Lean management at the outpatient surgery department

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"Work Smarter, Not Harder"

-Alan Mogensen-

PREFACE

This master thesis is a result of the study Business Administration track Innovation and Entrepreneurship at the University of Twente, conducted in the Hospital St Jansdal at Harderwijk. Using this opportunity, I would like to thank several people who gave me fully support during my days at Hospital St Jansdal and during my graduation period.

At first I would like to express my sincere gratitude to my leading supervisor Prof. Dr. Ir. Koos Krabbendam for his advice and support. I also want to thank my other supervisor Ir. Remco Rosmulder. With his critical remarks he helped me along.

Further I would like to thank my co-supervisor Hilde Oliver for her advice, support and her patience. Subsequently I want to thank my former co-supervisor Sietske Huizer for helping me to start with the research in a right way. I learned much from her.

Finally I want to thank the medical assistants of the outpatient surgery department and the head of the department Henriëtte Fraters for their co-operation.

Ambt Delden, December 2010
Geronique van de Riet

MANAGEMENT SUMMARY

Because of the development of the introduction of the regulated market force in the healthcare hospitals have to be more business oriented. The hospitals must organize their processes more efficient in order to deliver care at a lower price so that they can compete with other hospitals.

The regional hospital St Jansdal at Harderwijk must also deal with the new development of the regulated market force and try to organize their processes more efficiently. As a consequence they are looking for improvements of their processes.

PROBLEMDEFINITION

Partly through contact with other hospitals and partly through intuition, the head of the outpatient surgery department of the hospital St Jansdal has a feeling that the outpatient surgery department has less results with more employees than other hospitals with less employees.

There is a common feeling that there are certain processes that can be organized differently and more efficiently or are of less value to the outpatient surgery department as well. This feeling is based on the fact that during the consulting-hours the medical assistants have to wait a lot.

The focus of the research lies on the outpatient surgery department and their medical assistants.

OBJECTIVE

The objective of the research is:

" to make recommendations that enables the medical assistants to work more efficiently through the concepts of Lean management".

RESEARCH QUESTIONS

- *Central question*

Does waste occur in terms of Lean management in the work of medical assistants at the outpatient surgery department of the hospital St Jansdal and can there be given recommendations based on the concepts of Lean management?

- *Research questions*

1) What are the special characteristics of the healthcare environment?
2) What are the products or services that the outpatient surgery department offers and what are the qualifications?
3) What is known about the concept of Lean in hospitals?
4) What do the processes in the outpatient surgery department look like?
5) How do the medical assistants contribute to the processes?
6) Which non-added value activities have the medical assistants to carry out?
7) Which of these activities are avoidable and which activities are not avoidable?
8) How can these processes be changed in order to reduce the non-added value activities as much as possible?

METHODOLOGY

Several methods are used to answer the research questions. There has been made use of:

- Literature review
- Observation of the medical assistants during the consulting-hours and preparation of these consulting-hours
- Interviews with medical assistants, surgeons and the head of the outpatient surgery department
- Gathering data from internal documents
- Mapping the value-stream of the patient and the medical assistants during the consulting-hours and preparing the consulting-hours
- A work sample of the medical assistants during the consulting-hours (5 working days, 1343 observations) and preparing the consulting-hours (3 working days, 425 observations)

ANALYSIS

Through the concepts of Lean management we get an insight in the current state of the outpatient surgery department. The processes of the outpatient department during the consulting-hours and the preparation of the consulting-hours focused on the patient and the medical assistant will be made visible in a value stream map. At the same time we will take a closer look at the activities that the medical assistants carry out and how much of their time they spend on these activities, by executing a work sample. With the data of the work sample we can quantify the idle time or so-called waste at the outpatient surgery department.

CONCLUSION

The activities that the medical assistant execute during running consulting-hours and preparation of the consulting-hours are categorized in main categories: direct care, documentation, idle time, indirect care , personal time and unit related. The category direct care is not applicable during the preparation of the consulting-hours

The work sample showed that medical assistants spent much of their time on non-value activities in the perspective of the patient. The activities that fall in the category documentation, indirect care, personal time and unit related are not avoidable non-value-added activities in the patient's perspective. The activities that fall in the category idle time are avoidable non-value-added activities. On the other hand the activities that fall in the category direct care are value-added activities in the patient's perspective.

During running the consulting-hours the medical assistants spend 36% of their time on idle time. These avoidable non-value-adding activities are waste or in terms of Lean called 'muda'. During the preparation of the consulting-hours medical assistants spend 20% of their time on idle time. It is concluded that a large part of the activities performed by medical assistants is waste. The total waste that was measured 1,5 weeks for observation during the consultation and preparation of the surgery has a value of € 1,783.89. This amount is based on the internal labor costs of € 25.60 per hour which are used within the hospital. When we make a calculation of total annual waste of the medical assistants, we see that the labor costs of this waste is € 93,843.20 per year or 2,2 FTE (based on a working week of 36 hours). It can be stated that the hospital is disposing € 93,843.20 or 2,2 FTE per year due to waste which takes place within the outpatient surgery.

The observation of the preparation of the consulting-hours make clear that checking if the treatment chart is complete and making them complete, takes medical assistants a lot of time.

The medical assistant checks several times if the treatment chart is complete and if necessary they request the lab results to complete the treatment chart. This is duplication of their work and waste of their time. Time that they better could use for other value-added activities. This is the result of the fact that the lab results are not visible in the computer system.

RECOMMENDATIONS

The following recommendations can be given on the basis of the current research:

- *Flexible scheduling*

The 'flow' or the efficiency can be improved during running the consulting-hours through flexible scheduling. This means that during the consulting-hours three medical assistants instead of four medical assistants will be scheduled to assist the surgeons. Through this initiative medical assistants make more efficient use of their available time.

- *Improving the process of making the treatment chart complete*

It involves mainly the process of making the treatment charts complete with the needed lab- and test-results. It appears that the medical assistants often have to perform the same actions repeatedly. This leads to that the medical assistants do not make efficient use of their available time.

- *Implementation of Lean management at the entire outpatient surgery department*

To improve the efficiency/flow in all the processes at the outpatient department it is important that the concepts of lean management are implemented at the entire outpatient surgery department.

Process mapping is a good start of the lean transformation. A process mapping session will be performed by a selected team of medical assistants, surgeons and the head of the outpatient surgery department. The team will together map the entire process at the outpatient surgery department. They will see what the other persons see and this will be a possible eye-opener.

FURTHER RESEARCH

The purpose of future research is that the described processes in this current research will be more specified. The process mapping session will give a more specific insight into the processes during the consulting-hours and the preparation of these consulting-hours. It is also intended that an insight will be created into the processes of the surgeons and their activities. Further research must give an insight in the following aspects:

- The workload of the surgeons
- The variation in the supply and demand of the surgeons and medical assistants during the consulting-hours
- The up and down peaks of the consulting-hours in relation to the activities of the surgeons and medical assistants
- The idle time of the medical assistants in relation to the activities of the surgeon

The results of additional research will help to give more specified conclusions about the efficiency within the outpatient surgery department. These conclusions will form a basis for a better detailed plan that enables the outpatient surgery department to organize the processes more efficiently within the department. Improving efficiency will lead to a saving of a large amount of (wage) costs.

TABLE OF CONTENTS

CHAPTER 1 INTRODUCTION

In the following chapter an introduction is given of the research that is conducted in the context of the Master thesis of the education Master Business Administration track Innovation and Entrepreneurship at the University of Twente.

This first chapter starts with the research background *(1.1)* and gives information about Hospital St Jansdal and the associated outpatient surgery department *(1.2)*. The next paragraph adds the problem definition and clarifies the direction of the research among others like the research objective and research issue *(1.3)*. The last paragraph clarifies the structure of the report *(1.4)*.

1.1 BACKGROUND

In recent years Dutch hospitals have been confronted with several developments. One major development is the introduction of the so-called regulated market by the government. The operation of the regulated market system is that Hospitals increasingly do their best to deliver patient-oriented, safe and the highest possible quality care at the best possible price. This ambition is partly responsible for the costs rising sharply in the healthcare. This allows the health insurance to have a hand in it (Ministry of Health, Welfare and Sport).

The basic idea of the regulated market in healthcare is that patients are free to choose where they purchase healthcare or health insurance and health insurers are free to choose with whom they buy care. Healthcare providers in turn are free in the way they offer care and at what price and health insurers are free to the insurance they offer and at what price. Providers (healthcare insurers and healthcare providers) compete with each other by offering better products and/or being cheaper than their competitor (Ministry of Health, Welfare and Sport).

Because of the development of the introduction of the regulated market force in the healthcare hospitals have to be more business oriented. The hospitals must organize their processes more efficient in order to deliver care at a lower price so that they can compete with other hospitals.

The regional hospital St Jansdal at Harderwijk must also deal with the new development of the regulated market force and try to organize their processes more efficiently. As a consequence they are looking for improvements of their processes.

This research focuses on the processes of the medical assistants of the outpatient surgery department of the St Jansdal Hospital in order to improve the efficiency.

1.2 THE CONTEXT

1.2.1 HOSPITAL ST JANSDAL

The Cristian Public Hospital St Jansdal opened in 1987. The Hospital has arisen from a merger with three regional hospitals. St Jansdal is a medium sized hospital at Harderwijk where 1500 employees , 95 medically specialists and 350 volunteers work to offer optimal and professional care to the inhabitants of the North West Veluwe and a part of Flevoland. The hospital is primarily aimed at the municipalities Harderwijk, Ermelo, Putten, Nunspeet en Zeewolde. The secondary share service area consist mainly of the municipalities Dronten, Nijkerk, Barneveld en Elburg. The hospital has a medical service area of 144.000 inhabitants *(Referring to appendix I)*. In the year 2008 there was an average of 70 day clinics and an average of 1061 visits to the outpatient departments per week.

Referring to appendix II for the organization chart of the hospital.

The hospital states their mission as follows:

"With love and compassion give the best care to patients, in a healing environment"

The hospital wants to give care with love and compassion; patients feel themselves heard and supported. Patients are seen as a partner in the care process. They are given control about their own care process as much as possible. The hospital strives for an environment which makes patients feel themselves at ease. This approach is not only pleasant for patients, but also contributes to their recovery.

The vision of the hospital is stated as following:

"St Jansdal wants to be a full-fledged hospital that offers all the basic care, that belongs to the 25% of the best hospitals of the Netherlands and that independently determines her own policies .The hospital does not exclude the option however of contracting a strategic alliance with another care organisation".

1.2.2 THE OUTPATIENT SURGERY DEPARTMENT

The hospital has 19 outpatient departments. One of them is the outpatient surgery department. This department is one of the biggest specialisms of the hospital. The department employs a lot of employees to run the department as best as possible. There are ten surgeons, eleven female medical assistants and some other professionals (for example the nurse practitioners for oncological care) employed by the outpatient surgery department.

The patient can be admitted to the outpatient surgery department for all types of surgery. Outpatient care with regard to oncological surgery, vascular surgery, gastro-intestinal surgery, lung surgery, the somewhat simpler traumatology and plastic surgery is therefore possible.

At the outpatient surgery department several parties are participating. The department has eight surgeons with several specialisms and two plastic surgeons. There are two qualified nurse practitioners employed and one nurse practitioner in training, who assist the surgeon with consulting the patients. Furthermore there are eleven medical assistants working at the outpatient department. These assistants assist the surgeon during the consulting-hours with nursing and administrative activities. They execute all administrative tasks with regard to preparing the consulting-hours as well. All the assistants have the diploma 'doctor assistant B' and several extra trainings.

In figure 1 an organization chart is displayed to get an overall picture of where the employees of the outpatient surgery are in relation to the whole organization of the hospital. The management of the hospital is in control of the Board of Directors. Among them are the manager "Acute zorg", manager "Snijdende zorg" and the manager "Beschouwende zorg".

Referring to appendix II for the organization chart of the hospital.

The head of the outpatient department surgery Henriëtte Fraters, is subordinated to the managers. The head is responsible for the daily operations and manages the medical assistants. The medical assistants have several tasks. They have to execute all the tasks that are related to running the consulting-hours and the preparation of these consulting-hours.

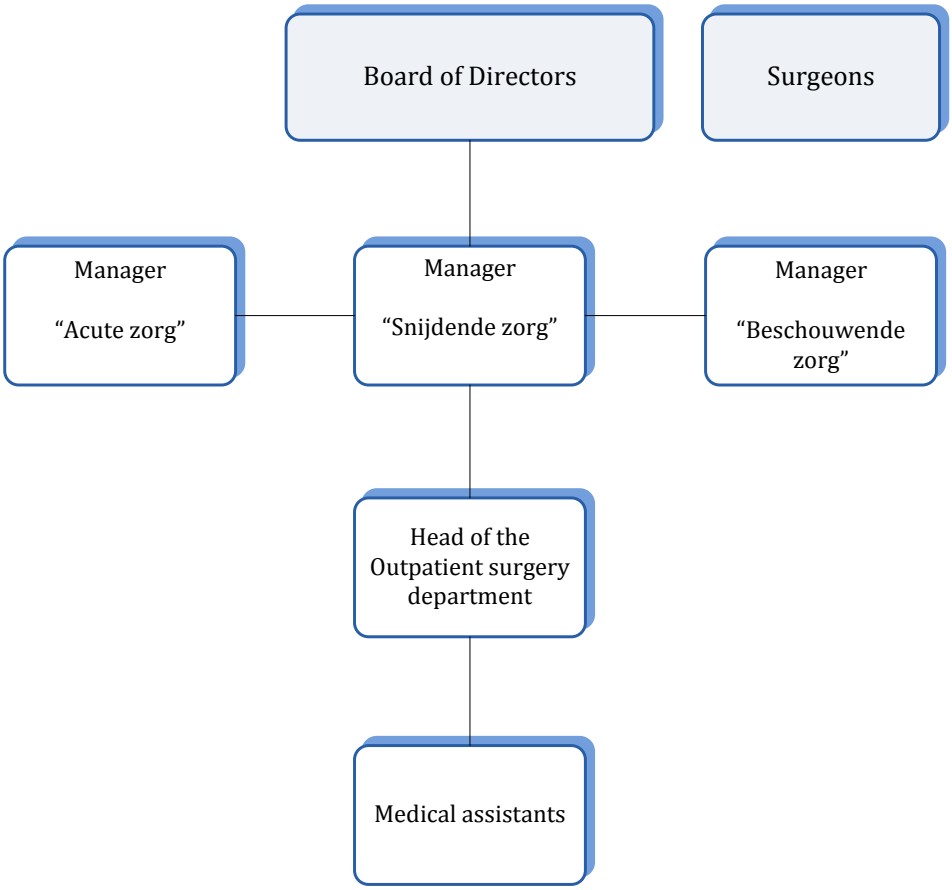

Figure 1 Organization chart outpatient surgery department

1.3 THE PROBLEM DEFINITION

1.3.1 THE RESEARCH CONTEXT

Partly through contact with other hospitals and partly through intuition, the head of the outpatient surgery department has a feeling that the department has less financial results with more employees than other hospitals with less employees. There is a common feeling that there are certain processes that can be organized differently and more efficiently or are of less value to the outpatient surgery department. This feeling is based on the fact that during the consulting-hours the medical assistants have to wait a lot. In this research the problem is to put the finger on the sore spot, because it is not clear where the bottleneck is. The focus of the research lies on the outpatient surgery department and their medical assistants.

1.3.2 RESEARCH OBJECTIVE

The objective of the research is:

" to make recommendations that enables the medical assistants to work more efficiently through the concepts of Lean management".

1.3.3 RESEARCH ISSUE

A central question is formulated to make the problem at the outpatient surgery department comprehensible. Research questions are formulated to get more insight in the whole problem. These results of the research questions will lead to answering the central question and making recommendations.

- *Central question*

Does waste occur in terms of Lean management in the work of medical assistants at the outpatient surgery department of the hospital St Jansdal and can there be given recommendations based on the concepts of Lean management?

- *Research questions*

1) What are the special characteristics of the healthcare environment?
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7) Which of these activities are avoidable and which activities are not avoidable?
8) How can these processes be changed in order to reduce the non-added value activities as much as possible?

1.3.4 RESEARCH FRAMEWORK

To make recommendations for improvement it is important that we form a notion of the current state and the future state of the outpatient surgery department. To form a notion of the current state we first need to gather information through preliminary research and literature. Through the preliminary research we form an overall image of the outpatient surgery department and with the concerned employees. The focus is on the medical assistants and their activities. Through the literature of processes, value stream mapping and work sampling a basis will be

formed at which the current state of the outpatient surgery department can be reflected. An analysis of the current state of the outpatient surgery will be conducted. Then the whole research that has been conducted will be discussed. After the results of the research are declared and clarified, conclusions can be drawn. After a picture is formed of the current state we can form an image of how the future state must look like at the outpatient surgery department with help from the literature of Lean management and Dutch healthcare. Subsequently the current state can be reflected to the future state of the outpatient surgery department. This will lead to a set of possible improvements for the department. The recommendations are based on improving the efficiency at the outpatient surgery department.

Referring to figure 2, a schematic reproduction of the research is displayed.

