGUEIRAS, 2018).

In this context of an ageing population and innovation in different types of private health care services, this study aims to discuss the application of lean thinking in healthcare through the context of a health insurance company that might illustrate a solution for the difficult situation looming in Brazil. Moreover, this study reviews the application of concepts of lean thinking and lean healthcare in a private company that is innovating in a traditional industry.

Last but not least, as this study belongs to a master's in business administration program, it will add a case study to the academic literature of the lean thinking and lean healthcare subject. In addition to verifying the implementation of theoretical concepts in a business, it will also illustrate the implementation of these concepts on a practical way.

1.4. Delimitation of the study

This dissertation has been organized as a case study of one single company that has idiosyncratic characteristics in comparison to its competitors in the Brazilian context and has the main objective of understanding how the lean thinking philosophy can be applied in the management of the elderly in one health insurance company.

Because of the selection of this private company, this study will only discuss the private healthcare structure in Brazil, looking more specifically to the health insurance sector.

This company was selected because one unique characteristic of its client base and also because of its commitment to implementing lean across its units. The specific client base is different from its competitors, as it focuses on the +49-year-old clients, while others have

younger clients (ANS, 2016). Also, the company sells individual health insurance plans, which have become a minority in Brazil and are not even sold anymore by many big players of the industry. Still, it is among the biggest private insurance operators of Brazil.

As the study focused mainly on the lean techniques being implemented in the company by its employees and managers, only quality department personnel and doctors have been interviewed in the present study. No patients or patients' relatives were interviewed, however.

1.5 Dissertation structure

This dissertation will be organized in six chapters: Introduction, Literature Review, Methodology, Presentation of the case study, Analysis of the case study and then the Conclusion.

The introduction chapter describes the objectives of the study and also the relevance that it will have for the literature. In addition, a brief explanation about the context of Brazil regarding ageing and health care is given.

The literature review chapter looks at the ageing of society, the implications of this phenomena to health care costs and then it finally looks deeply on the lean thinking and lean healthcare concepts.

The third chapter discusses the selected method for the dissertation. It shows the method, its motivations and finally its limitations. In addition, there is a description of the interviews that were conducted during the study and how the interviewees were selected.

The fourth chapter will present the main points that have been discussed in the interviews and also additional information that has been gathered regarding the company.

The fifth chapter will analyze the data collected in the interviews and compare it to the main information and theories that can be related to them in the literature.

Finally, the sixth chapter will present the conclusions of the study and will also give suggestions of further studies on the subject.

2. Literature Review

In this chapter we will go through the literature review of the main topics related to this dissertation study.

Firstly, it will be shown the literature that concerns the ageing of the population and the growth in the healthcare costs that this might bring. Following this topic, the literature regarding the lean thinking and the lean healthcare philosophies will be approached and reviewed.

2.1 Delimitation of the Literature Review

The study of this literature review was started by using the renowned databases available at Instituto COPPEAD, which were EBSCO, Proquest and Emerald. The search in these databases initially used the following keywords in different combinations: “Ageing”, “Aging” and “elderly” combined with “Disease Management”, “Health care plan”, “Health insurance” and “Lean Thinking”.

In order to better understand the initial context of lean in the western literature, the two books from Womack and Jones, “The machine that changed the world” and “Lean Thinking” were also reviewed and received a deeper focus. In addition to the database results, Pires (2012), which studied the application of lean thinking principles in disease management programs, also provided a complimentary bibliography to this study.

Finally, other articles were searched in other databases in order to complement the relevant literature discussed in this chapter. This search used specific databases such as SciElo and PubMed but also a more general approach in Google Scholar, that could provide articles that were not found in the other scientific databases.

2.2 Ageing Population and Healthcare

2.2.1 Ageing Society

The human lifespan is the longest among all the great apes, and it has more than doubled since the early 1800s. Even during the human gatherer era, where humans lived similarly to animals, humans that survived infancy had a good chance of living up to their 50-60 years.

In the era without modern medicine, most deaths were caused by infections which were very common in the early ages and then again during the ageing process (FINCH, 2010).

The classification of what old age was varied throughout history. During Roman Empire, an individual with 40 years old already had a respectable age. In the 16th century France, someone older than fifty years old would be considered old in the classification of Ambroise Paré. (ROBERT, 2004)

During the 20th century most developed nations reached a higher than 70 years life expectancy at birth (FINCH, 2010). Nowadays some countries have well passed the 80 years old of age as life expectancy and the centenarian population has never been bigger. This will soon be a reality in developing countries such as Brazil that has already passed the 70-year-old threshold.

Fast ageing has been a process happening in the last decades across most continents. While the oldest societies are in Western Europe and East Asian countries (CIA WORLD FACTBOOK, 2018), other countries in the developed world have also been undergoing this process. This process has been the result of mostly two factors. Firstly, life expectancy has continuously grown in the 20th century reaching unimaginable levels in the 21st century (WHO, 2015). At the same time, the fertility rate in many countries has collapsed and many countries have now less children per woman than would be sufficient to maintain a stable population in the long run. These phenomena have resulted in a significant increase in the average age of countries and also very high dependency ratios. While these ratios are alarming, there should be a careful interpretation of them (WHO, 2015).

According to Imam (2013) the financial implications of an ageing population have not been deeply studied. Also, the author discusses how the growth in life expectancy has different consequences for household balance sheets. The importance of taking financial consideration and planning for long-term care should be taken into account as individuals might lose control of their lives and finances as they age. (WILKE, 1996).

In Brazil, Kalache *et al.* (1987) had already called to attention that Brazil was becoming an elderly country because of the growth in life expectancy and also the decline in the fertility rate. As the author mentioned at this point, it was not only important to grow life expectancy

but also to keep the ability of people maintaining their quality of life. For him, it was also relevant the fact that this process would be more challenging in countries such as Brazil because developed countries had started their demographic transition toward an older society as soon as the beginning of the industrial revolution. Developing countries, on the other hand would have few decades in order to adapt to this new population structure.

2.2.2 Anti-Ageing Medicine and Quality of Life

During parts of history the relationship of society with ageing was not deeply studied, but some indicatives slowly appeared. At least in France, institutions providing elderly care, hospices, appeared in the 17th century. In the 18th and 19th centuries as medicine developed, new medical approaches for aging developed but mostly focusing on rejuvenation. Only in the 20th century that biogerontology emerged. (ROBERT, 2004) New studies on the field were developed in the 20th century leading to geriatrician specialization, which by the 21st century could already be in danger of extinction (KANE, 2002). As Mulley (2012), the study of the history of geriatrics shows us recurring messages such as how diseases affect older people differently, the dangers of medications, the benefits of exercise and healthy diets, harm done by political interference and the importance of such a medical specialty that is focused on ill old people.

The biomedicine domain of antiaging medicine has grown tremendously since the 1990s. These have developed into new different and controversial approaches to anti-aging medicine in the 21st century (MYKYTYN, 2010).

Although anti-ageing medicine and longer life expectancies are a strong aspiration, this can only be celebrated if people are having these extra years with quality of life (VERAS, 2009). Functional capacity is key for taking care of elderly, which is maintaining their physical and mental abilities such that these older people can take care of themselves independently. Longevity shouldn't mean that the elder person is no longer autonomous. This goal should be approached with prevention in addition to the advances of medicine, even for those that are already at an advanced age (VERAS, 2009)

2.2.3 Health insurance worldwide

Different forms of universal health care have become the norm in most developed countries with the notorious exception of the USA, where citizens can opt to have private insurance or none at all (VERAS, 2011). The first steps toward universal healthcare began in Germany in the late 1800s under the patronage of Otto von Bismark. This process continued to the UK with the creation National Insurance Act in 1911. After the second world war the new system accelerated with its adoption in many developed countries, with universal systems such as the National Health Service (NHS) being developed. Later, many more universal health insurance programs have been adopted by other countries, such as the case of Taiwan and Canada. The appearance of private insurance was also something that began in the 19th century and slowly spread. First it covered specific incidents and then became inclusive of injuries and illnesses. After second world war the health insurance gained strength with the offerings to employees by companies.

Today there are four basic main models of health care systems in the world (PNHP, 2018).

- The Beveridge Model: Healthcare is provided by government and financed by taxes. Most of hospital and clinics are also owned by government giving government a protagonist space in this model. The British NHS is an example of the model. (PNHP, 2018)
- The Bismarck Model: This system uses a multiple health insurance plans to provide healthcare for its citizens. Although hospitals and providers are private, everyone has access as usually having one insurance is mandatory for residents. Germany was the pioneer in this system. (PNHP, 2018)
- The National Health Insurance Model: Normally in this model, private institutions provide healthcare for everyone through one single national insurance, such as in Canada. (PNHP, 2018)
- The Out-of-pocket Model: These are the systems where only those that have private insurance have access to health care. The USA is an example of country that uses this system. (PNHP, 2018)

In Brazil there were already initial steps toward universal health coverage during the 1960s and 1970s, but this was associated with formal employment, which excluded a big part of the Brazilian population. After the democratization of Brazil in 1985 and the new constitution of

Brazil of 1988, Healthcare was considered a universal right for the Brazilian population and this resulted in the creation of the Sistema Único de Saúde (SUS), a healthcare system that used public and private institutions and that had been inspired in other European models such as the NHS of the UK. SUS gives access to healthcare to the Brazilian population which is unable to afford private health insurance but also to those that have private insurance. SUS is primarily maintained and financed by taxes payed to federal, state and municipal government (GERSCHMAN; SANTOS, 2006; PAIM *et al.*, 2011; MENDES, 2013)

2.2.4 Elderly Care Growing Costs

After reviewing the growth trend in life expectancy and anti-ageing medicine across the world and in Brazil, we may look at the frequently cited problem of the growing medical costs which an ageing population will likely bring or reinforce.