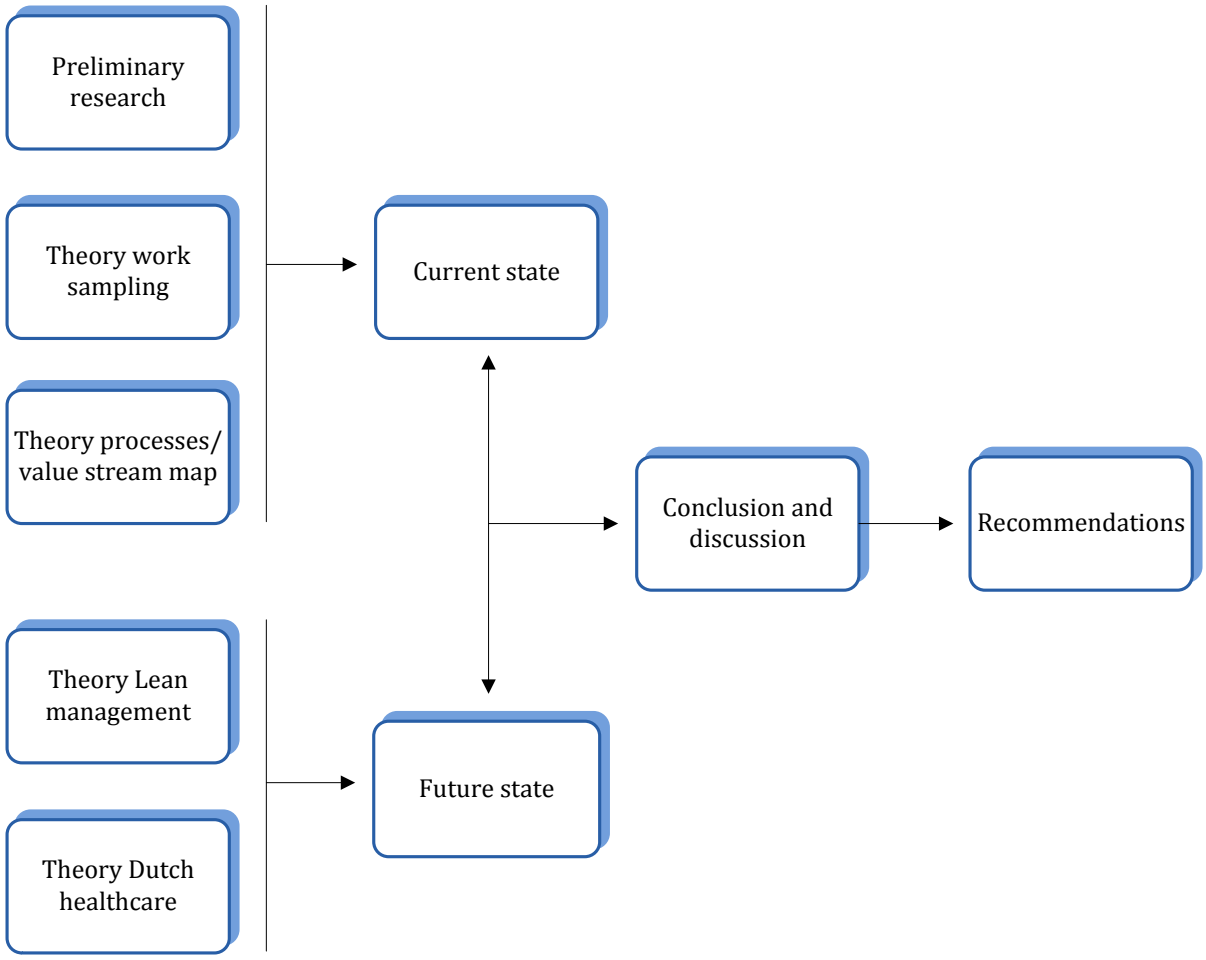

Figure 2 Research model

1.4 STRUCTURE OF THE REPORT

In figure 3 the research model and the structure of the report is visualized. The first chapter of the report contains an introduction of the research. A part of this chapter is a description of the background, context, problem definition and an overview of the structure of the report.

The second chapter contains a review of the literature and forms the basis of the research. In this chapter the theory about the Dutch healthcare system, the concepts of Lean management and Lean healthcare are outlined.

The third chapter discusses the research methodology. The chapter contains a description of the research design, the methodology, the method work sampling and the sample design.

The fourth chapter gives an analysis of the current state at the outpatient surgery department. The chapter gives an insight in the entire outpatient department. We also take a closer look at the processes during the consulting-hours and the preparation of the consulting-hours accompanied with value stream maps. After that, the design of the work sampling will be displayed followed up with the results. In conclusion a quantitative description will be given and a closer look will be taken at the total wage costs of time spent by the medical assistants on idle time.

The fifth chapter contains conclusions and the discussion. At first the chapter answers the research questions and subsequently the central question. After this the entire research will be discussed in the paragraph 'discussion'.

The sixth chapter will form an image about the future state at the outpatient surgery department. Therefore a set of possible recommendation will be given.

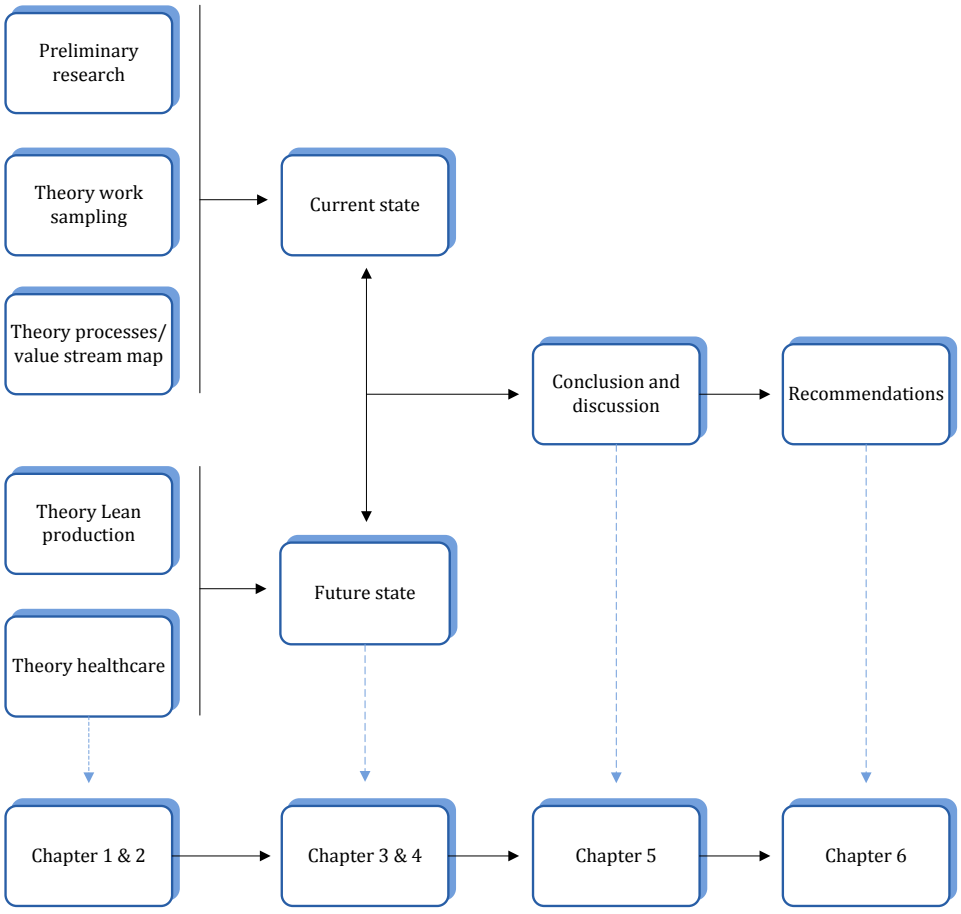

Figure 3 The structure of the report

CHAPTER 2 THEORETICAL FRAMEWORK

The manufacturing theory of Lean is more often applied to the healthcare sector. The concepts of Lean give an opportunity to analyze the outpatient department in a different way than hospitals are used to. The main goal of this research is to make recommendations that enables the medical assistants to work more efficiently through the concept of Lean management. In this research we are going to use some of the concepts of Lean management to analyze the current state at the outpatient surgery department.

This chapter starts with an introduction about how the healthcare sector in the Netherlands is composed *(2.1)*. Subsequently the origin of Lean and the Lean concepts are exhaustively described *(2.2)*. Finally Lean is discussed with regard to the healthcare sector *(2.3)*.

2.1 THE HEALTHCARE SECTOR IN THE NETHERLANDS

2.1.1 THE HOSPITAL CARE

Hospital care is aimed at treating and curing acute and chronic physical illnesses. It provides medical-specialized assistance with related nursing and care. The care given in hospitals is the primary part of cure-sector within the health care. Hospital care consists of care provided by general and academic hospitals, class hospitals, independent treatment centres and top clinical and trauma care. The general hospitals are by far the greatest in number (Wieren, van).

Hospitals are permitted by government institutions. Most hospitals provide basic care for common diseases. Some hospitals also provide more specialist care. An academic hospital is an example of such a hospital. For a medical specialist it is not possible to start on their own with delivering care without permission of the government. This is a recognition of the regulation of admission healthcare institutions (WTZi). Health care institutions need permission if they want to offer care under the Health Insurance Act or Exceptional Medical Expenses Act (AWBZ) for reimbursement eligibility. The WTZi regulate the authorization, set rules on good governance and also determine the cases in which profits can be distributed (Ministry of Health, Welfare and Sport.

2.1.2 THE GENERAL HOSPITAL

The general hospital is a medical centre. It consists of a concentration of facilities for research, treatment and nursing of professional staff and expert medical attendance. It is also the place where prominent doctors and nurses are trained. Its main features are diagnosis, therapy, nursing and isolation. A patient is admitted to the hospital when the therapeutic or diagnostic opportunities outside the hospital are insufficient or if only isolation is needed. Intakes are usually through the outpatient department or the emergency room of a hospital where the patient normally by the general practitioner or sometimes by a fellow institution is reassigned. From these departments a patient can be transferred to a nursing care department, acute or planned, when the condition of the patient makes this necessary.

The outpatient department is primarily aimed at research and outpatient treatment of conditions which the general practitioner does not have the resources and the knowledge of. In addition, the clinic is focused on the so-called redundant retesting of hospital patients.

The focus in hospitals is in the large number of different operations and production. The production in general hospitals is more technical, complex and dynamic than in other settings of care. That is the reason partly why staying at an hospital is expensive.

As a medical centre, the general hospital in its development is, to a large extent, determined by developments in medicine. The hospitals have a so-called cumulative grow model.

This means that the differentiation in medicine, medical specialties are incorporated. If the target is at least double occupancy per specialty, it is clear that hospitals in their efforts to complete a medical centre, go through a long-term growth. Complete in this context should not be construed as up to the mark. An up to the mark hospital is a hospital that can offer responsible care to the hospital population (Boot & Knapen, 2005).

2.1.3 THE DUTCH HEALTHCARE SYSTEM

The characteristic of the Dutch healthcare system is that patients are insured against the most health risks. The system is a combination of systematic or social system and market-oriented system(Engberts & Kalkman-Bogerd, 2009). Therefore the Dutch healthcare system has been defined as a form of a regulated market force. At the systematic or social system the government plays an explicit role. De government has the control in their hands and therefore ins taxes or employers- and employees-contributions. This is needed for the defrayment of the healthcare and the healthcare that is financed by government contributions(Engberts & Kalkman-Bogerd, 2009).

At the market-oriented system the government intervenes slightly with the healthcare. In this system the contents of the care are stipulated by the concerning parties: the insured, care insurer and the healthcare provider. There is no limit to the consumption of care because both, the insured and the care insurers have an interest in maximal healthcare(Engberts & Kalkman-Bogerd, 2009).

The combination of these systems must result in a lower-priced and qualitative sublime healthcare with a better balance between supply and demand(Engberts & Kalkman-Bogerd, 2009).

2.1.4 THE MARKET FORCES IN THE HEALTHCARE

Introduction of the (regulated) market is an important development in the hospital in recent years. This means that hospitals increasingly are run like a business. Hospitals are improving their effort to provide patient-oriented, safe and the highest possible quality care at the best possible price. This allows the health insurance to have a hand in it. An important step is the introduction of the diagnosis treatment combination.

The ministry of Health, Welfare and Sport wants more competition in the care. Competition between care providers forces and motivates care institutions to provide the best quality of healthcare at the best possible price. In the new healthcare scheme the customer is in the centre, free market is stimulated and the government steps backwards.

To stimulate the market there are two laws:

- The law admission care institutions (WTZi)
  has as an aim gradual more freedom and creating responsibility for the care institutions, less government intervention with the capacity and the construction of care institutions.
- The law market structure health care (WMG)
  must ensure more competition in the care. According to the WMG care providers and insurers have an information obligation. Moreover the WMG regulate the supervision of all care markets (care insurance, care purchase and care attribution), on the development of these markets and of forms and procedures in the care.

Care providers in hospitals and GGZ-organizations (mental health care) and care insurers get more space to organize the care to their own insight in the coming years. The government creates for this space the correct boundary conditions. For that reason there are diagnosis treatment combinations (DBC's). The health insurance companies pay one price for a sickness case for the total care which is granted to a patient: the DBC. The use of DBC's must lead to more efficiency and quality (Ministry of Health, Welfare and Sport).

2.1.5 3 PARTIES AND 3 MARKETS

The system of healthcare consist of three parties: patients, healthcare providers and health insurance companies *(Referring to figure 5)*. These parties have relations with each other. The relations can be distinguished in three types:

- The market of care providers, where patients and care providers interact with each other
- The care insurers, the market where patients and care providers meet each other and discuss who for which forms of care is insured.
- The healthcare repurchase market, the market after which care providers (in the role of entrepreneurs) and care insurers (in the role of the payer) determine how much care against which price is available.

The government has a coordinating role in this whole because she stipulates conditions for the players in the healthcare. Moreover she preserves with regard to the constitutional task, the final responsibility. This is the reason why the government established numerous supervision holders and advisory bodies (Engberts & Kalkman-Bogerd, 2009).

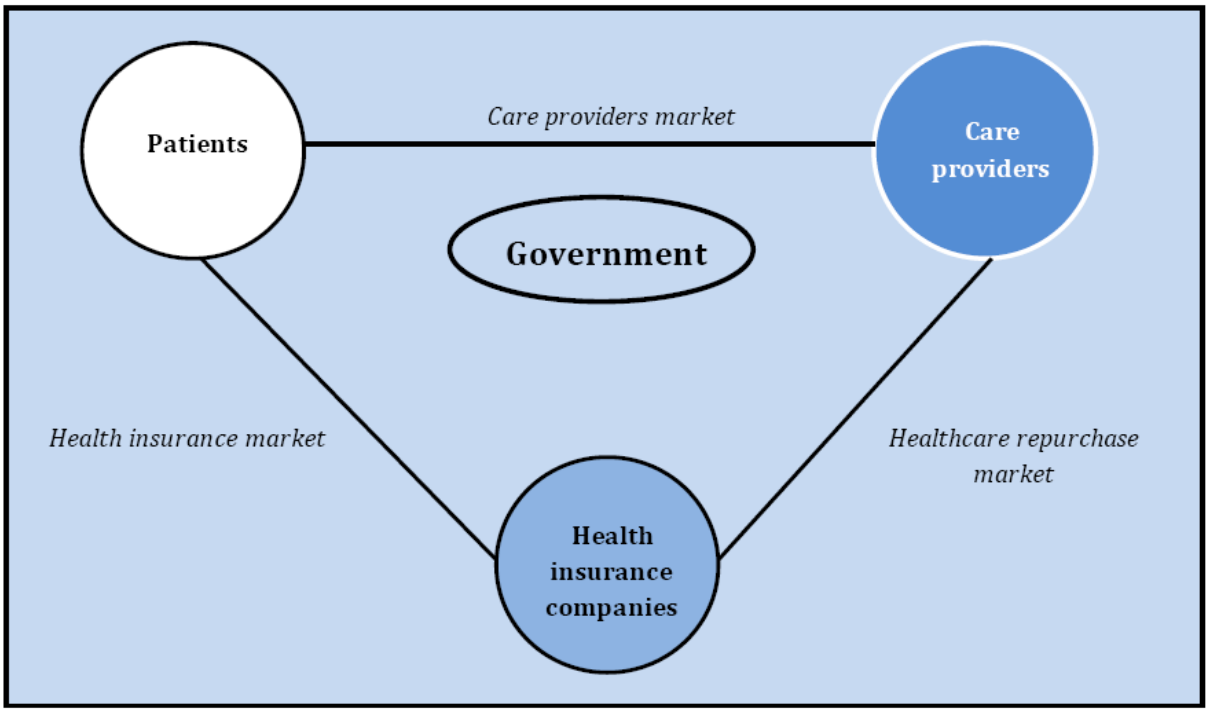

Figure 4 A schematic reproduction of the 3 parties and the 3 market, altered from: *Engberts & Kalkman-Bogerd, (2009):*

2.2 LEAN

2.2.1 THE HISTORY OF LEAN

The management philosophy and tools of Lean management come from the manufacturing industry, where they were pioneered by Toyota Motor Corporation, which is viewed as the leader in utilizing these performance improvement methods (Kim et al., 2006).

The Fundamentals of Lean started in Japan at Toyota in the 1940s. The Toyota Production System was based around the desire to produce in a continuous flow which did not rely on long production runs to be efficient; it was based around the recognition that only a small fraction of the total time and effort to process a product added value to the end customer. This was clearly the opposite of what the Western world was doing. In the Western world mass production was based around materials resource planning (MRP) and complex computerized systems were developing alongside the mass production philosophies originally developed by Henry Ford, i.e., large high volume production of standardized products with minimal product changeovers (Melton, 2005).

Toyota is known as the inventor of Lean management. This is not accurate, because Toyota was inspired by many others and learned from them, such as the early writings of Henry Ford and the practices of American supermarkets. Toyota took some aspects of the Ford system, but created its own systems, using and inventing methods that fit its needs and situation. They refined the system. Toyota developed the Toyota Production System (TPS) over many decades, starting in 1945. Inventing and refining a new production system was not an overnight success story, changing old mindsets and organizational cultures takes time (Graban, 2009)

2.2.2 THE DEFINITION OF LEAN

It is very difficult to include Lean in one definition, because Lean is a lot of things. To give a starting point of what Lean is we use the definition of Graban (2009):

"Lean is a toolset and a management system, a method for continuous improvement and employee engagement, an approach that allows us to solve the problems that are important to us as leaders and as an organization"

2.2.3 WHAT IS LEAN?

Lean is not a tool or a method that you can easily use to change an organization in a few steps in a short period. According to Melton (2005) Lean is a revolution and is about the complete change of a business; how the supply chain operates, how the directors direct, how the managers manage and how employees or people do their daily work.

When an organization applies correctly the Lean tools, this will result in the ability of an organization to learn (Emiliani, 1998). When an organization is willing to learn this will add to the continuous improvement. Lean is about creating a continually improving system which is capable of achieving more, using less (Jones and Mitchell, 2006). Continuous improvement transforming waste into value from the customer's perspective. It provides a rigorous and systematic approach to process improvement, error proofing and waste reduction (Kim et al., 2006).

Lean is unique in its focus on the specification of value from the customer's perspective and on the identification and categorization of waste and its transformation to value using specific tools(Kim et al., 2006). The categorization of waste involves determining the value of any given process by distinguishing value-added steps from non-value-added steps, and eliminating waste (or *muda* in Japanese) so that ultimately every step adds value to the process. (Innovations Series, 2005). The Lean approach encourages individuals within the organization (from top to bottom) "to learn to see" the flow of their product's processes and thus to help to identify areas of waste, with the ultimate goal of creating a product with built-in quality with the least amount of waste (Kim et al., 2006).

Lean teaches that optimizing the performance of an individual area is insufficient, that the entire process flow, which requires cooperation of multiple operating units, must be improved in order to achieve meaningful and sustained improvement in performance (Kim et al., 2006). Lean is not a thing. It is a set of ideas and concepts, which people have to think about and make decisions to the best of their ability. (Graban, 2009).

Lean is also about learning to fix problems permanently instead of hiding them or working around them (Graban, 2009).

When Lean management is applied successfully the processes will flow, and operations are improved. Because of this the job descriptions and duties of individuals may be redirected. (Kim et. al., 2006). An almost inevitable result of Lean initiatives is that fewer people are needed to achieve the same (or more) results. (Jones & Mitchell, 2006).

2.2.4 LEAN THINKING

Womack and Jones define Lean thinking in their book *Lean thinking* as follows: "In short, Lean thinking is Lean, because it provides a way to do more and more with less and less – less human effort, less equipment, less time, and less space – while coming closer and closer to providing customers with exactly what they want.

Lean thinking brings together several strands of process improvement. It starts by defining the purpose of the process (value for the customer), then redesigns the process to deliver this value with minimum wasted time, effort and cost. It then organises people and organizations to manage this value delivery process (Jones & Mitchell, 2006).

There are five basic concepts that define Lean thinking and enable Lean management: specify value, identify the value stream, flow, pull and perfection (Womack & Jones, 1996) *(Referring to figure 5).*

- *Specify value*

The identification of value and the definition of value propositions for specific customers is the starting point. Without a robust understanding of what the customer values you cannot move forwards . What customers value usually includes care that is of high quality, safe, efficient and appropriate. (Emiliani, 1998).

According to the concepts of Lean, value is defined solely from the customer's perspective. The products must meet the customer's need at both a specific time and price (Emiliani, 1998). In a hospital the customer will generally be the patient. Anything that helps treat the patient is value-adding. Everything else is waste. Lean eliminates waste and reinvest released resources in value creation (Jones & Mitchell, 2006).

- *Identify the value stream*

Identifying the value in Lean management means to understand all the activities required to produce a specific product, and then to optimize the whole process from the view of the end-use customer.

The viewpoint of the customer is critically important because it helps identify activities that clearly add value, activities that add no value but cannot be avoided, and activities that add no value and can be avoided (Emiliani, 1998).

- *Flow*

After value has been specified and value streams have been identified, the next step is to get the activities that add value to flow without interruption (Emiliani, 1998). Flow is concerned with processes, people and culture and is probably the hardest Lean concept to understand. (Melton, 2005). Flow in Lean management means to process parts continuously, from raw materials to finished good, one operation or one piece at time (Emiliani, 1998).

- *Pull*

The concept of pull in Lean management means to respond to the pull or demand of the customer. Lean manufacturers design their operations to respond to the ever-changing requirements of end-use customers (Emiliani, 1998).

To create value we need to provide services in line with demand. No less. And no more. Delivering services in line with demand also means all work, material and information should be pulled towards the task as and when needed. Not before. Not after. Any time spend waiting or queuing is another form of waste; resources are being used up but are idle (Jones and Mitchell, 2006).

- *Perfection*

The hardest of all concepts is the concept of perfection. Perfection in Lean management means that here are endless opportunities for improving the utilization of all types of assets. The systematic elimination of waste will reduce the costs of operating the extended enterprise and fulfils the end-use customer's desire for maximum value at the lowest price. While perfection will never be achieved, its pursuit is a goal worth striving for because it helps maintain constant alertness against wasteful practices (Emiliani, 1998). Pursuing perfection requires an organization to commit to process improvement and the elimination of defects and waste on daily and permanent basis (Kim et al., 2006).

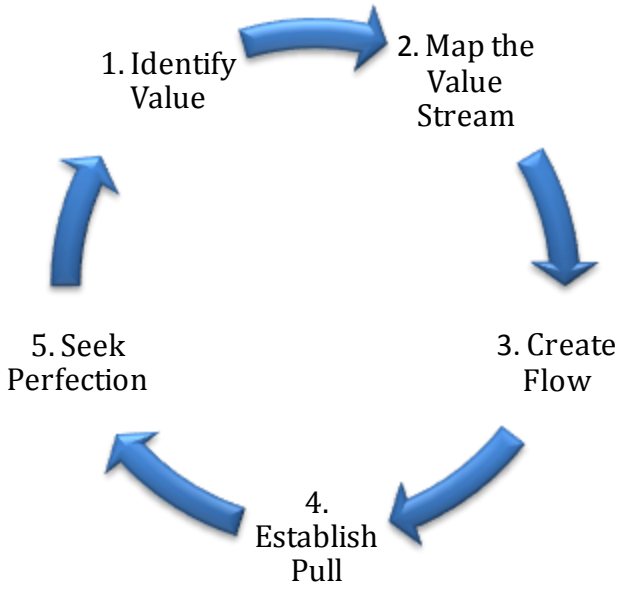

Figure 5 Lean principles derived from: *Lean Enterprise Institute (2009)*

2.2.5 THE BENEFITS OF IMPLEMENTING LEAN

Implementation of Lean principles brings four waves of benefit (Jones and Mitchell, 2006):

- Improved quality and safety – fewer mistakes, accidents and errors
- Improved delivery – better work done sooner
- Improved throughput – the same people, using the same equipment, find they are capable of achieving much more
- Accelerating momentum – a stable working environment with clear, standardized procedures creates the foundations for constant improvement.

2.2.6 LEAN TOOLS

For implementing Lean an organization need tools. Lean has several tools and techniques within the 'Lean' system: kanban, 5S, kaizen, error proofing and visual management. In table 1 the Lean tools are defined.

Lean tool	*Definition*
Kanban	Japanese term meaning "signal", a method for managing inventory
5S	Method for organizing workplaces to reduce wasted time and motion for employees, making problems more readily apparent.
Kaizen	Japanese term meaning "continuous improvement," focused on workplace improvement by employees.
Error proofing	Method for designing or improving processes so errors are less likely to occur.
Visual management	Method for making problems visible, providing for fast response and problem solving

Table 1 Definitions of the Lean tools

2.2.7 WHAT IS WASTE?

The search for waste is never-ending and regarded as one of the few things that non-production workers can do to add value to products Waste in Lean management is defined as actions that do not add value to a product and can be eliminated. Waste is viewed by those that understand the concept deeply as the singular enemy that greatly limits business performance and threatens prosperity unless it is relentlessly and systematically eliminated over time. Taichi Ohno defined seven types of waste. These types of waste include: overproduction of goods, waiting, transportation, inventory, over processing, motion and defects (Emiliani, 1998). Later publications list eight types of waste (Graban, 2009). *Referring to figure 6 and table 2*

Initially, waste can be easily identified in all processes and early changes can reap huge savings. As the processes continually improve, the waste reduction will be more incremental as the company strives to achieve a waste free process. Continuous improvement is at the core of Lean thinking (Melton, 2005).

There are eight main types of waste as outlined in the figure 6 and further detailed in table 2.

Figure 6 Eight types of waste, altered from: *Melton (2005)*

Type of waste	*Description*
1. Over Production	• Product made for no specific customer • Development of a product, a process, or a manufacturing facility for no additional value
2. Waiting	• As people, equipment or product waits to be processed it is not adding any value to the customer
3. Transport	• Moving the product to several locations • Whilst the product is in motion it is not being processed and therefore not adding value to the customer
4. Inventory	• Storage of products, intermediates, raw materials and so on, all costs money
5. Over Processing	• When a particular process step does not add value to the product
6. Motion	• The excessive movement of the people who operate the manufacturing facility is wasteful. Whilst they are in motion they cannot support the processing of the product • Excessive movement of data, decisions and information
7. Defects	• Errors during the process – either requiring re-work or additional work
8. Human potential	• Waste and loss due to not engaging employees, listening to their ideas, or supporting their careers

Table 2 Eight types of waste, altered from: *Graban (2009) and Melton (2005)*

2.2.8 NON-VALUE-ADDED AND VALUE-ADDED ACTIVITIES

According to Womack and Jones (1996): "Value can only be defined by the ultimate customer." The Lean methodology gives us some specific rules to use in determining what activities are value-added (VA) or non-value-added (NVA). The three rules that must be met for an activity to be considered value-added are:

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

All three of these rules, which will be revisited, must be met or the activity is non-value-added (Graban, 2009).

2.2.9 VALUE STREAM MAPPING (VSM)

When we want to find waste in the organization we have to "go and see". In Japanese this is called *genchi genbutsu*. This is the most effective way. According to Graban there are in any organization, three forms of any process:

1. What the process *really* is
2. What we *think* the process is
3. What the process *should* be

Womack and Jones (1996) defined the value stream as a the set of all the specific action required to bring a specific product (whether a good, a service, or, increasingly, a combination of the two) through the three critical management tasks of any business: the *problem-solving task* running from concept through detailed design and engineering to production launch, the *information management task* running from order-taking through detailed scheduling to delivery, and the *physical transformation task* proceeding from raw materials to a finished product in the hands of the customer.

Jones and Mitchell (2006) defined the definition of a value stream more practical. According to them a value stream is all the actions (both value-adding and non-value-adding) and associated information required to bring a product through the value-adding process from beginning to end.

- *Mapping the value stream*

Value –stream mapping is a pencil and paper tool that helps you to see and understand the flow of material and information as a product makes its way through the value stream (Rother and Shook, 2003). According to Rother and Shook (2003) value-stream mapping can be a communication tool, a business planning tool and a tool to manage your change process.

There must be taken several steps to draw a value stream map *(Referring to figure* 7). The first step is drawing the current state, which is done by gathering information on the shop floor. This provides the information you need to develop a future state (Rother and Shook, 2003). Mapping the 'current state' of the process invariably highlights all sorts of activities and procedures that are not necessary, do not add value or could be redesigned seamlessly (Jones and Mitchell. 2006). The arrows between current and future state go both ways, indicating that development of the current and future state go both ways, indicating that development of the current and future states are overlapping efforts. Future state ideas will come up as you are mapping the current state. Likewise, drawing your future state will often point out important current-state information you have overlooked (Rother and Shook, 2003).

Step 2 is drawing the future state map. There is an ongoing, continuous loop between the current-and future state maps through implementation and testing to develop the ideal way in which the process should flow toward the final product of service. The future state value stream map represents an improved and streamlined or ideal way in which the process could be accomplished, as best the team was able to envision at this point. Ideally, the process described in the future state value stream also allows customers to "pull "value when they need goods or services proved by the organization, rather than having to do the usual requesting and waiting seen in health care and other service industries (Kim et al., 2006).

The final step is to prepare and begin actively using implementation a plan that describes, on one page, how you plan to achieve the future state. Then, as your future state becomes a reality, a new future-state map should be drawn. That's continuous improvement at the value-stream level (Rother and Shook, 2003).

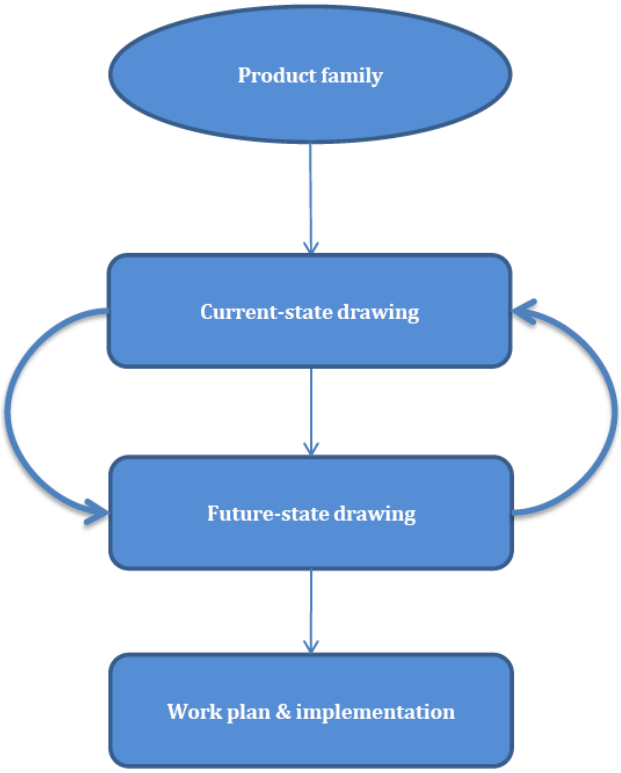

Figure 7 Initial Value Stream Mapping Steps derived from: *Rother and Shook (2003)*

- *The benefits of Value stream mapping*

Using Value stream mapping as a tool has several benefits. In table 3 these benefits are displayed.

It helps you visualize more than just the single-process level in production. You can see the flow
It helps you see more than waste. Mapping helps you see the sources of waste in your value stream.
It provides common language for talking about manufacturing processes
It makes decisions about the flow apparent, so you can discuss them. Otherwise, many details and decisions on your shop floor just happen by default.
It ties together Lean concepts and techniques, which helps you avoid 'cherry picking'.
It forms the basis of an implementation plan. By helping you design how the whole door-to-door flow should operate – a missing piece in so many Lean efforts – value – stream maps become a blueprint for Lean implementation.
It shows the linkage between the information flow and the material flow. No other tool does this.
It is much more useful than quantitative tools and layout diagrams that produce a tally of non-value-added steps. Value stream mapping is a qualitative tool by which you describe in detail how facility should operate in order to create flow.

Table 3 Benefits of using Value stream mapping as a tool altered from: *Rother & Shook (2003)*

2.2.10 INVOLVING STAFF

Respect for employees is a very important aspect with Lean. Respect does not mean leaving employees alone to struggle with problems of their workload. Lean is a system that demands employees do their best, but does not overwork them. The sense of trust created between management and the workers can promote efficiency and at the same time a relaxed feeling. The Japanese not only have a word for waste *muda*, but also have specific words that describe overwork *muri* and uneven workloads *mura (Referring to figure 9).* Having respect for people means we do not allow our employees to be overworked or overburdened. Lean is not about pushing people to work faster or to be in two places at the same time (Graban, 2009).

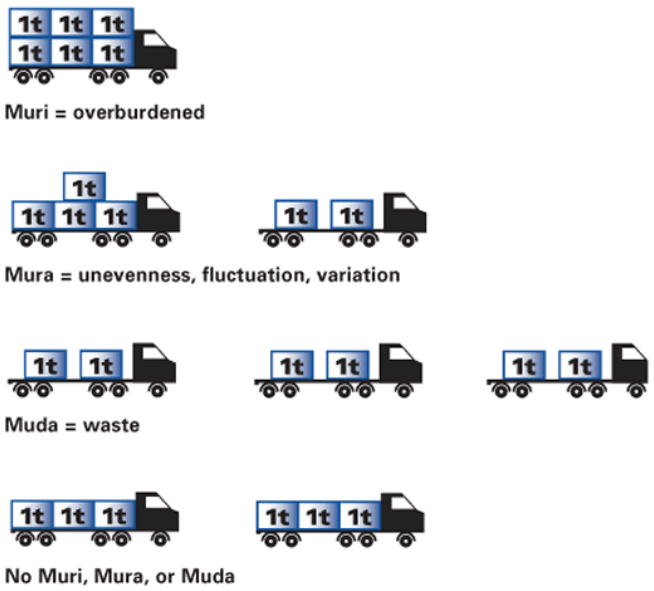

Figure 8 Muri, Mura and Muda, derived from: *Lean enterprise institute (2009)*

When an organization wants to implement Lean all levels of staff must be involved. While every individual staff member knows more about his or her particular job than anyone else, most people's in-depth understanding stops there. No matter how clever, expert or professional they are, they do not know or understand the work other people do and will not see how the parts fit together to make the whole. By involving staff at every level, across every function and department, Lean exercises help everybody see how to complete 'value stream' works form end to end, and where the waste is (Jones & Mitchell, 2006).

Beyond philosophy and technical tools, Lean also challenges how we manage people and systems. Leadership and management skills are important for implementing Lean methods. Without leadership, employees might not understand why improvement is necessary and why Lean methods are a path to that improvement. Once Lean methods have been implemented, sustained leadership and a management system are required to sustain those improvements (Graban, 2009).

Implementing Lean thinking requires major change throughout an entire organization, which can be traumatic and difficult. Strong commitment and inspiring leadership from senior leaders is essential to the success of an effort this challenging. The CEO must be a vocal, visible champion of Lean management, create an environment where it is permissible to fail, set stretch goals, and encourage "leaps of faith."A senior management team that is aligned in its vision and understanding of Lean is a critical foundation for "going Lean" (Institute for Healthcare Improvement, 2005).

2.3 LEAN IN HEALTHCARE

Also in the healthcare waste can be identified. Types of waste in healthcare could be long waiting times, avoidable transports/transfers of patients, personal or means, inefficient supply of information, execution of double or redundant routine inspections at particular types of pathologies and inefficient planning of appointments (Cock, de, 2008).

2.3.1 IS LEAN A NEW CONCEPT FOR THE HEALTHCARE?

In literature a discussion is going on whether Lean is new to the healthcare or not. According to Kim et al. (2006)Lean management is a novel approach to delivering high-quality and efficient care to patients. They also stated that health care systems have just begun to utilize Lean methods, with reports of improvements just beginning to appear in the literature. At the same time the Institute for Healthcare Improvement (2005) stated that Lean management is relatively new to the health care.