In the USA, data from Medicare, the national health insurance for elderly Americans, suggests that medical spending more than doubles between the ages of 70 and 90, while the top 10% of these spenders account for more than half of the expenditures (DE NARDI *et al.*, 2016). This study also suggests that the US government is responsible for more than 60% of elderly health care expenditures in this country. In Japan, where health care expenditures have also continued to grow, top 10% healthcare spenders are responsible for 60% of expenditure and those in the last year of life for almost 17% (IBUKA *et al.*, 2016). On the other hand, Polder *et al.* (2006) argue that traditional arguments overestimate the impact of ageing in growth of healthcare costs, stating that actually costs are merely postponed with growth in life expectancy. In Medicare, more than a quarter of total spending comes in the last year of life. Although common sense would call this waste, this interpretation is incorrect as it assumes that people know who will either die or not (EINAV *et al.*, 2018). These authors argue that the spending in patients with high probabilities of dying are much lower at 5% only, while the rest is spent on patients that had good chances of living.

The costs of hospitalization for those above 60 years old were 2.6 times bigger than the cohort between 0-14 years old. Also 60-year-old or older were responsible for 30% of hospitalizations in the private sector and 25% in public healthcare according to a report from ANAHP, the Brazilian private hospital association (OLIVEIRA, 2016). According to this author, the tendency of using health insurance grows with age causing an increase the

financial burden of healthcare. Clear rules of utilization would help tackle this problem with financial limited coverage that would favor the prevention disease for those insured. Also, the consumption of healthcare services is higher for the elderly as the hospitalizations are more frequent and the stay at the hospital is longer than other age cohorts (VERAS *et al.*, 2008).

Another factor increasing healthcare costs for the elderly would be the fact that their hospitalization is more likely to become a terminal hospitalization compared to the other age cohorts. Also, elderly were more likely to be affected by hospital infections which was very relevant in the hospitalization costs increase. This is due to weaker immune system as age advances (PIUVEZAM *et al.*, 2015).

Although the study was focused on the elderly with dementia, Veras *et al.* (2007) discussed the impacts that elderly care has at the care givers in Brazil, that are normally spouses or relatives. On average the household costs with the elderly would consume between 62% and 80% of the household income depending of the advancement of the disease and the presence of comorbidities. The reason for these very huge economic costs in this research would mainly be the continuous necessity of care and treatment and the usual loss of employment by the person in the family responsible for the caregiving. In addition to financial costs, the authors highlight the relevant emotional cost for the people dealing with this situation.

Other reason for the higher healthcare costs for the elderly are non-transmittable chronic diseases. Having one or more of these diseases is extremely common in the elderly population (VERAS, 2009). In Brazil an individual with one or more chronic diseases had a likelihood of 25,6% of using public hospital in the previous two weeks whereas an individual without had only 10,8% probability (MALTA *et al.*, 2017). These differences were similar with those that had private health insurance and those without it, although the difference was higher among those insured.

As it is discussed in the previous paragraphs, usually top spenders are responsible for a significant amount of health care costs. This makes it important to talk about moral hazards. There has been a well-known and researched trade off in insurance between risk protection and moral hazard (KOWALSKI, 2012). The theory of moral hazard can imply that health insurance coverage would decrease disease prevention. It has been found evidence of this as

the presence of health insurance increases the presence of unhealthy behaviors among elderly men. However, physician counseling can have an opposite effect (DAVE; KAESTNER, 2009). Another study (VAN DEN BUSSCHE *et al.*, 2016) looked at the overutilization of ambulatory medical care in Germany, a country with universal health insurance. This study found that almost 20% of the elderly could be classified as high users and it wasn't clear whether the high use of medical services would bring any health benefits to them.

On NHS report, Jones and Mitchel (2006) claim that a possible solution for financial deficits and capacity constraints on the NHS could be the introduction of lean principles in healthcare. This was one among many other publications suggesting Lean could bring sustainability to healthcare.

2.3 The Lean Concept

The lean concept that will be described in this chapter was firstly mentioned in texts regarding the car manufacturing industry. Specifically, it was in Japan where the car manufacturer Toyota started developing this new approach. During the 1950s and 1960s, engineers from Toyota developed a more efficient way to manufacture vehicles than the current car mass production line method at the time. (WOMACK; JONES, 1990). According to Hines *et al* (2004), this innovative system was developed because of the scarcity of resources in Japan and an environment of very intense competition among Japanese manufacturers. This innovative production systems included the *just in time* approach, the *kaban* method, among others. Although this new system developed by Toyota had already been described in the literature, Womack and Jones (1996) were the first to coin the new system as "lean thinking".

The book "The Machine that Changed the world", from Womack and Jones (1990), was the pioneer in addressing the new Japanese production method in the western literature. The authors looked at the Toyota production method and compared it to other American car manufactures. General Motors had been the master of mass production in the world and had been dominating the car manufacturing industry, after its prominent manager Alfred P. Sloan improved and expanded the manufacturing process initiated by Henry Ford. Japan on the other hand, was a country recovering from WW2 and Toyota was a truck manufacturer that had very low productivity. Without resources the company developed a new production process that would compete and then beat the previous system developed in North America.

The new method developed by Japanese engineer Taiichi Ohno focused on reducing Muda from production lines, a Japanese word that would describe waste. The new technique was great at discovering errors and immediately correcting them, preventing their multiplication. Also, the company worked with its suppliers and “*developed a new way to coordinate the flow of parts within the supply system on a day-to-day basis, the famous just-in-time*”. This new approach significantly reduced the need for inventories. To illustrate the great efficiency gains brought with the new production system, the comparison between General Motors Framingham Assembly plant and Toyota Takaoka Assembly plant in 1986 can be used. Productivity measures would indicate almost half the time of assembly time to each car of the Japanese in comparison to the American competitor, with almost double productivity. (WOMACK; JONES, 1990)

In this book, the authors also defined six types of different wastes that occurred in production: *excess production, excess of processes, excess redundancy, excess of labor movement, excess inventory and defects.*

Another finding of the book refers to the replication of the model after other manufactures learnt the new Toyota system. Fortunately for the demise of the other companies, a follow up comparison in 1989 showed that American companies had plants that had achieved similar indicators to the Japanese plants and could also call their assembly lines Lean.

Following the first introduction to the world of this new production method in 1990, Womack and Jones (1996) approached again the subject but now extending it to other areas outside the car manufacturing industry. This time they pointed out that while the 1990 book “The machine that changed the world” was a book mainly focused on the new manufacturing style created by Toyota, Lean Thinking was a generalization of these practices to any company or industry, giving key principles and actions for implementation.

Hines et al (2004) argues that while the 1990 book focused at costs, the 1996 book was centered around the value concept. In the later approach, the two authors explain that value is significant when it fulfils the clients will at a specific moment and at a specific price.

Womack and Jones (1996) defined five key principles that according to them would define a lean thinking system. The authors’ definitions are:

1. *There is a search for defining value, i.e. what the customer really wants*
2. *Identifying the value stream and looking for unnecessary steps.*
3. *Making the remaining process more efficient in shorter time, providing time efficiency.*
4. *“Pulling”, which is the customer actually triggering their needs for the product.*
5. *The continuous search for making the process more efficient, in a continuous search for perfection.*

The first concept, i.e. defining value, can only be defined by the customer and can only be meaningful for customer when it meets at a specific price and at a specific time. To illustrate the lack of understanding of this concept, the authors cited the habit in German companies where engineers gave products refinements and complexities that would only please the engineers themselves. *“Providing the wrong good or service the right way is muda”*.

The second step, i.e. identifying the value stream, could be defined as the group of steps that are needed to bring a specific product *“through the three critical management tasks of any business”*, which are the problem-solving task, the information management task and finally the physical transformation task. Identifying the entire value stream of a product can expose great amounts of *muda*. Mainly these value stream *muda* are (1) steps that unambiguously create value, (2) unavoidable steps that create no value because of current technology limitations (both being Type I Muda) and (3) additional steps that create no value and can be immediately removed (Type II Muda).

The third step, i.e. value creation flow, is nothing more than making all the value creating steps flow. An example of inadequate flow ideas was production using batch-and-queue modes which wasn't necessarily more efficient than low-volume production in a continuous flow. Actually, the idea of flow is counter intuitive as people usually think that creating batches and departments will make the production more efficient.

The fourth step, i.e. pulling, is related to the necessity of producing the correct amount expected by clients. There is no shortage or huge waiting time. In addition, its application should reduce the need for inventories.

The fifth and last step, i.e. continuous improvement to perfection, can also be said to be a consequence of the previous four steps reinforcing each other. Continuously working on the

previous steps will create products desired by customers in the correct quantities, in a flow with less effort and with very few mistakes.

These were the main contributions of the second book of Womack and Jones, with innumerable examples in different industries.

According to Pettersen (2009) this new process called lean production had its objectives as eliminating waste, either to reduce to costs or improve the product. However, the meaning is not clearly defined in the literature. Through an extensive research in the literature and in order to define the real meaning of lean production, Pettersen (2009) found that “Just in time practices”, “Resource reduction”, “Improvement Strategies”, “Standardization” and “Scientific Management” were cited unanimously in the literature. However, there was another disagreement among authors. A first group would present lean as a more philosophical approach and the other group would present it as a group of waste reduction tools. This would be a more theoretical approach vs a practical/operational approach to the concept.

Shah and Ward (2007) also attempted to clarify the semantic confusion that is related to “lean production”. In their research they arrived at a definition of lean that encompasses 48 practices/tools. In a multi-step construct, the authors identified 10 factors that can be applied to the definition. These factors would be *supplier feedback, Just in Time delivery by suppliers, supplier development, customer involvement, pull, continuous flow, set up time reduction, total productive/preventive maintenance, statistical process control and employee involvement.*

In addition to these new concepts addressed above that were mainly created for the manufacturing industry, Bowen and Youngdahl (1998) started their approach of lean thinking looking towards the services industry. They argued that the services industry had been a constant laggard in comparison to manufacturing when the subject was innovation. They defended that lean service would be the production line approach to services. It is important to mention that one of the studies described in this 1998 article took place in a hospital.

Womack and Jones (2005) added new definitions to the literature as what they would coin as lean consumption. As the world had been full of good quality products with incredible variety

by that time, there should be a reason for the continuous frustration that still existed among consumers. This could be explained by the big amount of work that companies expected consumers to do after they had purchased goods or services. Thus, they understood that the lean consumption would be complimentary and a consequence of the lean thinking approach and that it would help explaining how companies could try to decrease customer frustrations. In order to describe this new philosophy, they introduced six new concepts in addition to the existent five that had been defined in the Lean Thinking book. These principles of lean consumption were:

1. *Solving the customers' problem completely*
2. *Not wasting customers' time*
3. *Providing exactly what customer wants*
4. *Providing exactly what is wanted exactly where it is wanted*
5. *Providing what is wanted where it is wanted exactly when it is wanted*
6. *Looking continuously for solutions to diminish customers' time consumption and hassle*

Vieira and Leite (2015), point out that after the first article focused on lean services from 1998, the philosophy received several important suggestions. The authors point out that, in the many studies that have been performed analyzing lean service implementation by companies, there were not only financial gains but also positive perceptions by clients. According to the authors the areas that have been applying lean services the most are the healthcare and the financial sector. According to Araujo *et al.* (2009), the health sector has many sources of inefficiencies and is challenging for managers, justifying the high use of the lean philosophy in healthcare. In the group of examples of healthcare companies that adopted lean, it is important to highlight that the elimination of non-value-added activities and also the reduction of trade-offs of performance combining flexibility and efficiency are the most common improvements with its implementation.

Gupta *et al.* (2016) also went through a systematic review of lean services. The authors argued that while lean services were gaining space among service providers, there was still a long road in order to standardize the exact notion of what lean services would be. This standardized definition would be needed for structured implementation in the service

industry. According to them, there was a very slow rate of adoption until 2010, and after this year the papers published on the subject surged. The authors specifically looked at lean adoption cases in the healthcare, software, public service and education sectors. While pointing out for necessary facts such as employee engagement and changes in the company culture to have successful cases of lean implementation, the authors also argued that there should be deeper research on relevant subject such as barriers of implementation and also the adoption of lean in developing countries.

In these studies, discussed above, it is possible to understand that one of the key areas investigated for the implementation of lean thinking is healthcare, which is the sector that will be more deeply discussed in the following section.

In addition to concepts in lean thinking and lean thinking applied to services, it is also important to introduce the concept of Lean Six Sigma (LSS), most importantly in the case of services. George (2003) on the book *Lean Six Sigma for Service* gives examples of how LSS can be implemented and increase shareholder value for companies.

Six Sigma was a program initially developed at Motorola in 1986 in order to improve quality and decrease the number of defects in production. The new methodology was able to reduce defects by 94% across the company between 1987 and 1993. The new methodology focused on reducing the variability in key quality characteristics of products. With the objective of reducing variability in the production process, specification limits of defects should be at least six sigma standard deviations from the target, i.e. three to the left side and three to the right side of a normal distribution. *“Companies involved in a Six-Sigma effort utilize specially trained individuals, called Green Belts (GBs), Black Belts (BBs) and Master Black Belts (MBBs)”*. These individuals would then lead project implementations within a company, especially the BBs and MBBs which also received statistical training. These projects would use the DMAIC framework which has five steps: Define, Measure, Analyze, Improve, and Control. (MONTGOMERY; WOODWALL, 2008).

George (2003) argues that the fusion of the lean and six sigma is necessary because while lean does not offer statistical control, six sigma alone is unable to improve process speed

significantly or reduce invested capital. The interaction of these two methodologies would reinforce each other and increase the return on invested capital (ROIC).

Services are also a great area of application for LSS because they are “full of waste”. Firstly, processes in services are normally slow, which is likely to compromise quality. Secondly, the great amount of work-in-process (WIP) in services creates unnecessary complexities to processes and non-value-added activities. Finally, usually 80% of delays in services are caused by only 20% of activities, which brings great benefits if only these 20% of activities are revised and made more efficient (GEORGE; 2003).

2.4 From Lean Thinking to Lean Healthcare

One of the first articles to study the lean thinking in healthcare was the previously-mentioned Bowen and Youngdahl (1998), with the case study of Shouldice Hospital among the other cases used in their research. Following this research, Allway and Corbett (2002) compared traditional measures of productivity in the healthcare sector with those more related to lean thinking. Later, Spear (2005) illustrated empirical cases of lean adoption in several hospitals.

As discussed by Borges (2010), the current healthcare model has been focused in the treatment of acute symptoms and not prevention of diseases. In this context healthcare costs have been running out of control and disease management and lean thinking could offer alternatives to mitigate this surge in costs.

Toussaint and Gerard (2010) stated that the lean healthcare principles are based on patient care. These principles would be (1) focus on the patients (2) Identifying value for the patient (3) eliminating waste (4) minimizing treatment length.

The Lean Thinking and Six Sigma are philosophies that have been used in the industry in order to gain efficiency and improve shareholder return George (2003). According to Pocha (2010), the financial rationale for using lean thinking is clear but its application has been challenging. The author points out that health care costs have been increasing continuously as a consequence of the population ageing but also because of unnecessary operational inefficiencies that occur during the medical delivery process. Stanton et al (2014) researched the process improvements of the lean six sigma (LSS) techniques in a large Australian

hospital emergency department (ED). The research found out that while there were improvements in patient flow and staff conditions, these were probably consequences of senior staff using the project to leverage resources and create desirable outcomes and not from LSS. Thus, the implementation of LSS in politicized and professionalized context such as healthcare would be very different from those in manufacturing (STANTON *et al.*, 2014).

Gowen *et al.* (2012) contrasted six sigma improvement (SSI), continuous quality improvement (CQI) and lean management in US hospitals in the context of the rising healthcare costs in the that country. The research found that Continuous quality improvement and Lean Management were significant on mediating hospital error sources. CQI and six sigma were effective in improving organizational effectiveness and SSI was significant for sustained competitive advantages.

Souza (2009) wrote a literature review of the subject of lean healthcare and pointed out that that there were two types of articles in the literature. Those that were case studies and others that were mainly theoretical articles. In addition, the author found out that most of the publications in lean healthcare had been concentrated in the United states and the United Kingdom.

McIntosh *et al.* (2014) looked at the implementation of techniques imported from the manufacturing industry into the healthcare services as one solution to the problem described previously of the rise in healthcare spending and also the decline in patient staff indicators. The enthusiasm with lean implementation in healthcare was disappointing as the improvement indicators remained inconsistent in underperforming hospitals.

Matthew (2013) looked at the lean six sigma approach in healthcare. The author was able to map more than 80 hospitals that would use these principles in their operations. It was highlighted that although most of the hospitals had metric improvements with the use of the six-sigma approach, only 9% could sustain them and other 28% were able to have cost reductions. Thus, these findings would indicate that healthcare was an area that could still undergone a lot of improvements.

Another study in the healthcare sector, compared the cost effectiveness of fracture prevention in nursing homes. The results were proved to be robust indicating that the costs were lower when prevention was taken into account. (MILLER *et al.*, 2015)

Eiro *et al.* (2015) did a literature review on the subject of lean healthcare. The study found out that after 2008, research look more deeply at costs. Most of the articles were from the USA and the UK. Also, the review noted that the studies are organized around six areas normally: Operations, Organizational Culture, Support from upper management, reductions in waste and costs, focus on the client and communication with capacitation. Among the five lean principles, the continuous improvement was the only cited in less than 90% of the articles. Additionally, this study points out that scheduled services present less variability in demand than those with free demand, which are more unpredictable like emergency rooms, needing some excess capacity to deal with unpredicted peaks in demand. Having this in mind, only 12% of the papers found in the study looked at free demand services while 88% talked about scheduled services. Thus, the study concluded that the predominance of literature in scheduled services might be an indication that lean thinking implementation is easier in types of scheduled healthcare services.

Dannapfel *et al.* (2014) looked at the dissemination strategies of lean healthcare in one specific county that was located in Sweden. The program had been implemented in order to diminish the rise in costs due to population aging and rising care demands by society. The originality of the study was in the fact that most other studies had focused in one specific institution in contrast to this one that focused on one local healthcare system. The study pointed five common activities that would result in successful lean healthcare implementation:

1. *“Motivating the Lean improvement program...”*
2. *“Establishing a clear vision and objectives...”*
3. *“Developing and supporting implementation approaches...”*
4. *“Testing the supporting implementation approaches at a piloting organization”*
5. *“Communicating the program to all stakeholders.”*

Presenting a model that could identify lean implementations key success factors, Hwang *et al.* (2014) wrote a case illustration of a major American hospital. This study conducted interviews in order to identify lean practices in this institution. The main conclusions pointed out by the study showed that key success factors would be:

1. *There must be a shared vision of lean practices. This would mean that healthcare institutions need to focus on both customer satisfaction and cost competitiveness.*
2. *Various functional units are required for the dissemination of the strategy. Managers need to communicate down the hierarchy the practical implementation issues.*

These two main lessons would result in waste minimization, increase in employee satisfaction and delivery of better value for customers.

Also looking at the employee perspective, Roemeling *et al.* (2017) studied the role that these stakeholders played in the implementation of lean healthcare in the context of controlling variability in healthcare. While some investment in knowledge for employees can broaden the focus of interventions, most of lean gains were in the area of waste reduction. Hussain *et al.* (2016) analyzed the key waste reduction opportunities in healthcare with the implementation of lean practice and found 21 healthcare wastes based on the experience of healthcare professionals. In Abu Dhabi Health care system, the focus was found to be in reduction of inventory waste.