On the other hand Graban (2009)stated the opposite. According to him Lean methods are not new to the healthcare. He stated the following: "Frank and Lillian Gilbreth published many studies about industrial engineering methods could be applied in the hospitals as well. Also Henry Ford wrote about efforts to apply his production methods to a hospital in Dearborn, Michigan."

2.3.2 WHAT DOES LEAN MEAN IN HEALTHCARE?

In his book Graban (2009) stated very clearly what Lean can do with a Hospital. He stated the following:"Lean is a toolset, a management system, and a philosophy that can change the way hospitals are organized and managed. Lean is a methodology that allows hospitals to improve quality of care for patients by reducing errors and waiting times.

Lean is an approach that can support employees and physicians, eliminating roadblocks and allowing them to focus on providing care. Lean is a system for strengthening hospital organizations for the long term – reducing costs and risks while also facilitating grow and expansion. Lean helps break down barriers between disconnected departmental "silos", allowing different hospital departments to work better for the benefit of patients."

Lean is not about productivity but it is about aligning every bit of work that is done up, down, through and across the organization so that the patient flows through the process from beginning to end with minimal interruptions and with a supply of skill, expertise, materials and information that exactly meets demand (Jones & Mitchell, 2006). Through aligning the work, Hospitals can deliver better healthcare at lower overall costs.

With Lean healthcare organizations can build a positive future. This means that healthcare organizations must be managed in a completely different way so that short-term fire-fighting becomes a thing of the past (Jones & Mitchell, 2006).

2.3.3 BENEFITS OF IMPLEMENTING LEAN IN THE HEALTHCARE?

With implementing Lean it is possible to improve quality (to deliver better and more timely patient care), to make working lives less stressful and more rewarding for staff and to boost efficiency and productivity (thereby pleasing politicians and taxpayers), all at the same time (Jones & Mitchell, 2006).

Early results from health care organizations suggest that utilizing Lean management methods can lead to substantial improvements in the quality and efficiency of health care (Kim et al., 2006). Lean is proving to be an effective methodology for improving patient safety, quality and cost, while preventing delays and improving employee satisfaction. Lean helps save money for hospitals, while creating opportunities for growth and increase revenue. Lean methods can be benefit everyone involved in hospitals. (Graban, 2009).

Better quality means less rework for hospital employees (less human effort). It also leads to shorter lengths of stay (less time for patients), which translates into a need for fewer rooms (less space and equipment for the hospital). Lean is not just about the "less and less"; we should not lose sight of trying to provide more value and more service to patients and our communities (Graban, 2009).

CHAPTER 3 RESEARCH METHODOLOGY

In this third chapter the methodology of the research will be discussed. The chapter starts with clarifying the unit of analysis *(3.1)* and the research design *(3.2)* to determine the focus of the research. Subsequently the method work sampling used for data and information gathering is discussed *(3.3)*. Finally the sample design of the work sample is described *(3.4)*.

3.1 THE UNIT OF ANALYSIS

The unit of analysis is the what and whom being studied (Babbie, 2007). The focus of this research lies on the medical assistants of the outpatient surgery department. To let the outpatient department work more effectively and efficiently is it important to get an insight in the *waste* of the outpatient department. Therefore the medical assistants will be observed and studied in order to map the value added and non value added activities.

3.2 RESEARCH DESIGN

3.2.1 PURPOSE OF RESEARCH

The purpose of the research is a combination of a descriptive and explanatory research. "Description is the precise measurement and reporting of the characteristics of some population or phenomenon under study. The descriptive part of the study will answer the questions of what, where, when, and how"(Babbie, 2007). Through descriptive research the situation will be described at the outpatient surgery department. "Explanation is the discovery and reporting of relationships among different aspects of the phenomenon under study"(Babbie, 2007). Through the explanatory research the observed patterns at the outpatient surgery will be studied. Why these patterns exist and what they imply will be studied as well. "The explanatory questions will answer the question of why"(Babbie,2007).

3.2.2 TYPE OF RESEARCH

The topical scope of the study will be a single case study. A case study is the in-depth examination of a single instance of some social phenomenon. The single case study was chosen because a single case study places more emphasis on a full contextual analysis of fewer events or conditions and their interrelations.

3.2.3 PRACTICE-ORIENTED RESEARCH

The research is a practice-oriented research, because the research is about giving recommendations in order to improve the existing practical situation at the hospital St Jansdal. The intervention cycle is an appropriate method to carry out a problem analysis. This means following a predefined set of steps to reach a solution in case of operational problems. Five steps or stages can be defined: problem finding, diagnosis, design, intervention and evaluation (Verschuren & Doorewaard, 1999).

The research will be a combination of the problem finding stage, diagnosis stage and design stage *(Referring to figure 9).* These stages related to the research will be outlined below.

- *Problem-finding*

At the problem finding stage a distinction will be made between the actual and the desirable situation. The desirable situation will be formulated in criteria so that it will be clear why the efficiency at the outpatient surgery department is a problem. According to Verschuren and Doorewaard (1999) the problem-finding type of research serves to indicate that a certain factor is a problem, why it is a problem and/or what the exact nature of the problem is with the objective in ordered to create consciousness, to set the agenda or to reach a consensus.

- *Diagnosis stage*

With diagnostic research we try to gain insight into the background and relevant relationships of the problem in question at the outpatient surgery department.

- *Design stage*

Before we are at the design stage it is important to get an insight in the problem itself , the causes and the criteria for the new situation. At the design stage recommendations and a plan for improving the efficiency at the outpatient surgery department will be designed.

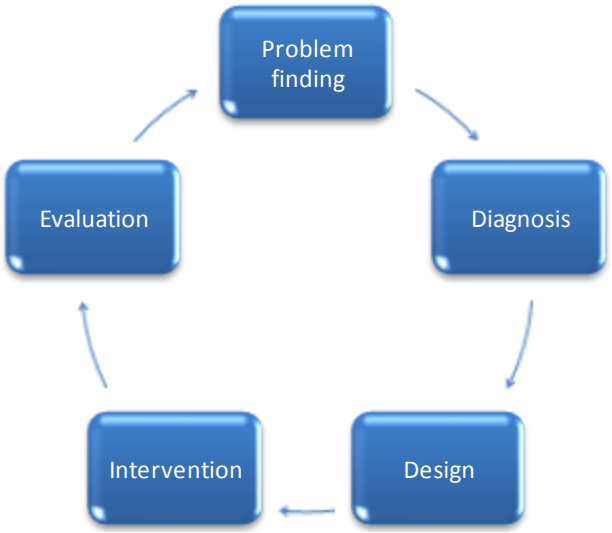

Figure 9 The intervention cycle

The practice oriented aspect of the research has the same basis as the Lean theory that will be used in this research. Through the concept of value stream mapping the current state at the department will be mapped and the problems that lie underneath the surface become visible. Through a set of recommendations an image can be formed of the future state of the outpatient surgery department.

3.2.4 DATA COLLECTION

The research is a combination of qualitative and quantitative analysis. Qualitative analysis is the nonnumeric examination and interpretation of observations, for the purpose of discovering underlying meanings and patterns of relationships.

Quantitative analysis is the numerical representation of manipulation of observations for the purpose of describing and explaining the phenomena that those observations reflect. These analyses will help to discover patterns at the outpatient surgery department.

The qualitative analysis consists of mapping the value stream through the concept of Lean management. The current state of the processes at the outpatient surgeon department will be mapped to get an overall image of the department.

The quantitative analysis consists of the work sampling method. This method will give an insight in the activities that the medical assistants execute and the pastime of these activities through the medical assistants.

3.2.5 DEFINING OF THE RESEARCH

This research will be focused only on the medical assistants of the outpatient surgery department at the hospital St Jansdal where they are employed. The reason that the focus in this research lies on the medical assistants is very clear. It is difficult to evaluate the efficiency of the surgeons. During the consulting-hours the surgeons have incidentally to deal with emergencies. The unpredictable nature of the work has an effect on their other activities.

The other reason for excluding the surgeon in the research is because it is difficult to make statements about the efficiency of the executed activities of the surgeons. A surgeon has a lot of activities to execute and is the heart of the outpatient department. In the end it is more profitable to let the medical assistant wait for the surgeon than the surgeon waiting for the medical assistant. The working time of a surgeon is more rare and therefore more expensive.

3.2.6 RESEARCH STRATEGY

In this research obtaining information goes through the following sources:

- Literature from books and articles
- Observations
- Internal documents of the hospital
- Interviews with the medical assistants and the head of the outpatient surgery department
- Information from other hospitals
- Discussion with stakeholders

In table 4 are the sources for the data-collection per question displayed. Also the data-collection methods are listed in the table.

Questions	*Sources*	*Method*	*Chapter*
1) What are the special characteristics of the healthcare environment?	• Literature	• Desk research	• Chapter 2
2) What are the products or services that the outpatient surgery department offers and what are the qualifications?	• Medical assistants, surgeons and the head of the outpatient surgery department • Observations at the hospital • Documents with description of the processes	• Interview • Work sampling • Desk research	• Chapter 4
3) What is known about the concept of Lean in hospitals?	• Literature • Information from other hospitals	• Desk research • Desk research	• Chapter 2
4) What do the processes in the outpatient surgery department look like?	• Medical assistants, surgeons and the head of the outpatient surgery department • Observations at the hospital • Documents of the description of the processes	• Interview • Work sampling • Desk research	• Chapter 4
5) How do the medical assistants contribute to the processes?	• Observations at the hospital • Lean management methods/literature	• Work sampling • Desk research	• Chapter 4
6) Which non-added value activities have the medical assistant to carry out?	• A process analysis (qualitative and quantitative) • Lean management methods/literature	• Work sampling + desk research • Desk research	• Chapter 4
7) Which of these activities are avoidable and which activities are not avoidable?	• Stakeholders • Observations at the hospital	• Interview • Work sampling	• Chapter 4/5
8) How can these processes be changed in order to reduce the non-added value activities as much as possible?	• Literature • Observations • Stakeholders	• Interview • Work sampling • Desk research	• Chapter 6

Table 4 The research strategy

3.3 MEASURING INSTRUMENT

3.3.1 WHAT IS WORK SAMPLING?

Work sampling consist of intermittent, random, instantaneous observations of work activities of multiple workers by independent observers who record the various activities on data collection forms. The exact activity is recorded; actual time spent in activities is not recorded. The theory of work sampling is based on the laws of probability, which indicate that observations taken at repeated random times will have the same distribution. Thus actual observations can be translated into percentages of time spent in actual activities (Urden & Roode, 1997) rather than the exact amount of time spent on specific tasks (Heizer & Render, 2006). Like the time that workers are actually spending for personal time and delays that are a part of the job (Buffa, 1965).

Based on the findings in the sample, statements can be made about the activity(Chase, Jacobs & Aquilano, 2006). The results of work sampling are effective for determining allowances applicable to the job, for determining machine and man power utilization, and for establishing standards of production. (Niebel, 1982). As well the findings in the work sample may lead to staffing changes, reassignment of duties, estimates of activity cost, and the setting of delay allowances for labour standards (Heizer & Render, 2006).

The unique thing about work sampling is that it accomplishes the results of stop-watch study without the need for a stop watch (Buffa, 1965). Executing a work sampling requires random observations to record the activity that a worker is performing (Heizer & Render, 2006). Times and days for data collection should be randomly generated (Pelletier and Duffield, 2003).

The accuracy of the data determined by work sampling depends on the number of observations and the period over which the random observations are taken. Unless the sample size is of sufficient quantity, and the data are taken over a period of time that represents typical conditions, inaccurate results will occur (Niebel, 1982).

3.3.2 ADVANTAGES

The work sampling method has several advantages over other time study methods. Firstly, because a single observer can observe several workers simultaneously, it is less expensive. Secondly, observers usually do not require much training, and no timing devices are needed. Thirdly, the study can be temporarily delayed at any time with little impact on the results. In the fourth place because work sampling uses instantaneous observations over a long period, the worker has little chance of affecting the study's outcome. In the fifth place the procedure is less intrusive and therefore less likely to generate objections (Heizer & Render, 2006).

3.3.3 DETERMINING THE SAMPLE SIZE

To determine the number of observations needed, it is important to know how accurate the results must be. The larger the number of observations, the more valid the final answer will be. Sampling errors will diminish as the size of the sample increases (Niebel, 1982).

To determine the number of observations required, management must decide on the desired confidence level and accuracy. At first, a preliminary value for the parameter must be selected. Then an equation gives the sample size for a desired confidence and accuracy(Heizer & Render, 2006). The equation is as following:

Variable	*Definition*
***n* =**	The required sample size
=	The number of standard normal deviations for the desired confidence level (= 1 for 68% confidence, = 2 for 95,45% confidence, and = 3 for 99,73% confidence)
***p* =**	Estimated value of sample proportion (of time that a medical assistant is observed being busy or idle)
***h* =**	Acceptable error level, in percent

Table 5 Definitions of the variables of the sample size equation altered from: *Heizer & Render (2006).*

3.4 THE SAMPLE DESIGN

During eight days a work sampling will be conducted at the outpatient surgery department. The work sample is aimed at the medical assistants, they are the focus of this research and therefore the focus of the sample.

3.4.1 THE SAMPLE

The choice was made to exclude the front desk in the work sampling because by earlier observation the whole process was already mapped. Another reason is that a work sampling would not bring new insights.

As stated before the work sample is focused on the medical assistant. The work sample is executed during eight days. The sample contains a five days observation of running of the consulting-hours and a three days observation of the preparation of the consulting-hours.

The observation of the preparation of the consulting-hours will be executed during three days. This is chosen on the basis of the required sample size that is calculated *(Referring to paragraph 3.4.2).*

The observation of running the consulting-hours started at 8.00 a.m. till the end of the consulting-hours. The observation of the preparation of the consulting-hours started at 8.30 a.m. up to and including the end of the preparation time at 17.00 p.m.*(Referring to paragraph 4.2.3 about the working hours and the staffing of the medical assistants).*

The observations will be recorded on an average of seven minutes. These moments will be randomly chosen by means of random numbers. The total observed moments per day will approximately lie between 230 and 301 observations.

3.4.2 SAMPLE SIZE

Before the work sampling can be executed the sample size must be determined. Through the equation that is displayed in table 6 the number of observations that are required can be calculated.

Variable	*Definition*
n =	The required sample size
=	The number of standard normal deviations for the desired confidence level (= 1 for 68% confidence, = 2 for 95,45% confidence, and = 3 for 99,73% confidence)
p =	Estimated value of sample proportion (of time that a medical assistant is observed being busy or idle)
h =	Acceptable error level, in percent

Table 6 Definitions of the variables of the sample size equation altered from: *Heizer & Render(2006*

- *The sample size for the sample of running the consulting-hours*

To determine the sample size for the work sampling during the consulting-hours we use the variables that are displayed in table 7.

Variable	*Definition*
n =	The required sample size
=	2 for 95,45% confidence level
p =	Estimate of idle proportion = 20% = 0,2
h =	Acceptable error of 2% = 0,02

Table 7 Definitions of the variables of the sample size equation for the sample of running the consulting-hours

With the variables in table 7 we can calculate the sample size.

$$n = 1275$$

Through the equation we have calculated that we need 1275 observations at a 95,45% confidence level with an error of 2%.

- *The sample size for the sample of preparation of the consulting-hours*

To determine the sample size for the work sampling during the preparation of the consulting-hours we use the variables that are displayed in table 8.

Variable	*Definition*
n =	The required sample size
=	2 for 95,45% confidence level
p =	Estimate of idle proportion = 7% = 0,07
h =	Acceptable error of 2,5% = 0,025

Table 8 Definitions of the variables of the sample size equation for the sample of preparation of the consulting-hours

With the variables of table 8 we can calculate the sample size.

$$n = 417$$

Through the equation we have calculated that we need 417 observations at a 95,45% confidence level with an error of 2,5%.

CHAPTER 4 THE CURRENT STATE AT THE OUTPATIENT DEPARTMENT

The goal of this research is to improve the efficiency at the outpatient surgery department. To make statements about the efficiency of the activities of the medical assistants it is important to form a notion of the outpatient department. Therefore an analysis of the current state of the outpatient surgery department has to be made.

Therefore in this chapter we try to form an image of the current state at the outpatient surgery department. The following aspects will be discussed in this chapter: the outpatient department in general, the flow processes through the eyes of the patient and the medical assistants, the work sampling with the results, the workload of the medical assistants and finally a quantitative description of the outpatient department.

In the following paragraphs the processes that are a part of the entire process of the outpatient surgery department will be clarified and mapped in value stream maps. Activities will be outlined that are part of the entire value stream map as well.

4.1 THE PATIENT FLOW PROCESS

4.1.1 INTRODUCTION

When the patient arrives at the outpatient department the patient he or she has to go through several steps of the process. The whole process of the patient starts with making an appointment at the outpatient department after referral by the general practitioner or other medical specialists. The process of the patient ends with departing the outpatient department *(Referring to figure 10)*.

When the patient has an consultation at the outpatient surgery department, the consultation can have several purposes namely:

- *Intake*

Takes place when the cause of the physical symptoms is not clear. Through the intake the surgeon tries to get an insight in the symptoms and puts the patient through various tests, if necessary.

- *Reporting results*

The surgeon reports the results of the tests that the patients went through and discusses the treatment plan, if necessary.

- *Ex-post control*

Takes place in a short timeframe after the patient had an operation to check if the patient is healing well. At that time, when the patient has a wound, the surgeon will examine the wound to see if it is healing as well.

- *A follow-up (yearly/ half-yearly/monthly)*

Depends on the physical symptoms or operation of the patient. The patient has a consultation with the surgeon for control and retesting on a regular basis.

4.1.2 PATIENT

All the process steps that a patient goes through can be displayed in a value stream map *(Referring to figure 10)*. The flow of the patient will therefore be visible.