Waring and Bishop (2010) looked at the implementation of the lean thinking in the British NHS. The authors found that the adoption of lean thinking strategies had the potential to transform the organization of healthcare. The study looked at three dimensions of social practice: *rhetoric, ritual and resistance*. This analysis pointed out that although lean healthcare could bring service improvements, it could also bring tensions between clinicians and those service leaders implementing the new philosophy. The paper concluded that these barriers to implementation, i.e. conflict of interest and power struggles among stakeholders, were very likely to make lean healthcare a very difficult remedy to be implemented in order to bring more healthcare effectiveness and efficiency.

Porter (2010) highlights that the value in healthcare should be in the patient. This is the stakeholder that should receive the ultimate attention. In healthcare, this can be challenging

because of sometimes conflicting goals and also a lack of clarity of the goals. Providing the highest value for health outcomes per dollar spent should be the clear objective of healthcare, as the value delivered to the patient is the only goal that unites all the interests of the stakeholders. Looking at value in healthcare means looking at the health outcomes and not the number of services delivered (PORTER, 2010).

In the Brazilian healthcare context, the study of Silberstein (2006) is one of the first articles of lean healthcare in Brazil. The author verified the use of lean principles in five different Brazilian healthcare organizations. The author highlighted however that the organizations involved in the study didn't have knowledge that they were applying lean health care techniques in their operations. Also, the principles of lean healthcare were encountered on different degrees of implementation depending on the healthcare provider. In one of his final recommendations, the author recommended that the study of lean thinking in healthcare implementation should be more deeply studied in one single specific organization.

Still in the Brazilian context, Pires (2012) in another master dissertation, analyzed the alignment of disease management (DM) programs with the lean thinking approach in Brazil. The publication was also a case study that looked at disease management programs of private healthcare operators in Brazil. In this research the author tried to compare the adoption of the five main lean thinking principles in disease management programs. It was concluded that while the healthcare operators were worried about the quality of life of their patients, the main driver of implementation of disease management programs with a lean thinking approach in Brazil were the perceived cost savings. Looking at the different DM program types, the author pointed out that the program that had face-to-face meetings was more successful and more aligned with the lean thinking principles than the other two programs that were mainly composed of phone call interactions. Eiro (2014) observed the implementation of lean techniques in one Diagnostic Medicine company in Brazil. In this study, it was noted that the implementation of lean was incomplete as the operations personnel was not involved in the initial training and there was no integration with the company's operation. Thus, the benefits from lean implementation were few with below expected results in quality improvement and cost reduction.

Régis *et al.* (2018) researched at the implementation of lean healthcare in three hospitals in Brazil that explicitly adopted lean production and then looked for similarities among the implementation processes. It was seen that the first two lean techniques that should be implemented in future projects to increase success were kaizen and MFV and this aligned with the culture of continuous improvement and strategic planning. The study offered 10 lessons learned from the implementation.

In order to clarify and summarize the relation between lean thinking and its equivalents in lean healthcare, Pires (2012) used mainly Jones and Mitchel (2006) and Kollberg *et al.* (2006) studies in order to contrast these two groups of definitions. The following was copied and freely translated from Pires (2012):

Lean Thinking	Lean Healthcare
Identifying value	The patient should be recognized as the primary client (JONES; MITCHEL, 2006). Value is everything that is done to take care of the patient (KOLLBERG <i>et al.</i> , 2007). Easy access to facilities, respect to patients' rights, quality in medical treatment and patient participation on the treatment.
Identifying the value chain	To identify the value chain, it is necessary to verify all the way the patient must go from the first contact with the institution and the end of the treatment (KOLLBERG <i>et al.</i> , 2007). Waste in the healthcare process; delays on appointments, preparation for exam or procedures, patient transportation (KOLLBERG <i>et al.</i> , 2007). Duplicity of information, repeated hospitalizations because of incorrect medical release, repeated exams, lack of necessary equipment. (RADNOR <i>et al.</i> , 2011)
Developing a production flow	Following the patient in all the process steps, ignoring different departments, activity frontiers and functions (KOLLBERG <i>et al.</i> , 2006; WARING; BISHOP, 2010), creation of multifunctional teams for specific groups of patients; information transparency (KOLLBERG <i>et al.</i> , 2007); Planning of all steps of the clients' treatment, verifying consequences of previous and following activities, lean healthcare not focusing on health condition of similar patients but in similar processes (JONES; MITCHEL, 2006)

Pulling techniques	Interaction and participation indicate the degree of the pulling strategy of the healthcare unit (KOLLBERG <i>et al.</i> , 2006). Provide healthcare service in accordance to demand is using the available resources when necessary and not following artificial productivity metrics, such as asset utilization or cost per unit produced (JONES; MITCHEL, 2006).
Continuous search for improvement	Standardization of processes (JONES; MITCHEL, 2006); the process improvements in the healthcare sector should be originated from the results of medical intervention, i.e., from clinical indicators of the patient (KISSOON, 2010).

3. Research Method Discussion

This chapter has the objective of presenting the details of the research methodology used in this dissertation. In addition, all the objectives of the research will also be detailed at this part.

3.1 Definition of a research question

The objective of this study is to understand how private health insurance operators can use lean thinking philosophy in order to take care of the elderly in Brazil, a country where the population has been ageing rapidly. This study will look at what practices the companies have been adopting and how they relate to the main lean principles. The main findings in the practice will be compared to the main principles cited in the literature review.

Thus, the research question of this dissertation is: **How can lean philosophy principles be applied in the management of elderly patients in a health insurance company?**

In order to answer the question above in depth, with the most description and details possible, this research will try to answer the following secondary questions described below. These secondary questions are related to the principles established by Womack and Jones (1996).

- How to Identify Value?
 - How are the real demands of patients of the health insurance identified?
 - How is it determined if a procedure is adequate to a patient?
- How to Identify a value chain?
 - How is the patient monitored during treatment?
 - How are repeated or redundant procedures avoided?
- How to develop a production flow?
 - How are the processes for exams and procedures developed?
 - How is the communication between different departments of the health insurance?
- How to establish “Pull” production?
 - How is the patient stimulated to comply with prevention and treatments?
 - How to avoid that patients overload hospitals with unnecessary visits?

- How to maintain a continuous search for improvement?
 - o Is there standardization of treatments and procedures between different care units of the health insurance?
 - o How is the quality maintained and continuous improvement achieved?

3.2 Research Method

As this is a dissertation that has a research question based on “How”, Yin (2010) suggests that the research method that is adequate to this research question is a Case Study. It is considered that this methodology is adequate for practical problems offering an approach in practical knowledge fields (MERRIAM, 2009).

The project consists of a exploratory and qualitative research according to the methods proposed by Yin (2015) and its main objective is to understand how lean thinking can be used in the treatment of elderly patients.

As in this study the main objective is to deeply understand an organization and be able to relate its practices to the literature, this will be a Single Case Study, done at one single health insurance company (YIN, 2015).

3.3 Case selection

In this study, one specific institution was selected in order to perform a single case study. The selection of this specific institution was because of the following reasons: As this study focused on the management of elderly in health insurance companies, among the top 20 group medicine operators registered in the ANS website, this is the one that clearly has a bigger focus on this population group. Also, group medicine was chosen because it is a for profit business, different from other categories of health insurance in Brazil.

Additionally, this health insurance company has the majority of its users under individual insurance plans that have become rare in the Brazilian health insurance market (ANS, 2018). For example, accessing this institution website, you can see the different types of individual healthcare plans and their starting prices without any effort (PREVENT SENIOR, 2018).

Finally, there have been publications in the literature and in the media relating this institution to efficient practices. In a Harvard Business School case regarding the same institution, it is possible to understand that at least part of the lean thinking philosophy is used in the company within the lean six sigma approach. However, as this HBS Case study is an educational case study, it has a completely different approach and methodology from this Case Study (YIN, 2015). In addition, the lean thinking philosophy is not clearly described nor is the implementation and the decision processes inside the company regarding this subject.

3.4 Data Collection

According to Yin (2015), there are five main forms of data collection in a case study.

For this study the main method of data collection was through interviews with different employees of the researched institution. The initial contact with Prevent Senior was with the head of the quality department, that explained the application of lean in the company and how the implementation had been done so far. During the meeting with this person it was said that the lean was more important in the healthcare delivery activities, although there were some projects in the company's back office administrative structure. Additionally, this contact in the company was the responsible for introducing us to all the interviewees, which were selected by him. As a consequence of that the interviews were conducted with either quality department personnel or healthcare personnel. Thus, there was a focus on the lean implementation in the healthcare operations of the company. The interviews lasted approximately 30-40 minutes and were all recorded for further understanding. On the table below, we have the main positions and attributions of the people that were interviewed:

- Medical Director 1; responsible for overseeing one hospital unit and participant of the Black Belt course.
- Medical Director 2; responsible for overseeing one hospital unit and participant of the Black Belt course.
- Medical Coordinator; responsible for overseeing geriatric care at one hospital unit and participant of the Black Belt course.
- Quality Department Manager; responsible for supervising lean six sigma projects and teaching Green and Black Belt courses.

- Quality Department Coordinator; responsible for supervising lean six sigma projects and teaching Green and Black Belt courses

The interviews were conducted following the below protocol with the following questions to the interviewees in Portuguese (freely translated):

Identifying Value:

- How are the real demands of the patients identified by the company?
- How is it determined if one procedure is adequate to one patient?

Identifying the Value Chain:

- How is the patient monitored during the whole treatment?
- How are redundant or repeated procedures / exams avoided?

Developing a production flow

- How are processes for exams and treatments designed?
- How is the communication between different work units?

Pulling

- How is the patient stimulated to be part of prevention programs and follow prescribed treatments?
- How to avoid that patients overflow hospitals without need?

Continuous search for improvement

- Are processes and treatments standardized among different hospital units?
- How is quality and continuous improvement maintained?