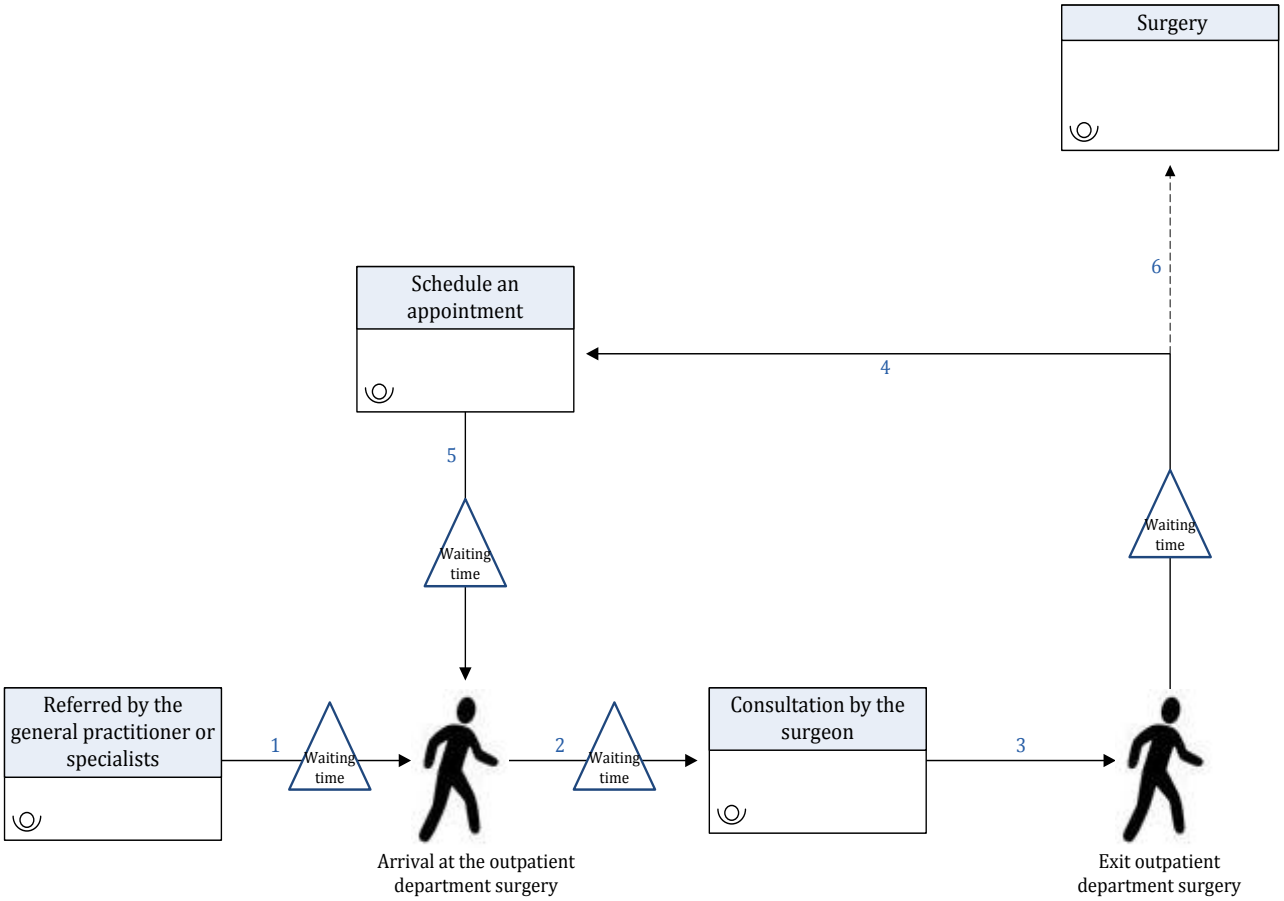

Figure 10 Value stream map patient

A patient can have different kinds of entries to the outpatient surgery department. The patient can be referred by the general practitioner or other medical specialists (1). The patient can make an appointment by himself of herself when the patient has had a consultation at the department in the past (5). When the appointment is made there is waiting time until the patient can arrive at the outpatient surgery department. The duration of the waiting time depends on the condition of the patient. The patient has to register himself or herself at the front desk when he or she arrives at the outpatient surgery department. Registering is significant in order that it is known that the patient has arrived. It is possible that the patient must wait in the waiting room. How long the patient must wait depends on how early the patient has arrived and if the surgeon is on schedule with running the consulting-hours. When it is the patient's turn, the patient will be called for from the waiting room by a medical assistant and will be escorted to the research room. Subsequently a surgeon comes to the patient in the consulting-room for the consultation (2). When the surgeon thinks it is necessary, the patient has to make a new appointment (4) or the patient can go home without making a new appointment (3). In some cases the patient must have a surgery (6).

4.1.3 INFLOW AND OUTFLOW

The inflow and outflow of the patient is made more comprehensible by making the processes visible in a cross functional flowchart *(Referring to figure 11)*. In the flowchart the processes are described that the patient goes through during a visit to the outpatient surgery department connected with the employees of the department.

The patient arrives at the outpatient surgery department. Subsequently the patient has to register himself or herself with the medical assistant at the front desk. The medical assistant will assign the patient to the right waiting room. The medical assistant that assists during the consulting-hours (middle desk) will call for the patient from the waiting room when it is the patient's turn and accompanies the patient to the consulting-room related to the surgeon. In the meantime the surgeon is finishing the consultation of the previous patient that takes place in an other consultation-room. After the previous consultation has been finished the surgeon will start the consultation with the following patient, who is already waiting in the consulting-room. When the consultation is finished there are four options that the medical assistant of the middle desk has to do, namely:

- *Taking care of the patient*

If the patient has recently had a surgery it can be necessary that the medical assistant has to assist the surgeon. This assisting can consist of removing a bandage and applying a new bandage, nurturing a wound and removing stitches.

- *Filling in a referral letter*

When the patient must undergo test(s) or therapy, the medical assistant will prepare the referral letter for the surgeon or fill in the letter by herself. This depends on which test(s) or therapy the patient must undergo, which letters must be filled in and what the surgeon wants the medical assistant to do.

- *Scheduling a new appointment*

When the surgeon thinks it is needed, the patient must schedule a new consultation. The consultation will be scheduled by the medical assistant in the consulting-room without the presence of the surgeon.

- *Accompanying the patient to the waiting room*

Sometimes a patient is very upset, walks badly or must wait in the waiting room after the consultation. In such cases the medical assistant will reassure and accompany the patient back to the waiting room so that the patient can depart the outpatient surgery department.

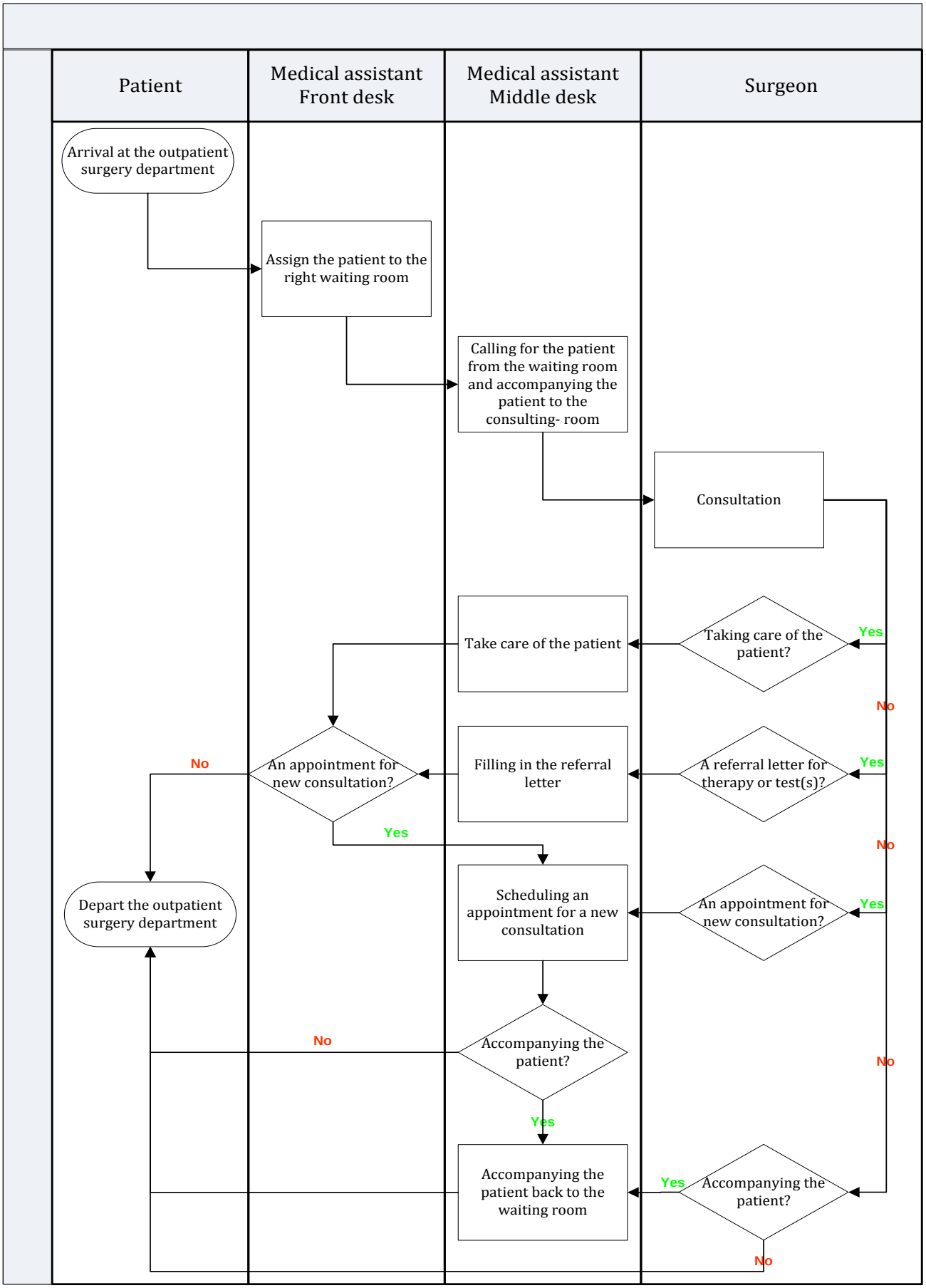

Figure 11 A cross functional flow chart of the patients' process

4.2 THE RESOURCES

4.2.1 THE LAY-OUT OF THE OUTPATIENT SURGERY DEPARTMENT

In all, there are nine consultation-rooms/ research rooms. In each room is a computer, a desk with chairs, a sink with a soap dispenser, a treatment table and a closet with supplies for replacing wound-dressings and materials for nurturing a wound.

During a consulting-hour a surgeon uses a maximum of three consulting-rooms. This means that a surgeon with a quiet consulting-hour will use an average of one or two consulting- rooms and a surgeon with a tied up consulting-hour will use an average of three consulting-rooms. The surgeons uses several consulting-rooms during the consulting-hours, so that the surgeon can carry on with the consulting-hour without waiting until the patient has arrived in the consulting-room.

There is a space between the consulting-rooms with two higher desks, one at each side of the consultation rooms. At each desk is a computer for the surgeon. Behind each higher desk is also a lower desk for the medical assistants with a computer on it.

Referring to appendix III for the floor plan of the outpatient surgery department.

4.2.2 INFORMATION SYSTEMS

The treatment charts of the patient are available in two manners: on paper or electronically. The paper version is still used because it is not yet technically possible to put all the results of medical check-ups in the system. Therefore the results of medical check-ups that can not be put in the system are stored in a box under the desk of the medical assistants. There are juridical reasons for this way of storage. A disadvantage is that if there might be an emergency, searching for the paper with results is like a needle in a haystack.

The medical assistants use two computer programmes: AV5 and Mirador. The computer programme AV5 is used for making appointments with patients. A medical assistant can see which appointments are already made and which time blocks are open. There is the possibility to fill in a short description about which physical symptoms the patient has.

For preparing the consulting-hours the medical assistants use the computer programme Mirador. Through this programme the medical assistant can see which paper treatment charts are in the archive. A treatment chart can be requested through the programme if this is in the archive.

The surgeons also make use of the programme Mirador. They use the programme to examine the results of the check-ups of the patients and their course of disease. Furthermore the surgeons use the programme for filling in the clinical state of the patient in the electronic treatment chart.

4.2.3 PERSONNEL SCHEDULE

In general the duty-roster is based on the busiest consulting-hours. This means in practice that the front desk is staffed by one person, to welcome the patients. During the consulting-hours the surgeons will be assisted by two medical assistants per consulting-hour. Occasionally when there are certain circumstances and a consultation is not tied up, three medical assistants will run the consulting-hours of two surgeons. The circumstances when this may occur are: with temporary illness and if a medical assistant has an appointment.

In the back office, two medical assistants are preparing the consulting-hours. One medical assistant is responsible for the telephone and the other medical assistant is responsible for the emergency telephone line. This telephone line is only intended for the general practitioner so that in case of emergency they have direct contact with the outpatient surgery department, without interference of other departments.

On an average, the consulting-hours start at 9.00 a.m. and end approximately 12.00 – 12.30 p.m.. In the afternoon the consulting-hours start at 13.00 p.m. and end approximately 17.00 p.m. In the morning two surgeons run the consulting-hours and in the afternoon two surgeons run the consulting-hours as well. So per working day there are four surgeons that have their consulting-hours.

In the field of running the consulting-hours, there are four medical assistants per day. That means two assistants per surgeon per half a day. On an average one medical assistant starts at 8.00 a.m. and the remaining three medical assistants start at 8.30 a.m. At lunchtime there is a shift. In practice this means that the two medical assistants that were preparing the consulting-hours the whole morning, are now going to assist the surgeons during the consulting-hours. Two of the four medical assistants that have assisted the surgeons in the morning are responsible for the preparation of the consulting-hours in the afternoon.

At the end of the day the medical assistant that has started at 8.00 a.m. finishes working at 16.30 p.m. The remaining assistants keep working till the end of the consulting-hours. The official end of the consulting-hours is usually 17.00 p.m., but often the consultation ends much later.

4.3 THE PROCESSES AND ACTIVITIES

4.3.1 INTRODUCTION

The patient visits the outpatient surgery department to have a consultation with a surgeon. A visit to the outpatient department involves check-up and minor surgery. During the consulting-hours two surgeons are working. Per surgeon are three consulting-rooms available. Per patient the surgeon takes 5 to 10 minutes time, depending on the type of consultation.

The medical assistants perform in turn the following roles:

- Desk assistant at the front desk *(Referring to subparagraph 4.3.2)*

The assistant welcomes the patient and assigns the patient to the right waiting room. Adjacent to these tasks the assistant has small administrative tasks.

- Assistant of the surgeon *(Referring to subparagraph 4.3.3)*

The assistant assists the surgeon during the consulting-hours.

- Administrative assistant *(Referring to subparagraph 4.3.4)*

The assistant answers telephone calls of the patients and does preparations for the consulting-hours.

A schematic reproduction is made of the processes at the outpatient surgery department *(Referring to figure 12)*. In these processes a distinction is made between the patient, medical assistant and the surgeon. The relation between the participants in the whole process will be illustrated by the figure.

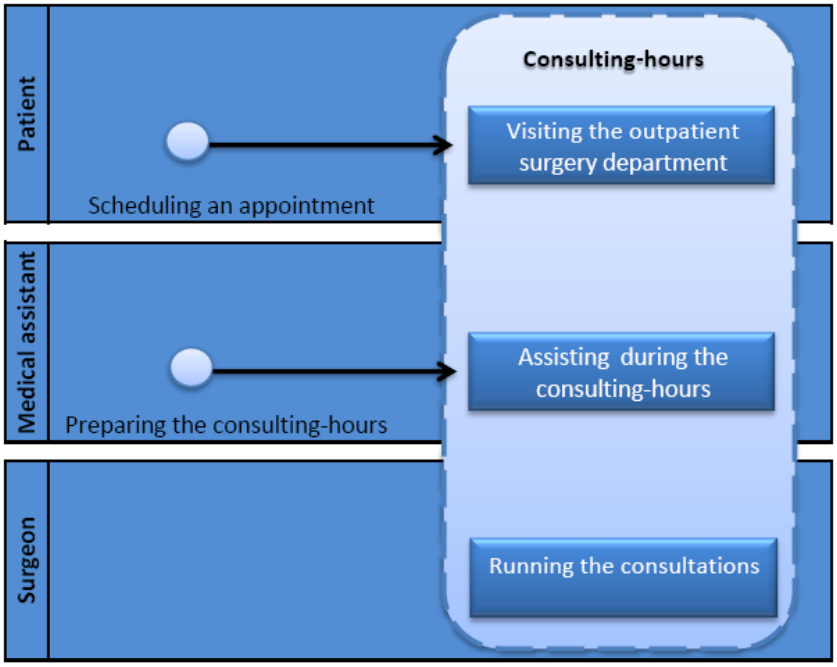

Figure 12 A schematic reproduction of the whole process at the outpatient surgery department altered from an internal document: *"Processen Polikliniek Chirurgie – Sint Jansdal" (2009)*

4.3.2 THE FRONT DESK

The process steps that medical assistants at the front desk are taking are mapped in a value stream map *(Referring to figure 13)*. Per day the front desk is staffed by one medical assistant.

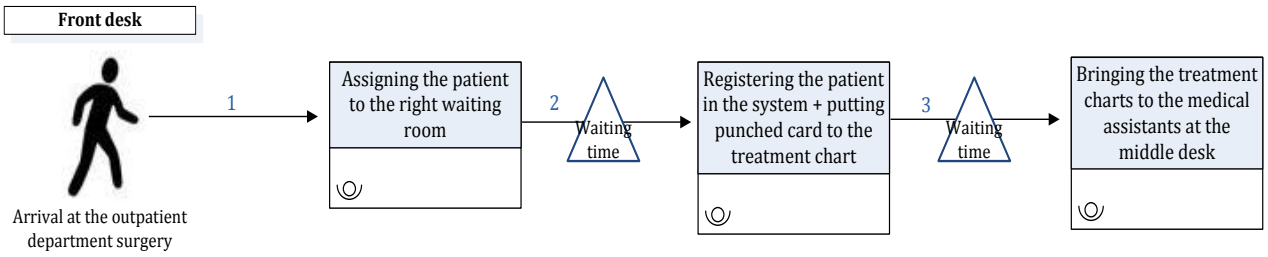

Figure 13 Value stream map front desk

The front desk will often be employed by 'poolers'. Poolers are medical assistants that work at different outpatient departments of the hospital. Some of these poolers are not trained to run the consulting-hours or to prepare these consulting-hours.

When the patient arrives in the waiting room, they have to report themselves at the front desk and give their punch card to the medical assistant. Subsequently the medical assistant assigns the patient to the right waiting room(1). Then the medical assistant must register the patient (2), so that it is known that the patient is present. The punch card will also be put to the treatment chart.

When there is time, the medical assistant at the front desk will bring the treatment charts to the medical assistants at the middle desk. These medical assistants are running the consulting-hours by assisting the surgeon during the consultation-hours(3).

4.3.3 RUNNING THE CONSULTING-HOURS

In a value stream map the process steps that the medical assistants take at the middle desk are mapped *(Referring to figure 14)*. Per day there are four medical assistants who assist the surgeon during the consulting-hours. This means in practice that there are two medical assistant per consulting-hour and per surgeon.

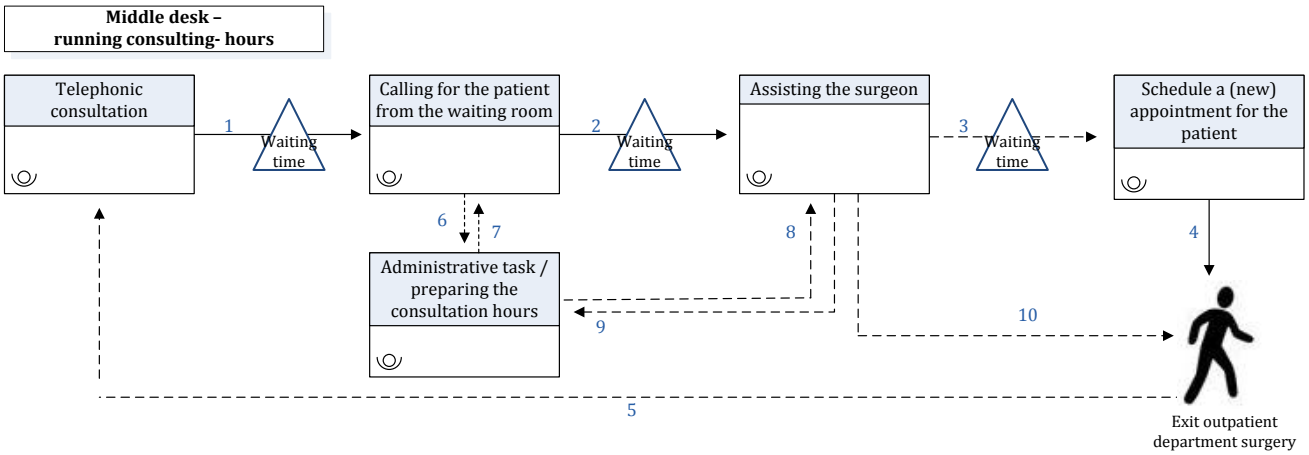

Figure 14 Value stream map running consulting-hours

In the morning before the consulting-hours start, the medical assistant attends the telephonic consults that are scheduled in the first place. Some of these consults can be done alone by the medical assistants and some in cooperation with the surgeon.

When the consulting-hours start the medical assistants call for the patients that have first arrived in the waiting room and take them to the relative consulting-room (1). Sometimes it is necessary that a medical assistant assists the surgeon (2). This assisting can consist of removing a bandage and applying a new bandage, nurturing a wound and removing stitches. When the surgeon thinks it is necessary a medical assistant must schedule an appointment with the patient for a new consultation (3) or the patient can go home immediately (10). This happens after the consult with the surgeon has finished. When the appointment is scheduled, the patient can go home (4). For some of the patients a telephonic consult will be scheduled when the surgeon thinks this is sufficient (5) instead of an appointment for a new consultation.

The medical assistant will do some administrative tasks and make a start with preparing the consulting-hours, when she does not have to assist a surgeon or has finished with assisting and all the patients that are in turn are in the consulting-room(6, 9). When it is needed they will put down their administrative tasks and the preparation of the consulting-hours and they will call for a patient from the waiting room (7) or they will assist the surgeon if the surgeon asks for it (8).

Some surgeons don't want the medical assistants to do other activities like administrative tasks, so that the medical assistants are always ready to assist the surgeon directly when he wants to. When this is the case, the medical assistants are forced to do nothing and wait until the surgeon asks to assist or when there must be called for a patient from the waiting room.

4.3.4 PREPARING THE CONSULTING-HOURS

Before the consultations can be run preparations must be done first. The preparation of the consulting-hours is done by two medical assistants *(Referring to 15)*.

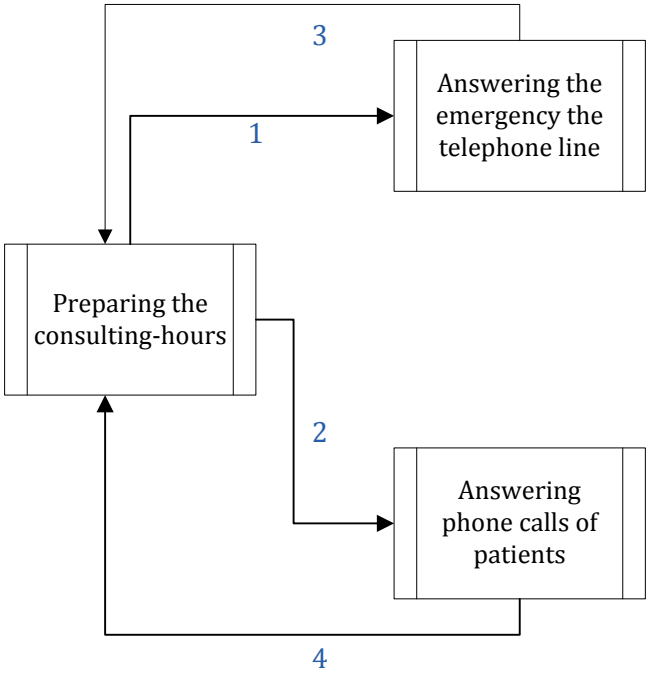

Figure 15 The entire process at the back office

During the preparation one medical assistant answers the emergency phone-calls (1). The emergency telephone line is in direct contact with general practitioners. This telephone line is only intended for the general practitioner so that in case of emergency they have direct contact with the outpatient surgery department, without interference of other departments. After the telephone conversation is finished, the medical assistant carries on with preparing the consulting-hours (3). The second medical assistant answers telephone calls of the patients (2). The patients call for questions. When the phone call with the patient is finished, the medical assistant carries on with preparing the consulting-hours (4).

The related process steps of preparing the consulting-hours are mapped in a value stream map *(Referring to figure 16)*. Throughout the day, there are two medical assistants who prepare the consulting-hours. At lunchtime there is a shift. This means in practice that in the afternoon two other medical assistants prepare the consulting hours instead of the two medical assistants who did the preparation in the morning.

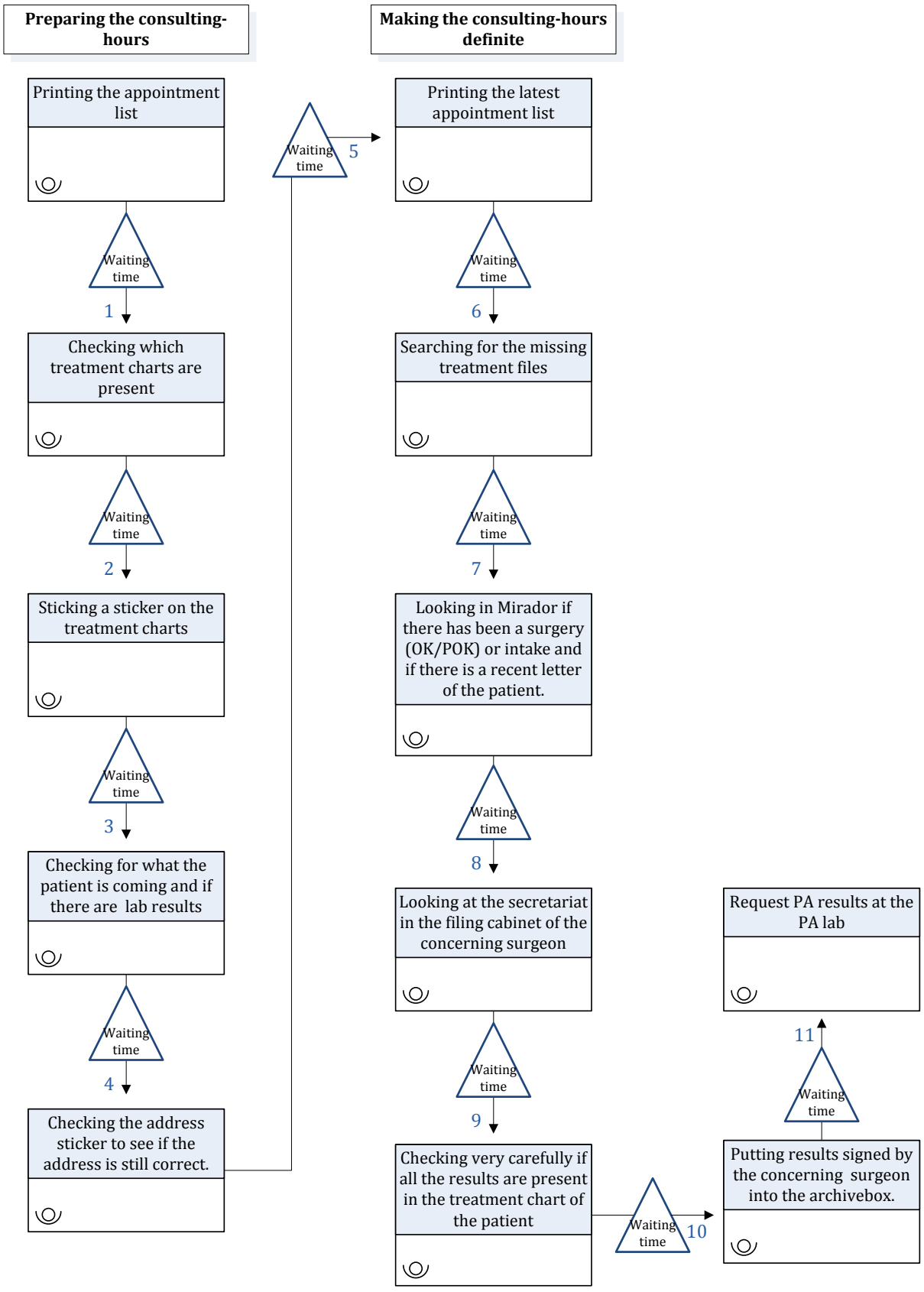

Figure 16 Value stream map of the preparation of the consulting-hours

Preparing the consultation must be done one day before the consultation takes place. When this is not attainable, the preparation must be done half a day before the consultation. The first step of the preparation is printing the appointment list of the consultation-hour. With the appointment list as a basis, they will check which treatment charts are present and which are not (1). Then a sticker must be put on the treatment charts of the patient (2). On the sticker must be written: the moment of the consultation, the name of the surgeon and 'intake' or 'NP' with a new patient. The medical assistant will check for which physical symptoms the patient is coming to the outpatient department and if any test results are needed (3). The address sticker on the treatment chart will also be checked on the correctness of the patients address (4).

The preparation of the consulting-hours must be ready at the latest half a day before the consulting-hour starts. Also with making the consulting-hours definite, the first step is printing the latest appointment list (5). Then the medical assistants will search for the missing treatment charts (6). Subsequently the medical assistants must check in the system if the patient has been in the hospital for a surgery, has had an intake or if there is a referral letter about the patient (from the general practitioner) (7).

When the treatment chart is not in the filing cabinet in the back office or in the archive, the medical assistants must have a look in the office of the secretary(8). There is a filing cabinet with treatment charts of all surgeons in this office. The treatment charts of the patients that the secretaries needed for administrative tasks lie in this cabinet.

At the end all the treatment charts will be checked. This means in practice that the medical assistant checks if all the needed results are in the treatment chart of the patient (9). Certain results, like lab results are printed on paper and others are visible in the computer system. The results on paper will be stored in an archive box (10). This is for legal reasons.

PA test stands for pathological anatomical. The PA results are about the nature of tissue that is removed during surgery. If the PA results are not visible in the computer system, the results must be requested at the PA lab (10). When these last results are present, the preparation of the consulting-hour is completed.

4.4 WORKSAMPLING

To resume the whole process we have to get an insight in the efficiency of the department in the medical assistants' perspective. In order to make statements about the efficiency of the performing activities of the medical assistant at the outpatient surgery department is it important that we get to know more about the 'waste' or 'muda'. This means that we want to know how much waste there is and where the wastefulness is hidden. Therefore we want to quantify the non-avoidable non-value-added waste. In order to quantify the waste, there has been chosen for the method work sampling. In this paragraph will be clarified what the comprised activities are which the medical assistants execute. The activities of the medical assistants will be categorized into 7 main categories. Adjacent to this the results of the work sample will be discussed.

4.4.1 THE MAIN CATEGORIES

During the execution of the work sampling, many activities were observed at running the consulting-hours as well the preparation of these consulting-hours. For a clearer overview these activities are categorized in main categories *(Referring to table 9)*.

Work activity	*Definition*
Direct care	All nursing activities performed in the presence of the patient and/ or family, such as assessing patient needs, administration of medications, all treatments and procedures, obtaining specimens, and all aspects of basic physical care associated with bathing grooming, eating, toileting, and ambulation. This includes explanations and communication with patients and families for planning care, teaching, intervening and evaluating.
Documentation	All activities associated with documenting, reviewing, or evaluating patient condition and care, including the review of all patient data, correlation of interdisciplinary data and nursing judgement, and the action of documenting.
Idle time	Non-productive time during which a medical assistants is on the job but not working. This includes all the activities that are non-productive. Idle time is also called waiting time.
Indirect care	All nursing care activities done away from the patient but on a specific patient's behalf, including communicating with other providers, reporting, seeking consultation, preparing equipment, gathering supplies, and preparing medications.
Not measured	These are all the medical assistants who are working at the outpatient surgery department at a certain moment of the observation, but of which cannot be measured which activity they are executing at that moment. This because the medical assistant is outside the visibility of the observer at that moment.
Personal time	Personal activities not related to the patients care or unit activities. Activities related to meals, breaks, adjusting personal schedules, personal phone calls, personal care and socializing with co-workers.
Unit related	Activities related to general maintenance of the nursing unit. They are not patient specific and include duties such as clerical work, cleaning, ordering supplies, checking equipment, attending meetings, and running errands.

Table 9 Definitions work activities altered from: *Urden (1997)*

4.4.2 RUNNING THE CONSULTING-HOURS

During the consulting-hours a medical assistant is employed for assisting the surgeon. This has a wide range from welcoming a patient, accompanying the patient to a consulting-room till making an appointment with the patient and directing them back to the waiting room *(Referring to Appendix IV)*.

The work sampling of the consulting-hours was executed during a workweek of 5 days. This has resulted in 1343 observations that were made during that week. The observations consist of all the medical assistants that were assisting during running the consulting-hours and the activities that they executed. To get a clearer insight in the pastime of the medical assistants, the results of the work sampling are calculated in percentages.

What attracts the attention is the percentage of idle time *(Referring to figure 17)*. Of all the time that the medical assistants spend on primary activities 36,0% of this time was spent on idle time. This is a relative high percentage in relation with the other categories of activities. This means in practice that the medical assistants spend 1,7 times of their work time on idle time in proportion to direct care . This is also a relative high fact.

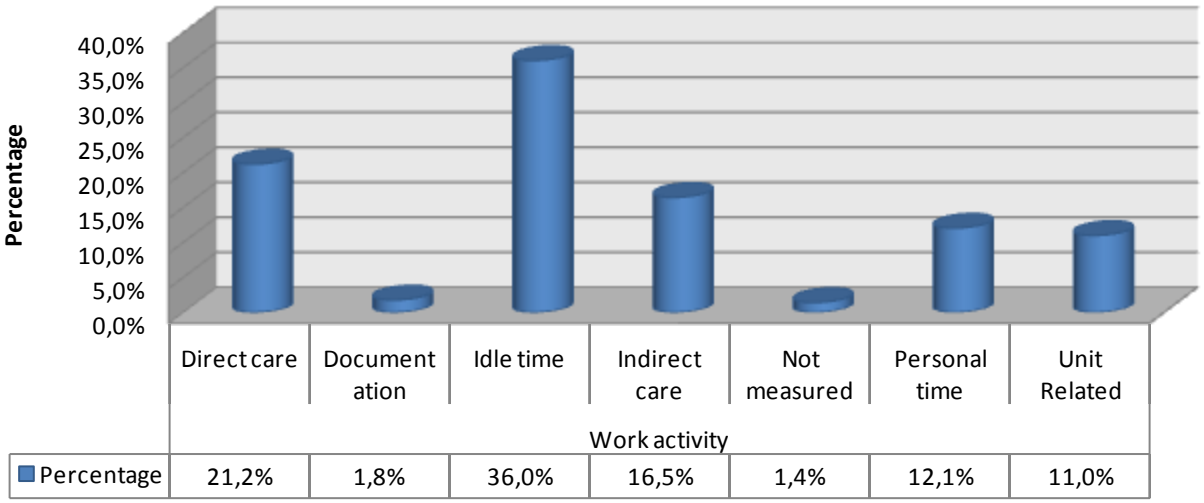

Figure 17 The percentages of the pastime of the medical assistants during running the consulting-hours

The results of the work sampling of the consulting-hours are extensively specified in Appendix VI.

4.4.3 PREPARATION OF THE CONSULTING-HOURS

During the preparation of the consulting-hours a medical assistant is employed for preparing the consultation-hours and answering the telephone. Preparing the consulting-hours has a wide range from printing the consultation list, checking which results of the patients are needed and which are present till request the needed results and making the patients chart complete for the consultation *(Referring to Appendix IV)*.