None of the interviewees will be identified and when necessary they will be treated as Interviewee 1 (E1), Interviewee 2 (E2) and so on. The order displayed above at the attribution description (Medical Director 1, Medical Director 2, ...) is unrelated to the order of identification of interviewees in this research (E1, E2, ...).

The other sources of information of the company were the company's website, other articles about the company and also data available in ANS website.

It is important to highlight that the views reported on the interview only reflect opinions of employees of the institution. No patient or supplier of the company was interviewed in this study.

3.5 Limitations of the method

This dissertation has limitations and these must be considered such as (1) The subjectivity of the collected information – as information received are derived from the analysis and perceptions of the interviewees and also subjective interpretation of the data collected by the researcher; (2) Voluntary participation of the interviewees, which according to Triola (2008), this procedure introduces a selection bias of the interviews and then from data collected; (3) The place where the interviews took place was in the studied company, Prevent Senior, which can create another bias because of people giving interviews at their work environment; (4) There is no possibility of generalization of the results as this research is qualitative, where results cannot be generalized.

4. Case description

4.1 The company

Prevent Senior is a health insurance company based in the city of São Paulo with more than 300.000 clients. The company started as a small clinic for elderly care more than 20 years ago and it has now become one of the top 20 private healthcare providers in Brazil. The main focus of the health insurance company is on elderly people, which for a long time were the only category served by their health insurance plans (“Adultos +”, those above 49 years old). In addition to approaching this unusual age group, the company also sells mainly individual healthcare plans, while the bigger competitors mostly sell insurance for corporate employees.

The company owns eight hospitals and other medical centers, having a vertical structure. Prevent Senior had a revenue of more than two billion reais in 2017. Currently, it is a privately-held company with two main controllers, Fernando and Rafael Parrillo, which are the founding partners.

4.2 – Lean Thinking in Present Senior

In the five interviews conducted with employees of Prevent Senior, all of them (Interviewees E1, E2, E3, E4 and E5) agreed that the company used the lean thinking philosophy on its day to day operations. Although the company officially follows the Lean Six Sigma principles internally, the interviewees pointed out that most of the theories applied come mainly from the Lean principles taught.

4.2.1 - Lean thinking dissemination in Prevent Senior

According to interviewees E1 and E2, Prevent Senior formally conducts Lean Six Sigma (LSS) training through internal company courses. Theoretically, anyone in the company can participate in those courses, if he or she is recommended by his or her manager. Two types of courses are conducted in the company. One for the employees in administrative services and the other for those providing care for patients. The employees participating in these courses are divided into groups and each of these groups become responsible for developing and implementing one Lean Six Sigma project. The high management gives guidance on the areas that projects should be conducted by the groups, but the specific projects are designed

by each group. All employees except for physicians are assigned initially to a Green Belt certification course if they are chosen to participate. On the other hand, physicians are sent straight to Black Belt certification courses. In order to receive the certification, the groups must create the projects, develop and also implement them. In case there is no full implementation, the participants in the group only receive a certificate of participation in the course, without receiving either the Green or Black Belts. Those LSS courses are fully paid by the company.

As per interviewee E2, the initiatives to formally implement the LSS culture in Prevent Senior started in 2011, with the support of the company's CEO. According to interviewee E3, the high management understood that having a culture of process evaluation was extremely important. The first projects in 2011, were for the Green Belt certification. Then in 2012, the company started to give courses for Green and Black Belt certification. Firstly, only managers attended those courses, being followed later by other company staff. In interviewee E5 view, the implementation of those lean principles meant understanding the real meaning of the word "management"

According to interviewee E2, the implementation of lean thinking faced great resistance by upper middle managers (superintendents) just below directors and officers on the company hierarchy. As the initiatives exposed inefficiencies in the company's departments and resource waste, some managers felt uncomfortable with the dissemination of the culture in their areas. In the first moment of culture dissemination, those involved in the projects would present the new project results to the company's management in meetings. Because of the tensions that arose during these meetings, these presentations were suspended. Even more recently, such was the resistance for some lean thinking projects in Prevent Senior by those superintendents, that many projects had to be suspended or cancelled during 2017.

With regard to doctors in the company, interviewee E2 said that it was a challenge to make them embrace the new lean thinking philosophy. As an example, the interviewee said that the extra paperwork and analysis demanded by the projects created resistance among these professionals because they didn't want to spend time on anything else besides patient direct care. Interviewees E3, E4 and E5 also agreed that there was and there still is resistance among doctors, especially in the first moment, because people in this industry are not concerned

with efficiency. Interviewee E5 highlighted that for a physician that is used to using a treatment rationale in healthcare, it is difficult to start thinking through an efficiency logic. As the number one priority is the patients' health, there is a tendency to overlook other aspects of the hospital operations and costs. In addition, the Med-schools in Brazil were very unlikely to give any management classes to their students, that would later become the doctors in Brazilian healthcare, in the view of interviewees E3, E4 and E5. As the interviewees with a medical degree would say, "they had never heard of lean thinking before joining Prevent Senior".

4.2.2 Examples of lean initiatives in Prevent Senior

In this section some projects discussed in the interviews will be briefly described in order to give a context of the lean thinking initiatives at Prevent Senior and how they put in place the main lean thinking principles. All project descriptions and comments have the interviews as their unique source of specifications and details. The first five projects described had a direct impact on the value received by patients. The additional projects increased efficiency and/or reduced costs in the company. Although not all of these projects were necessarily created and implemented during the LSS course, they all had lean thinking as their basis.

Firstly, there was one project that was cited by four of the five interviewees. This was the Breast Cancer Project. The accomplishment of this project by the company seemed to be a source of proud among the company's employees. It was a project initiated by a team of physicians that had the objective of decreasing the time that passed between the detection of a possible breast tumor and the beginning of the selected treatment for the patient. According to the interviewees, before the project was implemented, it would take from 3 to 6 months on average for a cancer treatment to begin after the first appointment with a doctor that detected something unusual with the patient. This led to negative outcomes and diminished possibilities of cure. As one interviewee would say, after 3 months, a cancer patient is a new patient as the condition has already evolved and it will demand significantly more effort and resources in order to be treated. In order to gain efficiency in the treatment, the project established that as soon as the patient left the mammography exam with her doctor reporting the tumor possibility, this patient would be conducted to a mastologist and then if necessary, to a tissue biopsy, everything on the same day. After that, in the period of one to two weeks,

the patient would do all the necessary exams, have appointments with the required doctors and begin treatment immediately, independently if the treatment was surgery, radiotherapy or chemotherapy. While this big reduction in the time interval between detection and treatment initially brought higher costs to Prevent Senior because of the need to have specialists on the hospitals all the time, the total cost of the treatment for a patient would prove itself much lower because of the need of smaller interventions and less days of hospital stay for the average patient treated.

Another initiative in Prevent Senior was the Knee Surgery Project that had the objective of reducing the total time spent by a patient on the complete knee surgery procedure. As per interviewee E5, initially, this surgery would require a minimum stay of two days at hospital, one at intensive care unit (ICU) and the other at a room. However, this practice appeared to be arbitrary for the hospital management. There was no justification for two days of stay at the hospital and even less for a single day at the ICU. The proposed solution was to cut the stay at the hospital into 36 hours while eliminating the mandatory stay at the ICU. After the implementation of this new policy, patients would go straight to a room, receive physiotherapy and recommendations and then leave the hospital, without feeling pain, within a 36-hour time frame. More importantly, the new procedure didn't bring any risk or harm for patients and no further complications were registered. In addition, no mortality was reported in this new procedure and only 1% of patients required ICU stay after surgery. Continuing the improvement of the process, today the process has been taking fewer than 30 hours according to interviewee E5.

Other new approach to treatment adopted by Prevent Senior was rethinking the way elderly patients would be treated if they arrived in the hospital with an infection such as pneumonia. Prior to this, according to interviewee E3, the standard process was to keep the patient between 7 to 14 days at the hospital while the antibiotics were administered. This approach although standard had some flaws. The probability of an elderly patient getting a hospital infection is directly proportionate to the duration of the stay at the hospital. While this is a risk that people with acute symptoms need to go through, there is no need to keep someone at the hospital just to complete the medicine cycle. At this new approach adopted by Prevent Senior, the elderly would arrive at the hospital and would receive the care needed to treat

these acute symptoms of an infection. On average, these patients would feel good within a two to three days' time frame. After this time, they could be sent home to finish the treatment. This would reduce the risk of hospital infection while also increasing the wellbeing of the patient. Although apparently sending someone home to receive treatment looked costlier, actually these patients would be freeing up hospital beds for more extreme cases and would be diminishing the probability of developing additional harmful infections.

In another hospital, a new initiative reported by interviewee E4 was in regard to exams required by doctors. About 50% of patients that had exams prescribed would not come back to do these exams, and even fewer would collect the results and show them to their doctors. Prevent Senior developed a new internal process where patients would do the exams and the results would be sent directly to their doctor automatically, without need of any patient intervention. In addition to providing efficiency to the process, this helped physicians to learn about the results of the prescribed exams as many patients would never go back to show them after the initial appointment. Giving continuation to the improvement at this unit, management started developing a process where patients would do their prescribed exams on the same day that their physician had prescribed them, increasing even more the rate of prescribed exams conducted while also making it less likely for one disease to go undetected because of lack of patient compromise.

Similar to the previous initiative, according to interviewee E2, in the ophthalmology department a project was developed to prescribe exams for patients just after the appointment had been scheduled with the doctor. A software would analyze the patient history and would generate a list of the probable necessary exams that this patient should take. Having the exam prescription before the appointment, patients were able to do the exams previously and then go to the scheduled appointment with all the required exams in hand, avoiding the need of a second appointment just to show the exams results.