The work sampling of the preparation of the consulting-hours was executed during three workdays. This has resulted in 424 observations that were made during these days. The observations consist of all the medical assistants that were preparing the consulting-hours and the activities that they executed. To get a clearer insight in the pastime of the medical assistants during the preparation of the consulting-hours, the results of the work sampling are calculated in percentages.

Also at preparing the consulting-hours the attention is drawn to the relative high percentage in relation with the other main categories of activities *(Referring to figure 18)*. The medical assistants spend namely 20% of their time on idle time. This means in practice that the medical assistants spend 1,5 times of their work time on idle time in proportion to indirect care . This is also a relative high fact.

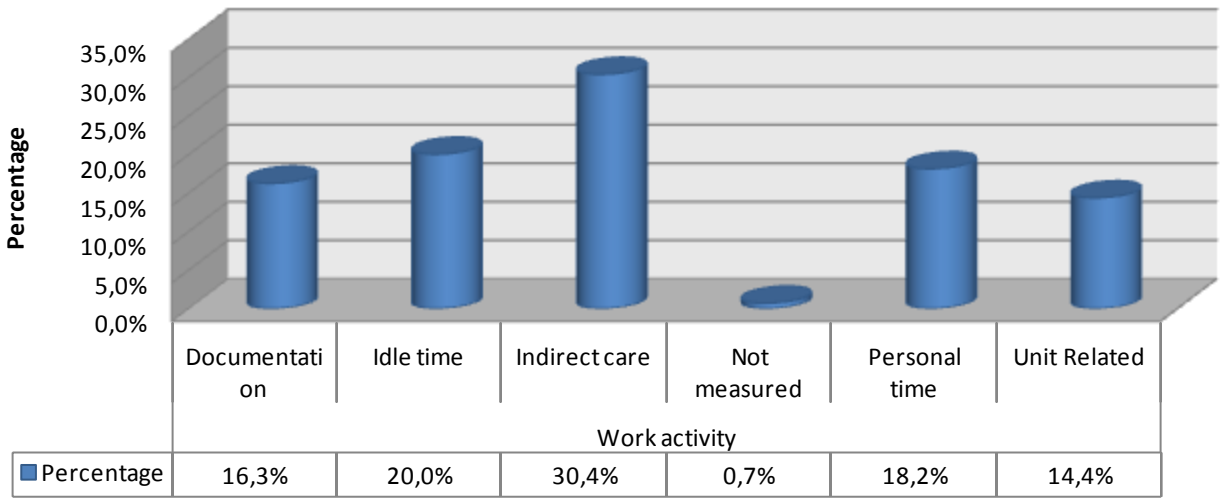

Figure 18 The percentages of the pastime of the medical assistants during preparation of the consulting-hours

The results of the work sampling of preparing the consulting-hours are extensive specified in Appendix VI.

4.4.4 VALUE-ADDED AND NON-VALUE-ADDED ACTIVITIES

The patient is willing to pay for activities that add value. Anything that helps treat the patient is value-adding as well. Everything else is waste (Jones and Mitchell, 2006).

The medical assistants don't add much value in the patient's perspective. The activities during the consulting-hours that are categorized under the category direct care adds value to the customer. For these activities the patient is willing to pay. The other main categories like: idle time, indirect care, personal time and unit related don't add value in patient's perspective.

The activities that are executed by the medical assistant during the preparation of the consulting-hours are non-value-added in the patient's perspective. These activities don't meet the three rules of Womack and Jones (1996) *(Referring to subparagraph 2.2.8).*

During the consulting-hours and the preparation of these consulting-hours, the main category idle time can be avoided. The other main categories are non-avoidable non-value-added activities. These activities are needed to keep the outpatient surgery department running and to help the patient in the best interest.

4.5 OBSERVATION

Certain aspects at the outpatient surgery department have drawn the attention because they are remarkable . These aspects have drawn the attention during the observation of the department as a basis for drawing the current value streams and the execution of the work sample. In this paragraph these so-called 'remarkable aspects' will be highlighted.

4.5.1 RUNNING THE CONSULTING-HOURS

Not every surgeon has the same amount of patients during a consulting-hour. There are surgeons that are well-known for their qualities and therefore have a busy consulting-hour. But there are also surgeons that have just started as a surgeon, so they have to build up their consulting-hours. Conclusion: not every surgeon has a busy consulting-hour, some have a tight schedule because of the large amount of patient during the consulting-hours and some surgeons have not. This means in practice for the medical assistants that they are very busy during consulting-hours with many patients but don't have much to do during consulting-hours that are not tightly scheduled with patients.

The activities of the medical assistants are not only based on the scheduling of the consulting-hours, it has also to do with the patients. A consulting-hour can have a lot of patients that have to make a new appointment or have a wound that has to be dressed or looked after. The activities of the medical assistants are also related to the patient and the level of care that they need. One could see that the medical assistants were constantly very busy with patients during the consulting-hours of surgeons which were tightly scheduled with a lot of patients. The surgeons of these consulting-hours must direct a lot of activities to the medical assistants because the consulting-hour must flow in order to be on schedule with consulting the patients.

A lot of the consulting-hours that were well attended by patients was too tightly scheduled. This resulted in the fact that the consulting-hours ran out with an average of half an hour till an hour. There was also a surgeon that wanted to have a break several times during the consulting-hour and therefore took a break that was not scheduled. Even when he lagged behind with the appointments with the patients he took a break. As a result the patients had to wait a lot longer.

It was remarkable to see that during the less busy consulting-hours a lot of so-called slack or idle time (that are produced by the medical assistants) took place during these hours. Medical assistants have two options then: use the time as idle time or do activities to serve the preparation of the consulting-hours. Sometimes the medical assistants have nothing to do if the surgeon doesn't need them. This is the case when the preparation for the consulting-hours is already done or they don't want to do the preparation of the consulting-hours because then they take the work out of the hands of the medical assistants who work at the back office and then these medical assistants have nothing to do what's related to the preparation.

There was one day with consulting-hours that were not well visited by patients, so the medical assistants had not much to do. One medical assistant was sick so that the surgeons were assisted by three medical assistants instead of four. So one assistant per surgeon and one assistant assisted both surgeons. A big difference was visible that day: there was a constant flow in the processes at the outpatient department. Normally during a consulting-hour the medical assistant would not have known what to do at certain times, but now because they were with three persons they kept up with executing their activities and there was no time left that they could use as idle time.

It appeared that some surgeons and medical assistants have a dislike to the high rate of idle time at the outpatient surgery department during running the consulting-hours and preparation of the consulting-hours. The surgeons are annoyed about the fact that the medical assistants 'do nothing' at certain times. It distracts the surgeons. The only thing that the medical assistants want is to do their job in the best possible way. They want to continue with their tasks as well.

4.5.2 PREPARING THE CONSULTING-HOURS

The Monday is the busiest day of the week for the medical assistants who prepare the consulting-hours for later that week. The logical explanation for this is that a lot of patients call with questions. Preparing the activities for the consulting-hours in that week must be started as well.

There were a number of afternoons during which the medical assistants had not much to do, but that is easy to explain. Because the medical assistants who run the consulting-hours in the morning had not much to do, they already started with the preparation of the consulting-hours later that week. This had as a consequence that the medical assistants that must prepare the consulting-hours had early finished their tasks. They could already start with the task for the next day but then all tasks shifts, namely tasks for tomorrow will be done today and the tasks of the day after tomorrow will be done tomorrow and so on. What a logical human choice is of the assistants is that sometimes they choose in such situation not to do tasks that must be done in the afternoon or the next day but just to do nothing what leads to idle time. Their reasons for this choice is that they will be too far on schedule and they don't want to take tasks out of the hands of their colleagues, so that they have nothing to do or not many tasks left to execute. But in this whole story there is an exception. Mondays and then especially in the morning the assistants at the back office have their hands full on answering phone calls, so they have not much time left for their tasks. At such times it is useful that the medical assistants running the consulting-hours deputize for their colleagues at the back office.

4.6 QUANTITATIVE DESCRIPTION

In this chapter we look at the quantitative side of the outpatient department. First we will take a closer look at the production numbers of the year 2008 and 2009.

4.6.1 NUMBER OF CONSULTATIONS

In the table 10 are the production numbers of the year 2008 and 2009 displayed.

Surgeon	*Up to and including week 27 of 2008*	*Up to and including week 27 of 2009*
Surgeon 1	1572	2371
Surgeon 2	25	2598
Surgeon 3	1232	2367
Surgeon 4	2288	2979
Surgeon 5	1629	2924
Surgeon 6	1347	2469
Surgeon 7	0	1426
Surgeon 8	1988	3735

Table 10 The numbers of consultations of the years 2008 and 2009

4.6.2 MUDA

In the previous paragraph the results of the work sample made clear that a lot of the activities that are executed by the medical assistants are muda (waste). We take a closer look on the waste to get an improved insight of the hours that the assistants spend on idle time.

- *Running the consulting- hours*

The hours that each medical assistant has worked during the consulting-hours are calculated and counted up together. It is calculated that the assistants have together worked 165 and 45 minutes during the week of observation. It became clear in paragraph 4.4.2 that 36,0% of the total time is idle time spent by the medical assistants. When we take 36,0% of the working hours the result is 59 hours, 40 minutes and 12 seconds *(Referring to table 11)*. This means in practice during the consulting-hours 59 hours and 40 minutes (rounded off downwards) during the observation week is literally thrown away.

Time	165:45:00	59:40:12
Percentage	100,0%	36,0%

Table 11 Contingency table of the working hours of the medical assistants and the percentage of idle time during the consulting-hours

- *Preparing the consulting-hours*

The hours that each medical assistant has worked during the preparation of the consulting-hours are calculated and counted up together. It is calculated that the assistants have together worked 50 and 6 minutes during the week of observation. When we take 20,0% of the working hours the result is 50 hours, 6 minutes *(Referring to table 12)*. This means in practice that during the preparation of the consulting-hours 10 hours and 1 minute (rounded off downwards) during the observation week is literally thrown away.

Time	50:06:00	10:01:12
Percentage	100,0%	20,0%

Table 12 Contingency table of the working hours of the medical assistants and the percentage of idle time during the preparation of the consulting-hours

- *The total idle time*

Looking at the muda and comparing the idle time of the consulting-hours with the preparation of the consulting-hours it is evident that the greater part of the muda takes place during the consulting-hours.

When we look at the total amount of muda the hours of idle time of running the consulting-hours and the preparation of the consulting-hours is counted up with a total of 69 hours, 41 minutes and 24 seconds *(Referring to table 13)*.

Idle time consulting-hours	59:40:12
Idle time preparation consulting-hours	10:01:12 +
Total idle time	**69:41:24**

Table 13 The total amount of idle time during the total work sample (5+3 workdays)

The idle time is connected with staffing costs. St Jansdal makes use of an internal wage of €25,60 per hour. The internal wage consists of labour costs including the employers contribution and is based on productive hours.

When we take a look at the costs of the idle time at the outpatient surgery department, we see that idle time costs the hospital a lot of money. Table 13 listed the total idle time of 69 hours and 41 minutes (rounded off downwards). When we multiply these hours with the internal wage per hour the result is €1.783,89 (rounded off downwards).This means that during the observation the total idle time has cost the hospital €1.783,89 *(Referring to table 14*). This money has actually been thrown away.

Total idle time consulting -hours	69:41
Internal wage per hour	€25,60 x
Total wage costs of idle time	**€ 1.783,89**

Table 14 The total wage cost of idle time during the total work sample (5 +3 workdays)

The costs of the total idle time per week are multiplied by 48 (i.e. 48 working weeks per year) to find out the total costs of idle time per year *(Referring to table 15).* By means of a calculation is calculated that the total idle time will costs the hospital an amount of € 93.843,20 (rounded off downwards) per year. This amount is based on the internal wage of €25,60 per hour that the hospital handles and 48 working weeks per year. The fact is that the hospital throws away an amount of € 93.843,20 and that is a lot of money that can be better used for other objectives in this hospital.

	1 week		Per year (48 working weeks)	
	Time	*Internal wage cost*	*Time*	*Internal wage cost*
Idle time running consulting-hours	59:40:12	€ 1.527,47	2864:09:36	€ 73.322,24
Idle time preparation consulting-hours	16:42:00	€ 427,52	801:36:00	€ 20.520,96
Total wage costs of idle time	**76:22:12**	**€ 1.954,99**	**3665:45:36**	**€ 93.843,20**

Table 15 The total wage cost of idle time per week and per year

- *FTE*

FTE stands for 'Full-time equivalent'. FTE is a unit of account that express the size of a job or the total staff within a company. One FTE equals one full working week, for example 38 or 40 hours.

In table 15 is stated that total idle time per year of the medical assistants is 3665 hours and 45 seconds (rounded off downwards). Within the hospital a FTE of 1.0 stands for a workweek of 36 hours. The total idle time per years is equal to 2,2 FTE (the total idle time per year divided by 36). This means that per year the hospital throws 2,2 FTE away or time of two full-time medical assistants (rounded off downwards).

CHAPTER 5 CONCLUSION AND DISCUSSION

At the outpatient surgery department of the hospital St Jansdal at Harderwijk a feeling dominates that certain processes can be done differently or more efficiently. This is related to the activities that the medical assistants execute during the consulting-hours and the preparation of these consulting-hours. The unit of analysis is therefore the medical assistants of the outpatient surgery department.

During the last years the concepts of Lean management are introduced in the healthcare environment. More and more hospitals in The Netherlands get familiar with the benefits of Lean management and therefore introducing the Lean concepts in their hospital. Lean management has been very effective in the field of processes in hospitals. With the interest of the hospital in Lean management and the situation at the outpatient department a central question has proceeded. The central question is formulated as follows:

Does waste occur in terms of Lean management in the work of medical assistants at the outpatient surgery department of the hospital St Jansdal and can there be given recommendations based on the concept of Lean management?

To be able to answer the central question and to form an overall picture of the situation there are an amount of research questions formulated. The research questions are formulated as follows:

1) What are the special characteristics of the healthcare environment?
2) What are the products or services that the outpatient surgery department provide and what are the qualifications?
3) What is known about the concept of Lean in hospitals?
4) What do the processes in the outpatient surgery department look like?
5) How do the medical assistants contribute to the processes?
6) Which non-added value activities have the medical assistants to carry out?
7) Which of these activities are avoidable and which activities are not avoidable?
8) How can these processes be changed in order to reduce the non-added value activities as much as possible?

The research is composed of different compositions. The first chapter starts with the research background and gives information about Hospital St Jansdal and the associated outpatient surgery department. Subsequently the problem definition is described and clarifies the direction of the research among others like the research objective and research issue. Finally structure of the report is outlined.

In chapter two an overview is made of the literature that is related to the research. Think among other things of a description of the Dutch healthcare and the Lean concepts.

Chapter three describes how the research is constructed. The research design and the methodology are outlined. The work sample and the related sample design size is discussed as well.

In chapter four an insight is given in the outpatient department. The processes and the accompanying activities executed by the medical assistant that play a role during the consulting-hours and the preparation of the consulting-hours are reported. Furthermore these processes are schemed through a Lean concept: value stream mapping. Chapter four is marked by the work sample. To get an insight in the pastime of the medical assistant the method of work sample is used. The results of the work sample are elaborated and interpreted.

5.1 CONCLUSION

First the research questions will be discussed and subsequently the central question.

5.1.1 THE RESEARCH QUESTIONS

1) What are the special characteristics of the healthcare environment?

One characteristic of the system is that every patient is insured against health risks. The Dutch healthcare system is a regulated market. Therefore more and more hospitals are run like a business. Hospitals try to improve the quality of the care at the best possible price. This takes care of that the prices in the healthcare don't rise too hard. The working of the system must result in qualitative sublime healthcare at a lower price but also an improved balance between supply and demand. *Referring to paragraph 2.1*

2) What are the products or services that the outpatient surgery department provide and what are the qualifications?

The patients that visit the outpatient surgery department come for an intake, getting results of tests, ex-post control or a follow-up. The medical assistants assist the surgeon during the consultations. *Referring to subparagraph 1.2.2 and paragraph 4.1*

3) What is known about the concept of Lean in hospitals?

Lean healthcare has proven its value in several cases. Lean improvements can be realized when people can invest more time in the value-added activities that are a part of their job. Just like in the motorcar industry it is also possible in the healthcare to find the non-value added activities (waste). *Referring to paragraph 2.3*

4) What do the processes in the outpatient surgery department look like?

The focus of the research at the outpatient department lies on two main flow processes namely: the patient flow process and the medical assistants flow process. The medical assistants flow process can also be classified in three flow processes: the front desk, running the consulting-hours and preparing the consulting-hours. *Referring to paragraph 4.1 and 4.3*

5) How do the medical assistants contribute to the processes?

The medical assistant at the front desk will assign the patient to the right waiting room when the patients report themselves at the front desk. Subsequently the medical assistant will register that the patient is arrived and put the patient's punch card to the treatment chart of the patient. When there is time, the medical assistant at the front desk will take the treatment charts to the medical assistants at the middle desk who run the consulting-hours. *Referring to subparagraph 4.3.2*

During the consulting-hours the medical assistants assist the surgeon. This assisting among others consists of: calling for the patient from the waiting room and accompanying them to the right consulting-room, scheduling a new appointment with the patient and applying a bandage. *Referring to subparagraph 4.3.3*

During the preparation of the consulting-hours the medical assistant executes several tasks. The medical assistants among others have to pick up the phone, search for the treatment charts of patients and the test results and make the patients charts complete for the consultation. *Referring to subparagraph 4.3.4*

Referring to subparagraph 4.1.3 for the inflow and outflow of the patient

6) Which non-added value activities have the medical assistants to carry out?

The results of the work sample made it clear that the medical assistants spend a lot of their time on non-value added activities. The activities that are categorized in the categories documentation, idle time, indirect care, unit related and personal time are non-value added activities in the patient's perspective.