The following initiative in Prevent Senior cited by interviewees E2 and E3 had objectives related to costs and resource optimization. This initiative was the installation of pneumatic tubes in hospitals, that would bring medication from the pharmacy departments to other parts of the hospital requiring medicine during the day. This was one of the first projects to be executed at a Prevent Senior hospital and it was later expanded to other units. The initial

project took place at Hospital Paraíso, where the pharmacy department was located in the ground floor while the hospital had around 18 floors. Although the pharmacy personnel would distribute the required medicine every morning to all demanding departments, if there was any need for additional medicine during the day, someone of the nursing staff would have to go down to pharmacy and get the required medicine. This was a problem because the nursing employees were not using their time efficiently taking these journeys to the pharmacy department while they were also making elevator use in the hospital higher. The solution set up by this project was to send every required medicine during the day through a pneumatic tube across all the hospital floors. After implementation and required investment, this project diminished elevator traffic in the hospital and also freed up nurses to focus on the care of their patients.

Also looking at costs and ways to increase efficiency, another project undertaken was the oxygen cylinder one according to interviewee E2, which also took place in Hospital Paraíso. This project was initiated after management learnt that a lot of oxygen cylinders were being underused in the hospital operations. Then the reasons for the waste were mapped. In most of cases, oxygen cylinders were not delivered with the full volume after refill by supplier (66% of total cylinders). In others, the cylinders would be sent back to the supplier without the complete use of the volume, either because of negligence or overzealousness. After the project was implemented, a new agreement was reached with the oxygen supplier and staff received better training on handling the cylinders, diminishing considerably the amount of oxygen wasted and permitting savings for Prevent Senior. This project is currently on the monitoring phase, which lasts 6 months. This is made in order to check whether the implementation was really assimilated by the team or not.

Other minor projects can also illustrate the approach taken by Prevent Senior to increase efficiency. As described by interviewee E2, continuous complaints by patients resulted in an initiative to diminish the time that nurses took to arrive at a patient's room after the alert siren was rang by the patient. The sponsor of this project not only wanted to improve the response time but also made resolution of these demands an objective, which were requests like providing a blanket, pain medicine, among others. According to interviewee E5, it was found out that one of the reasons for this problem was the intensity of the sound, which was

apparently too low to hear. A simple solution led to the resolution of one the biggest complaints of patients, and also created a project for the whole process improvement.

Another example of a minor process optimization in Prevent Senior was the creation of teams responsible for giving baths to patients. The specialized staff would know in advance the number of baths that would take a longer time (complex baths – 22 minutes) and also the number of baths that would be quick (simple baths – 7 minutes) just by learning about the patient situation. Thus, the team would be able to plan the people required to complete these tasks on a given time and improve the process efficiency. In addition, this brought more predictability to patients as they would receive baths at a similar schedule with a similar duration every day.

Also, differently from what is seen in many other hospitals, physicians at Prevent Senior have a Monday to Friday workweek on the same daily schedule. They don't have different shifts during the days of the week. In addition, they are also required to work for one weekend of the month. The consequence of this practice is that the doctor is able to follow up with the patient's treatment during the week. This gives continuation to treatments and decreases the number of errors as doctors are already familiar with treatment. In this case, the patient is less likely to be checked by a different doctor almost every day.

As it would be expected, some lean projects at Prevent Senior also had to be abandoned because of their size and complexity. During the early adoption of lean philosophy by the company, there was a project that intended to create an internal medicine distribution system within the company. This new department would buy directly from medicine suppliers and then would redistribute everything to the company's units. This was found to be unfeasible by management and so, as consequence, the supplier delivery was redesigned in order to increase efficiency while abandoning the initial big project. Compromise was also reached between purchase department and the supplier to have all medicine available when necessary.

4.2.3 Perception of Lean philosophy principles within the company

Interviewee E1 perceives that Prevent Senior looks to cut unnecessary costs of the operation while it is careful not to decrease the level of quality of customer experience. According to him, the company seeks the value that customers want looking at client satisfaction surveys

or directly asking customers. In addition, the company monitors all complains regarding Prevent Senior. When some feature that was initially thought as unnecessary or as a luxury is demanded by a lot of clients, the company rethinks its approach and considers including this new feature in the service. To maintain the quality in Prevent Senior, the company has internal audits and also applies to the rules of ISO 9001 certification. Still, in the interviewee's opinion, managers continue bringing on their own new initiatives to Prevent Senior in order to improve the quality of operations. Sometimes, so many changes are proposed that the quality department needs to break them.

Interviewee E2 believes that the company seeks quality improvement with cost reduction with the appliance of Lean Six Sigma principles (LSS). Although the lean culture has been more formally disseminated in the company with support of the CEO, there was a lot of resistance to culture change within the company. More recently, according to interviewee E2, the applicability of lean gradually increased as the fear of pointing out errors started to decrease, making people to accept error exposure. The lean thinking implementation teaches the employees to improve their own areas with integration with people from other departments. Lean brings great benefits to the company but there should be a closer focus at the more feasible projects, more likely to succeed. Also, the company still has to develop detailed ways to measure and evaluate each of its initiative after they have been implemented.

Interviewee E3 has the perception that Prevent Senior adopts a philosophy totally different from the other companies in the Brazilian healthcare sector. The Lean thinking approach teaches healthcare professionals to think about the whole process, i.e., from when the patient arrives at hospitals to when the patient is allowed to leave the facilities. For this interviewee, there can still be standardization of processes, still with high quality and individual care. Lean thinking actually improves value to patients and saves money for the company. To those that argue that lean thinking would decrease quality in health care services, he points out that either a Rolex or a cheap watch follow a production process, the differences in quality don't come because of standardization production processes. In his view, the application of the lean thinking approach will determine those that will survive and thrive in the healthcare sector in the long run, being these techniques of total strategic importance. For the interviewee, lean presents an approach that can control costs and provide high quality

healthcare. For the interviewee, if there was more willingness to look for solutions, lean thinking initiatives could be applied anywhere else in healthcare. Also, in its opinion, lean is one of the most interesting tools that can be applied to healthcare. Unfortunately, the efficiency brought by lean associated with cost reduction might conflict with the interests of some healthcare professionals and institutions. To reinforce this view that there is many room for improvement in healthcare, the interviewee even cited that some studies indicate that waste in healthcare could mount to 30-40% of the money invested in the sector in the USA.

For interviewee E4, when a new employee, especially doctors, arrives on Prevent Senior, their first impression is a shock. They are introduced to a new philosophy that is completely different from what they are used to in other institutions. Even if some employees have not received formal lean philosophy education, they will have an idea about the principles and how they should be applied in the operation. There is a culture of rationalizing processes. Lean at Prevent senior is responsible for continuous improvement of processes and always brings benefits to the company's patients. It never decreases the value of service provided. The Lean thinking approach teaches doctors to ask only for the necessary exams and to control costs efficiently. In Prevent Senior lean brings agility to operations, permitting early diagnosis and a decrease in mortality. Also, in this interviewee's opinion, if you are willing to provide a good quality service with a fair price, you need to adjust your costs, being lean an excellent tool for that. The limitations of the application of lean philosophy at Prevent Senior is mostly technological, as some software can take long to be developed and implemented, while the price of technology is also expensive sometimes. Ultimately, the great number of projects being proposed is also a constraint, as the company has to select them according to budget availability.

According to interviewee E5, Prevent Senior presents a new logic for doctors. It teaches the physicians to think efficiently. The optimized approach of Prevent Senior makes it possible to provide treatments that are comparable to the most respected hospitals in Brazil but still at very competitive prices. While doctors look for the best possible treatment strategy for a patient, management negotiates with medicine suppliers to maintain prices at an acceptable level. This proves to be effective as the treatment with better and more effective medicines becomes cheaper when the whole treatment process is analyzed, even though it has higher

initial costs. Interviewee E5 also believes that while other companies punish employees that commit some kinds of mistakes, Prevent Senior tries to understand what went wrong and tries to find a more efficient solution for this process. The lean approach also makes the company to be always in touch with the patients. No new customer will register for insurance and then be neglected by the company until one type of disease symptom appears. As people arrive in the health insurance company, they are required to take exams so that Prevent Senior knows the real health condition of its new patients. Additionally, in the interviewee's opinion, Prevent Senior management is always looking for the most advanced technologies trying to have a plan for what will come in the next 20 to 30 years. Finally, the interviewee also thinks that Prevent Senior is able to implement the lean philosophy not because it is a verticalized company but because of the way its owners think.

5. Case Analysis

In this part of this dissertation, there will be an analysis of the information collected with the interviewees of Prevent Senior and the literature from the subject. This will aim to contextualize and relate the five main lean thinking principles to the current practices at Prevent Senior and other characteristics of the company. This comparison will permit to understand to which degree Prevent senior has been using lean thinking principles in the management of elderly patients.

5.1 The use of the lean principles in Prevent Senior

Identifying value: According to Womack and Jones (1996), the first principle of lean thinking is identifying the value for the client. From what was told by interviewees at Prevent Senior, it can be seen that the company sees the real value for their clients as having them healthy and being cured. Other perks are distraction and usually increase costs. The real value for the patient when it has one condition or disease is to be cured with the minimum hassle and minimum time.

In the Breast Cancer Project, the value for the client can be seen in the speed of initiation of treatment that significantly increases the chances of cure. The new process that was created by Prevent Senior allows patients to have an earlier than usual diagnosis and a less invasive treatment.

In the case of the Knee Surgery Project, value for patients is increased as they are able to stay less time at the hospital and by avoiding the ICU stay. In this case, the patient benefits from the reduction of hospital stay while the supporting care is not diminished. Even though the process becomes shorter and less complex, the patient does not have the quality of the treatment decreased.

In the case of exams, Prevent Senior also increases the value for their clients as it simplifies the processes and avoids many unnecessary visits to the doctor, such as in the ophthalmology department, where patients already arrive at the appointment with their exams results available.

Allowing patients to leave after an infection is controlled provides value to the patients as it allows them to go back to their homes. In addition to this benefit of leaving the hospital

environment, this approach also diminishes the chances of further complications during the treatment. Again, the value for the patient is not staying at the hospital and receiving a lot of medicine, the real value is being cured.

The appreciation for the value for the client can also be seen when interviewees E1 and E2 cited the importance given to internal channels receiving feedback and complaints from patients. The information is effectively analyzed and results in projects for improvement in the quality of life of the patient during the stay at the hospital, even if this means only answering the patients request faster after a nurse is called.

In all these examples, the patient is recognized as the primary client as it is suggested by Jones and Mitchel (2006). Although these practices permitted cost reduction for Prevent Senior, they also provided some benefit for the customer, a consequence of lean thinking implementation (PETTERSEN, 2009).

Identifying the value chain: Another principle set by Womack and Jones (1996) was the identification of the value chain. In healthcare this means verifying and understanding all the path that the patient must follow in a hospital to receive care, from the beginning until the end of it (KOLLBERG *et al.*, 2006).

In the case of Prevent Senior, interviewee E3 mentioned that the physicians at Prevent Senior are taught to think about the whole care process. They are advised not to only pay attention in the specific task that they are performing. When talking about the new approach to infection treatment on the elderly, interviewee E3 also said that the process begins with the arrival of the patient at the hospital and only ends when the patient leaves the hospital to finish treatment at home. The doctor cannot think that the process of delivering care is restricted to only examining a patient or prescribing medicine. This principle of Prevent Senior is in line with the definition given by Kollberg *et al.* (2006).

In line with Radnor *et al.* (2011), who argues that identifying the value chain means avoiding duplicity of information, duplicity of exams, lack of necessary equipment for exams, among others, Prevent Senior has initiatives that curb these problems. For example, in the case of Breast Cancer Project, all equipment and staff required for a complete diagnosis of a tumor are in place in order to make a complete diagnosis within one day. In the case of the new

Knee Surgery Project, the company was able to eliminate one activity that didn't aggregate value to the process in the majority of cases, which was the mandatory stay at ICU after surgery. According to interviewee E5, the company tries to create a process logic in the way that doctors work. Again, in relation to Radnor *et al.* (2011), interviewee E4 cited the case of doctors that consistently ask for a lot of exams for their patients. Asking as many exams as possible is not the best care that can be given to a patient as sometimes a lot of these exams are unnecessary while a critical exam is forgotten. In Prevent Senior, the company gives orientation on the necessary exams that doctors should ask patients to do while also informing that some exams are just “trendy” in the healthcare industry at that moment but wouldn't provide effective benefits for the patients in general.

Developing a production flow: The third principle described by Womack and Jones (1996) is developing a production flow, which is meant to be making the remaining processes as efficient as possible in the shortest time as possible. As per Kollberg *et al.* (2006) and Waring and Bishop (2010), developing a proper production flow in healthcare demands following the patients through all the steps taken independently from the department that is responsible for each of the procedures. Clearly, this type of production flow has been used in Prevent Senior. To be successful in the Breast Cancer Project, Prevent Senior had to have different areas integrated and committed to the process of diagnosing breast cancer.

In the case of the treatment of infections on elderly people, according to interviewee E3, they were actually developing a production process for treatment as it is suggested by Jones and Mitchel (2006). In interviewee E3 view, developing a smooth process that can be accelerated will translate in significant cost reductions.

Pulling techniques: Another essential part of Lean according to Womack and Jones (1996) is the “pulling” part of lean thinking. One example of a pulling technique in Prevent Senior is making patients already do their exams just after scheduling the ophthalmologist appointment. The trigger for the exams is the future appointment that will require them. Thus, there are efficiency gains as one extra appointment can be avoided to complete the diagnosis.

Also, according to Interviewee E5, when someone is a new member of the Prevent Senior insurance, the company looks for what exams the person should undertake in order that the company knows the real health situation of these new clients. The company takes action to

monitor their patient's health condition. No man will enter the insurance without a recent prostate exam while women will need their mammography up to date. In case these exams are too old or inexistent, patients are told to do them. In the case of exams that patients did but never came back to see the results, when Prevent Senior send these results directly to doctors, they are able to initiate a disease investigation even if the patient didn't go to the appointment. In the case something relevant is identified, the company contacts the patient immediately so that it can start treatment as soon as possible.

Additionally, as per Jones and Mitchel (2006), pulling is also using resources only when they are necessary. A great example of this principle being applied at Prevent Senior in the Knee Surgery Protocol that established that patients would only be sent to the ICU if they were in critical condition. The new process ended with the unnecessary preventive ICU stay in the majority of cases.

Continuous Search for Improvement: The last key principle according to Womack and Jones (1996) is chasing continuous improvement. As per all respondents in the case study, Prevent Senior is keen on seeking continuous improvement of its operations. Even when things are already looking good, there is always space for improvement in the eyes of the company management. Interviewee E5 gave an example of this situation when talking about the Knee Surgery Protocol which initially had the objective of reducing the hospital stay from 48 to 36 hours, and that now has been running on a 27-hour interval.

According to Mitchel and Jones (2006), continuous improvement demands standardization. According to interviewee E4, everything in Prevent Senior is standardized as everything should have been mapped so that processes can function.

Also, processes are evaluated in accordance to the patient's wellbeing in Prevent Senior, as in Kisson (2010). If any new process impacts the health and wellbeing of patient's negatively, it should be dropped. This is out of the culture developed inside Prevent Senior.

According to interviewee E1, the message of always improving processes is now so strong within the company, that managers are continuously looking for new possibilities of creating efficiency, to such a point that the quality department have to slow them down a bit.

5.2 Additional Analysis of Lean Practices at Prevent Senior

In this section, other relevant elements of lean thinking and lean healthcare will be highlighted on the operations of Prevent Senior. Although not necessarily among one of the five main principles of Womack and Jones (1996), the below practices are compared to the relevant literature.

According to Bowen and Youngdahl (1998), the service industry lags behind when it comes to innovation and efficiency. This is in accordance with what was said by Interviewees E3, E4 and E5, who said that a lot of inefficiencies in healthcare exist, with a lot of opportunities for improvement throughout the industry. In Prevent Senior they try hard to tackle these inefficiencies. Araujo *et al.* (2009) highlighted that lean reduces the amount of non-value-added activities in healthcare services, reducing trade-offs between efficiency and flexibility. It can be seen from the interviews that Prevent Senior is keen on eliminating those non-value-added activities such as appointments just for exam prescription, according to the description of interviewee E2 about ophthalmology department, and also unnecessary stays in the ICU as it was described by interviewee E5 with regard to the Knee Surgery Project.

Veras *et al.* (2007) suggested that one of the big impacts of taking care of elderly patients relies on the patient's family. These people have significant loss of income in some cases and also health deterioration. For interviewee E3, the adoption of lean processes increases the predictability of a patient's treatment. For the interviewee this is beneficial for the patient but also for the family that shouldn't be required to be in full time dedication for the patient. Lean facilitates patient's family to maintain their lives and keep their incomes in order to support the patient. The view of Borges (2010) in which it is stated that healthcare has been focused on acute systems and not in prevention is also shared by interviewee E3, who stated the current hospital centered model is unsustainable for society. Also, Pocha (2010) said that health care costs are increasing significantly because of inefficiencies in the way medical delivery is provided. Interviewee E3 also seemed to agree with this view when saying that health care is full of inefficiencies, with even some studies citing that 30%-40% of healthcare money in USA is used in non-added value activities.

In addition to financial gains, lean services also bring positive perceptions from clients (VIEIRA; LEITE, 2015). When describing, Prevent Senior philosophy, interviewee E5

pointed out that the good services provided to elderly clients were important as word of mouth played an important role in their marketing strategy.

As it was suggested by Toussaint and Gerard (2010) the focus of lean healthcare should be around patient care. This is in line with the answers at Prevent Senior that illustrated the patients` well-being as a mandatory factor to be taken into account at any implementation.

Gowen *et al.* (2012) suggested that lean was consistent in mitigating medical error sources. Making doctors have a process minded care has been effective in diminishing errors and also increasing predictability according to interviewee E3. Additionally, the fact that doctors work Monday to Friday on the same schedule appears to be another source of decrease in errors in the company.

When looking at implementation factors of lean thinking in healthcare, Dannapfel *et al.* (2014) highlighted five common activities for successful lean healthcare implementation. Three of these activities can be clearly seen in the operations of prevent senior (“*Motivating the Lean improvement program...*”, “*Establishing a clear vision and objectives...*”, “*Communicating the program to all stakeholders.*”). From the interviewees` views, it is clear that the person responsible directly or indirectly for these activities in the company is its CEO, who has embraced lean philosophy and is working hard to spread it.

Eiro *et al.* (2015) suggested that scheduled services were more likely to have lean implementation because of its easier nature in comparison to free demand services. In the case of Prevent Senior, most of the projects were developed in fully or at least partially scheduled services.

Hwang *et al.* (2014) pointed that key success factors for lean implementation were (1) a shared vision of lean practices leading to customer satisfaction and cost competitiveness and (2) managers communicating down the hierarchy the practical implementation issues. Prevent Senior has these two key factors in place as the company insists that doctors or any other employee need to have a view of the whole process, having in mind patient value and cost control, and also when teaching lean to its managers who then pass the message to subordinates and send them to LSS courses to improve their skills. Such is the effective communication of the value of lean that employees feel proud when selected to these courses.

As it was cited by the interviewees, it is very likely that conflicts and tensions will emerge during the dissemination of lean culture in one company. This is what happened in Prevent Senior in the first years of dissemination of the program. Waring and Bishop (2010) described this problem saying that conflicts are very likely to occur between doctors and project leaders making lean very hard to be implemented. Although Prevent Senior has had difficulties in the implementation, it has been successful in many aspects as it has been described in the previous paragraphs. McIntosh et al (2014) said that lean implementation was likely to lead to disappointing indicators of hospital performance. This has not been the case in Prevent Senior, but many projects had to be suspended according to interviewee E2 because of the lack of feasibility. Additionally, implementations at Prevent Senior require a follow up of six months because, as predicted Matthew (2013), the benefits are very hard to sustain through a long period of time. Interviewee E2 pointed out that maintaining the quality of a successful project was an important goal for the company, even more realistic than continuous improvement of everything.

6. Conclusion and recommendations

This chapter will show the conclusions reached in this dissertation. Firstly, a summary of the whole research will be reviewed. Subsequently, the conclusions that could be taken from this work will be discussed and analyzed. The following section will discuss the theoretical and managerial implications of this dissertation. Finally, on the last section, topics for future research will be suggested.

6.1 Summary of the Research

This research had as its main objective the question of understanding how lean thinking philosophy can be used in the management of elderly people in healthcare. To reach this objective, a case study was conducted in one Brazilian health insurance company, Prevent Senior, that has the population older cohorts as its main clients (those aged 49 or more). This company also sells mostly individual health insurance plans, which are not the norm in Brazil.

In order to answer the main question of this dissertation, five secondary questions were used. These five questions were based on the five lean thinking principles discussed by Womack and Jones (1996) – *identifying value; identifying the value chain; developing a production flow, pulling techniques and continuous search for improvement* - and were adapted to the healthcare context.

The research was conducted as a Case Study in accordance to the method proposed by Yin (2015) and was mainly based on interviews. These interviews were conducted with five employees from Prevent Senior that were either physicians or employees from the quality department. These interviewees were identified in this research as only interviewee E1, E2, and so on.

After the interviews, the main findings were summarized in the case study chapter with additional information from Prevent Senior. After this, all the information was analyzed and then compared and related to the relevant literature on the subject, which permitted the presentation of the study conclusions.

6.2 Conclusions

In this section, the main conclusions that could be reached from this research will be reviewed. They were a consequence of the information discussed in the interviews and the careful analysis of all their findings, relating them to the relevant literature.

Having in mind the research question of this dissertation, it can be said that lean philosophy principles can be applied in the management of elderly patients in health insurance companies because their adoption is likely to contribute to the increase in the value that is received by the elderly, helping to keep them healthy and active, while contributing to maintain costs under control and insurance premia affordable, as this age cohort is more likely to have higher health care expenses if no innovative approach is applied in the health insurance company operations.

The findings from the interviews at Prevent Senior suggest that lean thinking philosophy can be a very useful tool in managing elderly clients in one healthcare company. In the case of Prevent Senior, it was possible to connect principles of their operations to all the five lean principles from Womack and Jones (1996).

Identifying value: The main examples of this principle were the Breast cancer project, where value is found in an earlier diagnosis and in higher chances of cure for the patient, and the Knee Surgery Project, where value is at a minimized stay at hospital without ICU stay. Additionally, in the case of exams, the new processes added value to the client with their simplification. Finally, in the case of infections, the value was provided with shorter hospital stays and lower chances of hospital infections.

Identifying the value chain: In the case of the value chain identification, the Breast Cancer Project illustrates the case where all the necessary equipment and staff are at the place to perform the required exams when they are needed. Also, the Knee Surgery Project illustrates how an unnecessary process, such as the mandatory stay at the ICU, can be eliminated without any complication. Additionally, the culture of parsimoniously prescribing exams, only those really necessary, again illustrates how the company eliminates procedures that are waste.

Developing a production flow: Again, the case of the Breast Cancer Project was an example of such principle being applied. In order to implement this new project, different areas were

integrated and committed to the process. In the case of infections' treatment, the full procedure had to be seen as a production process, from arrival at the hospital until the complete cure.

Pulling techniques: Prevent Senior provided examples of this principle in the case of the ophthalmology department, where exams are prescribed just after an appointment is scheduled, and also in the procedure for the new clients admitted to the health insurance plans in which all of them are asked to take the necessary exams, according to their age and medical history, and have their health reviewed by the plan.

Continuous Search for improvement: This is a principle that was continuously applied in Prevent Senior and can be exemplified by the Knee Surgery Project, where after completing the project's objective of reducing the procedure duration to 36 hours, the team responsible for it was able to diminish it to less than 30 hours.

Also disadvantages of lean implementations were found in Prevent Senior that were in line with the literature. Lean brought benefits to the company, but it faced strong resistance among some managers initially, resulting in internal conflicts. Additionally, the lean implementation is still viewed with skepticism by new employees, specially doctors, requiring upper management strong support.

More importantly, as it was noted by most of the interviewees, the patients mostly benefit from lean thinking implementation. At worse, the patient won't see a benefit but never a decrease on the quality of the services delivered according to Prevent Senior employees. Although there is resistance to lean in healthcare, as it was described by the interviewees, it can be concluded from the findings at Prevent Senior that this philosophy probably benefits patients and it is very unlikely to bring any disadvantage for the patient if properly implemented.

Now looking at the perspective from the company, according to Prevent Senior employees, Lean Thinking brings competitive advantage mostly related to cost reduction. As Prevent Senior seeks to provide healthcare for the elderly at affordable prices, it must take particular attention to its costs. As it was discussed in this dissertation, lean is likely one of the factors that makes possible the efficient use of the company's facilities and time, resulting in high

usage capacity without quality loss. Also, the company is able to diminish its cost structure because it focuses on prevention and early treatment of diseases and conditions, before acute symptoms appear. Although this approach results in higher costs initially, the shorter and less complicated treatments compensate them and diminish the overall costs.

In the context discussed in the previous chapters of rapid ageing of the population in Brazil and other countries added to growing healthcare costs, it can be said that lean thinking philosophy applied to healthcare, i.e. lean healthcare, is a promising solution to bring efficiency to medical services while maintaining costs controlled, at least partially. As it was highlighted by the interviewees, healthcare is full of slack and inefficiency and it is an industry that can extremely benefit from a lean thinking approach. Additionally, interviewees pointed out that although Prevent Senior benefits from having a vertical structure, lean can be implemented at every level of healthcare delivery or institutions. In most of the current activities there is space for efficiency gains and new forms of incentives between stakeholders should be created to accelerate lean implementation in other institutions.

In conclusion, the application of lean thinking in the management of elderly patients and in other areas of healthcare contributes for a win-win scenario for clients and healthcare institutions. While the quality of healthcare delivered is likely to increase, the costs of operation of healthcare institutions are likely to remain under control. More importantly, patients are more likely to be cured, with earlier diagnoses and better treatments, while health care institutions are likely to become more profitable and able to maintain health insurance premia at affordable levels, such as the situation found by this study at Prevent Senior.

6.3 Theoretical and Managerial implications

This dissertation illustrates the use of lean thinking and lean healthcare in the context of Brazilian private healthcare industry in the management of elderly patients. It is an example for the literature about one institution that has been able to implement the five main lean principles on its daily operations successfully.

The main theoretical contribution of this research is that it fills a gap in the theory regarding lean healthcare and the management of the elderly in Brazil. Although other studies exist reviewing the use of lean thinking in Brazilian hospitals, it was not identified any other study in the literature illustrating the impact that lean can have on the management of elderly

patients. Thus, this dissertation is innovative in presenting lean thinking as part of a possible solution for the growing health care costs due to an ageing population.

From a managerial perspective, this research shows that one company can develop competitive advantages from the introduction of lean philosophy on its business. It helps managers of other health insurance companies in dealing with this older age segment of clients in the context of a growing aging population in Brazil. As it was demonstrated in this dissertation, Prevent Senior is a company that deals with one customer segment that is not seen as viably profitable by many of its competitors. This age cohort is likely to have multiple chronic diseases which result in high medical costs. As Prevent Senior charges reasonable/affordable prices for insurance on the view of its employees, it would struggle to remain profitable if it adopted current practices of competition. Contrary to this, the company has had good financial performance as it was suggested by its financial reports. Therefore, this study also has implications regarding the general public health as it presents a solution to deal with huge waste in healthcare and excessive care costs with the elderly.

Ultimately, this study illustrated that in the opinion of the interviewees, the application of lean thinking to healthcare is very unlikely to decrease the level of care quality delivered to the patient. On the contrary, it could be understood that in most of the cases the introduction of lean initiatives can benefit greatly patients as it is on the case of initiatives that result in earlier diagnosis.

6.4 Future Research

This research focused in answering the question of how lean thinking principles could be applied in the management of elderly in a health insurance company. By this research findings, it can be said that lean thinking can be applied in the management of elderly, contributing to the increase in value to clients and also to the increment in the profitability of the company.

As this research was based on a case study of one single company, the information gathered was qualitative and restricted to the information provided during the interviews. Consequently, the results of this research can't be generalized.

Future research could analyze this topic through a quantitative approach. Although the interviewees believed in the benefits and financial gains that lean brought, no statistics were provided supporting these statements. In order to have more robust results, this study suggests that further research should be done to measure financial benefits and costs savings of the implementation of lean thinking in the management of elderly patients.

Also, other research could investigate the real value perceived by the elderly clients. Although the interviewees reported that there was no decrease in the value delivered to the elderly, these patients might show a different opinion if they are the ones being interviewed. The opinion on the ethical aspects of the implementation of lean healthcare could also be investigated with interviews with doctors and patients.

Additionally, further research could look deeper on the implementation of one single lean project, starting from the early steps until the phase where results are monitored, in this institution. This research only received information regarding lean programs from the company's employees but could not keep track of the whole process. Therefore, additional research could provide insights on the full development and implementation of lean thinking projects in the management of elderly patients.

Finally, other research could investigate if the perceived gains from lean implementation at Prevent Senior would also occur in one non-verticalized health insurance company, as the vertical structure of the studied company probably has positive impact on the value and the efficiency of its operations.

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