The category idle time is the biggest category that consist of non-value-added activities. During running the consulting-hours the medical assistants spend 36% of their time on idle time and during the preparation of the consulting-hours they spend 20% of their time on idle time. The activities that fall in the category idle time are: waiting for the surgeon and chatting. *Referring to paragraph 4.4*

7) Which of these activities are avoidable and which activities are not avoidable?

A value-added activity is any activity that directly contributes to satisfying the needs of the customer. In the patient's perspective the activities that fall within the category direct care are value-added activities. This means that the activities that are categorized in the categories documentation, indirect care, unit related and personal time are activities that are non-value added but are not avoidable. For example looking at the unit-related activities these activities are not value added but are not avoidable because these activities must be executed to maintenance the outpatient surgery department. The activities that are categorized in the main category idle time are avoidable non-value-added activities. *Referring to paragraph 4.4*

8) How can these processes be changed in order to reduce the non-added value activities as much as possible?

When we look at the time that is spent on the non-value-added activities, the activities that fall within the category idle time are in total the greatest part of all the non-value added categories. The cause of a high percentage of time spent on idle time during running the consulting-hours has to do with keeping the medical assistants waiting. When the flow during the consulting-hours is improved then the non-value added activities of the category idle time will reduce.

With timing of the waiting times of the medical assistants the surgeons must be included. This has to do with the high rate of waiting times of the medical assistant because they are waiting until they are directed by the surgeon.

5.2 THE CENTRAL QUESTION

Does waste occur in terms of Lean management in the work of medical assistants at the outpatient surgery department of the hospital St Jansdal and can there be given recommendations based on the concept of Lean management?

One of the methods that is used to identify the waste at the outpatient surgery department is work sampling. A state of view of the pastime of the medical assistants is made by observation and recording which activities they execute at certain times. The work sample made clear that there is a lot of waste at the outpatient surgery department. During the consulting-hours the medical assistants spent 36% of their time on idle time. A reason of this high percentage of idle time is that the medical assistants must wait a lot until the surgeon asks them to assist. During the preparation of the consulting-hours the medical assistants spent 20% of their time on idle time. The activities that are categorized in the category idle time are avoidable non-value-added activities. Idle time is also the biggest category of all non-value-added categories (direct care, documentation, indirect care, personal time and unit related). The other non-value-added categories are non-avoidable unlike the category idle time. On the other hand the activities that are categorized in the category direct care are value-added in the perspective of the patient.

The total wage costs of time spent on idle time by the medical assistants during the consulting-hours and the preparation of the consulting-hours was calculated. The result is that the hospital throws a lot of money away that better can be used for other objectives in this hospital. In Lean terms there is a lot of so-called waste or muda at the outpatient surgery department.

The total wage costs of the idle time spent by the medical assistants during the work sample is €1.783,89. The costs of the total idle time per week are calculated to the total costs of idle time per year. By means of a calculation is calculated that the total idle time will costs the hospital an amount of € 93.843,20 (rounded off downwards) per year (48 working weeks). These amounts of total wage costs during the work sample and per year consists of the internal wage of the hospital of €25,60. The internal wage consists of labour costs including the employers contribution and is based on productive hours. Calculated in FTE, the hospital throws 2,2 FTE (two medical assistants rounded off downwards) per year away.

Through observation and mapping the value stream of the preparation of the consulting-hours certain aspects became clear. The medical assistants spent a lot of their time on checking the treatment charts of patients. Making the treatment chart complete consists of several tasks: looking which results of the patient are needed and which are present and which not, request the lab results when it is needed and finally complete the treatment chart. But before the treatment chart of the patient is complete, the medical assistants check several times if the requested results are present and if the results are complete. This is duplication of work and costs a lot of time of the medical assistants. The reason that the medical assistants do the same work for several times is that the lab results are not visible in the computer system.

Based on the conclusion the following recommendations can be made *(Referring to chapter 6)*:

- Implementing flexible scheduling
- Improving the process of making the treatment chart complete
- Application of Lean management at the entire outpatient surgery department

5.3 DISCUSSION AND EVALUATION

5.3.1 EVALUATION OF THE RESEARCH PROCESS

During the research there were small little misfortunes but there was nothing that really went totally wrong . But that doesn't mean that I would do certain things differently the next time. I have certainly derived learning moments.

If I had to do the research again, I would involve the medical assistants and the head of the outpatient surgery department more. I would start with: composing a team of the head of the department, surgeons and medical assistants. The idea of composing a team will provide a basis for the Lean transformation, because it can build trust for the staff of the outpatient department in the concepts of Lean management.

Discussing the results with the medical assistants and the head of the outpatient surgery department would be an aspect for the next time. The reactions of the team could be observed. Brainstorming with the team for Lean improvements would be an important idea as well. A benefit of the brainstorm session is that the medical assistant could give ideas that are creative and are not obvious.

5.3.2 THE METHODOLOGICAL ACCOUNTABILITY

The quality of the research depends on the following valid criteria : reliability and validity.

- *Reliability*

Given that the analyses of the research are based on the work sample and the value stream maps we start with determining the reliability of these research methods. When we look at the sample size of the consulting-hours and preparing the consulting-hours, they both consist of a large sample size with a high confidence level. In conclusion the reliability of the work sample is high, because the larger the number of observations, the more reliable the results are. Also sampling errors will diminish as the size of the sample increases (Niebel, 1982).

When we look further at the work sample, the research is very reliable if another person would do the research in the exact same week. The results would be the same as the current results. On the other hand the reliability of the work sampling becomes weaker because of the fact that the work sample is executed during the summer holidays. Apparently the consulting-hours are more quietly during the summer holidays. If the work sample was executed for a longer period, where quiet and busy consulting-hours succeed each other, the reliability would be increased.

Subsequently the reliability of the value stream maps. The reliability of the value stream maps is high. The maps are composed with the help of 3 data collection methods namely, conversations/interviews with the medical assistants, reading internal documents and observation of running and preparing the consulting-hours. Because the processes are mapped on the basis of the so-called 'triangulation', the reliability of the value streams are increased.

- *Validity*

During the whole research there is made use of several data sources namely, the medical assistants, the head of the outpatient surgery department and internal documents. This use of multiple sources of evidence is one of the factors that increase construct validity.

On the basis of the results of the work sample and the theory there are given prudently concluded interpretations. The results are in line with the theory. Only through replication of the research the external validity can be enhanced.

CHAPTER 6 RECOMMENDATIONS –THE FUTURE STATE

To achieve the so-called 'future-state' certain improvements must be made. Based on the conclusion the following recommendations can be made:

- Implementing flexible scheduling
- Improve the process of making the patients' chart complete
- Application of Lean thinking at the entire outpatient surgery department

6.1 FLEXIBLE SCHEDULING

As a basis for continuous improvement, attention must be paid to the scheduling of the medical assistants during the consulting-hours and the scheduling of the consulting-hours of the surgeons. The results of the work sample made clear that during consulting-hours the medical assistants spent a big part of their time on idle time. It was remarkable to see that there was more flow in the process to observe during the consulting-hours when a surgeon was assisted by three instead of four medical assistants all day long. Because of this the recommendation of reducing the workforce of assistants during the consulting-hours is originated. The difference in the processes of running the consulting-hours with four or three medical assistants is visible in figures 19 and 20.

Figure 19 The flow of the process steps during running the consulting-hours with four medical assistants

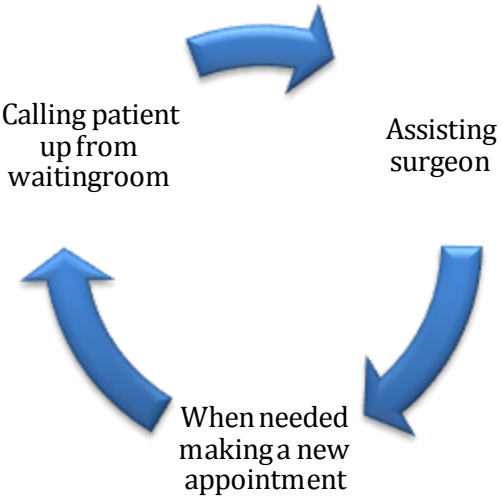

Figure 20 The flow of the process steps during running consulting-hours with three medical assistants

Simply said, in an organization that is truly flexible, members of staff work when there is work. This means that if there is no work, there must be no staff. With flexibility the key economic perspective is central, in particular the concepts of excess capacity and idling. Flexible working in health care seeks to increase the employability of the employees in an efficient way. It may include a lager deployment in time, in multiple places and/or in multiple functions and diversity in contracts.

The goal of the recommendation of implementing flexible scheduling is to work flexible and for the hospital to search an 'optimal mix' of scheduling the medical assistants to work efficiently. The basic idea of the recommendation is to set a new standard of scheduling: scheduling three medical assistants instead of four medical assistants in the duty-roster during the consulting-hours. There are variations in how to schedule three medical assistants:

- *Combining a consulting-hour of a surgeon that is always full of consultations with a consulting-hour of a surgeon that quiet.*

A consulting hour that is fully scheduled with patients with a tight time schedule cost a lot of time of the medical assistants. Opposing a consulting-hour with a loose time schedule because not the whole consulting-hour is scheduled with consultations and therefore takes not much time of a medical assistant. Because of the pressure of a tight time-schedule two medical assistants are busy with assisting the surgeon the entire consulting-hours. During a loose scheduled consulting hour with not many consultations one medical assistant per surgeon is sufficient. When a tight scheduled and a loose scheduled consulting-hour will be combined, three instead of four medical assistants can assist the surgeon. This combination will result in a reduced percentage of time that is spent on idle time by the medical assistant, because one medical assistant will not be scheduled in the duty-roster during the consulting-hour.

- *Schedule only the medical assistants of the outpatient surgery department as much as possible*

The internal flexibility at the outpatient department can be enhanced by obtaining flexibility of own staff. By using only the medical assistants from the outpatient surgery department as much as possible, the quantity of medical assistants that work at the outpatient department will be reduced. When it is needed medical assistants from the so-called 'flex-pool' can be called up. The flex- pool is a pool of medical assistants that can be placed at several outpatient departments of the hospital.

- *Transfer medical assistants to the flex pool*

When the recommendations that are just mentioned are put into practice it can be evident that the outpatient department can function with less medical assistants. If the practice shows that there is a surplus of medical assistants the medical assistants could be transferred to the flex pool.

6.2 IMPROVING THE PROCESS OF MAKING THE TREATMENT CHART COMPLETE

The observation of the preparation of the consulting-hours makes clear that checking if the treatment chart is complete and making them complete, take medical assistants a lot of time. The medical assistant checks several times if the treatment chart is complete and if necessary they request the lab results to complete the treatment chart.

At this moment the lab results cannot be made digital and therefore cannot be entered in the computer system. These results are only printed on paper. The process of making the patients treatment chart complete can be more efficient if all the test results and the lab results are entered in the computer system. Then it would take the medical assistants less time to prepare the consulting-hours and checking if the lab results are complete in the treatment chart, because an overview of the test results and lab results are a few mouse clicks away. When the flow of this

process is improved the department is able to make much better use of its capacity of medical assistants.

Digitalization of the lab results are also more efficient for the surgeons. During a consultation they only have to check the computer system for the test results and the lab results. At this moment the surgeon has to check the system for the test results and the patients chart for the lab results. That is duplication of work for the surgeon during the consult with the patient.

Another recommendation is to make the process of preparing the consulting-hours more efficient by reformatting the tasks of the medical assistants at the front desk and back office. This means that the efficiency will be improved when there are two medical assistant who prepare the consulting-hours and simultaneously staff the front desk. This means in practice a migration of preparation activities from the back office to the front desk. Observation has shown that the medical assistants who staff the front desk have minor activities to execute. These activities don't really need medical training (medical assistant B) just like preparing the consulting-hours. Because the medical assistants who are preparing the consulting-hours have a lot of idle time, this will be resolved by adding activities namely the activities relating to the front-desk. The flow will improve because the idle time will be reduced. The Monday is a very busy day for the medical assistants at the back-office. When the two medical assistants of the back-office will staff the front-office it is useful to have three instead of two medical assistants at the front-desk on Mondays. On Mondays the medical assistants at the back-office have a difficulty with executing all the activities in relation to preparing the consulting-hours due to lack of time, because there are a lot of phone calls they have to answer.

The staffing of the front desk can be done by two medical assistants or by one medical assistant and one pooler. The activities that are related to preparing the consulting-hours are administrative activities that don't require medical knowledge. For some of the phone calls of patients or the emergency telephone line medical knowledge is important to judge the physical condition of the patient and to deal in the best interest of the patients' health. Consequently an advice is to have at least one medical assistant staff the front desk/preparing the consulting-hours. On Mondays it would be smart to schedule one medical assistant/pooler extra to staff the front desk. By scheduling an extra medical assistant/pooler the preparation for the Monday isn't lacking.

6.3 IMPLEMENTATION OF LEAN MANAGEMENT AT THE ENTIRE OUTPATIENT SURGERY DEPARTMENT

This research has shown that giving recommendations in the field of Lean is difficult because the surgeons are not included in the study. To implement the concepts of Lean properly involves all employees of the department. Together they identify the entire department. Therefore the most important recommendation is to implement Lean thinking at the entire outpatient surgery department and thereby involve the entire staff of the department.

All levels of staff of the outpatient surgery department must be involved from medical assistant to the surgeon, so that waste can be identified. Involving all levels is important because every individual staff member knows more about his or her particular job than anyone else and they do not know or understand the work other staff members do. The parts of every staff member about how their job is done fit together and form a whole, namely the complete value stream and identifying where the waste is.

6.4 FURTHER RESEARCH

6.3.1 POCESS MAPPING

Within the study, the surgeons are not included and also not in the observations. According to the concepts of Lean is it important to map the entire process of the department, to be able to make judgments about the efficiency of existing processes. A recommendation is to implement lean management. Therefore it is important that the processes of the surgeons are mapped together with their activities. The processes that have so far been illustrated are the processes of the patient and the medical assistants during running the consulting-hours and the preparation of the consulting-hours. Additional research will ensure that these processes are specifically mapped. Organizing a process mapping session will be the first step towards the implementation of lean management at the outpatient surgery department. Through the method "process mapping, performed with a selected team of medical assistants, surgeons and the head of the outpatient surgery department, a complete picture will be created of the processes within the department. Using this method, the three parties will get an insight into how the other members of the department see the processes. Mapping the process will be a possible eye-opener. It is concluded that in addition to the above inquiry, a further investigation is recommended namely the observation of surgeons and their activities and a process mapping session.

EPILOGUE

The purpose of this chapter is to reflect the research. The chapter discusses the background of the research, the boundary condition, recommendations and further research.

THE BACKGROUND

The entire research consists of studying the concepts of Lean management, observation, a work sample, interviews with medical assistants and studying internal documents in order to be able to make statements about the efficiency at the outpatient surgery department. The research has focused on the medical assistants. The main conclusion of the research is that the medical assistants have a lot of idle time during running the consulting-hours and preparing these consulting-hours.

BOUNDARY CONDITION

Within the study, the surgeons are not included and also not in the observations. This was a boundary condition that was set by the hospital. According to Lean management it is important to map the entire process at the department. In order to form a complete picture of the processes within the outpatient surgery it is therefore important that the processes of the surgeons are portrayed together with their activities. The processes that have so far been mapped are the process of the patient and the medical assistants during running consulting-hours and preparing consulting-hours. A work sample is executed to get an insight in the pastime of the medical assistants as well.

Because of the boundary condition that was set, many aspects couldn't be observed or mapped. Observation of the surgeons and their activities could have been the basis for further analysis of the outpatient department. I would like to gather data about:

- The workload of the surgeons
- The variation in the supply and demand of the surgeons and medical assistants during the consulting-hours
- The up and down peaks of the consulting-hours in relation to the activities of the surgeons and medical assistants
- The idle time of the medical assistants in relation to the activities of the surgeon

RECOMMENDATIONS

Through the results of the research, the recommendations of the current research could be more based and specified. The following recommendations are raised from the current research:

- *Flexible scheduling*

The 'flow' or the efficiency can be improved during running the consulting-hours through flexible scheduling. This means that during the consulting-hours three medical assistants instead of four medical assistants will be scheduled to assist the surgeons. Through this initiative medical assistants make more efficient use of their available time.

- *Improving the process of making the treatment chart complete*

It mainly involves the process of making the treatment charts complete with the needed lab- and test-results. It appears that the medical assistants often have to perform the same actions repeatedly. This leads to the medical assistants not making efficient use of their available time.

- *Implementation of Lean management at the entire outpatient surgery department*

To improve the efficiency/flow in all the processes at the outpatient department it is important that the concepts of lean management are implemented at the entire outpatient surgery department.

Process mapping is a good start of the lean transformation. A process mapping session will be performed by a selected team of medical assistants, surgeon and the head of the outpatient surgery department. Together the team will map the entire process at the outpatient surgery department. They will see what the other persons see and this will result in an eye-opener for the team members.

FUTURE RESEARCH

The purpose of future research is that the described processes in this current research will be more specified. The process mapping session will give a more specific insight into the processes during the consulting-hours and the preparation of these consulting-hours. It is also intended that an insight will be created into the processes of the surgeons and their activities. Further research must give an insight in the following aspects:

- The workload of the surgeons
- The variation in the supply and demand of the surgeons and medical assistants during the consulting-hours
- The up and down peaks of the consulting-hours in relation to the activities of the surgeons and medical assistants
- The idle time of the medical assistants in relation to the activities of the surgeon

The results of additional research will help to give more specified conclusions about the efficiency within the outpatient surgery department. These conclusions will form a basis for a better detailed plan that enables the outpatient surgery department to organize the processes more efficiently within the department. Improving efficiency will lead to a saving of a large amount of (wage) costs.

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APPENDIXES

- **Appendix I The market share service area 2007 of St Jansdal**
- **Appendix II The organization chart of the hospital St Jansdal**
- **Appendix III The floor plan of the outpatient surgery department**
- **Appendix IV The activities during running the consulting-hours**
- **Appendix V The activities during the preparation of the consulting-hours**

APPENDIX I THE MARKET SHARE SERVICE AREA 2008 OF ST JANSDAL

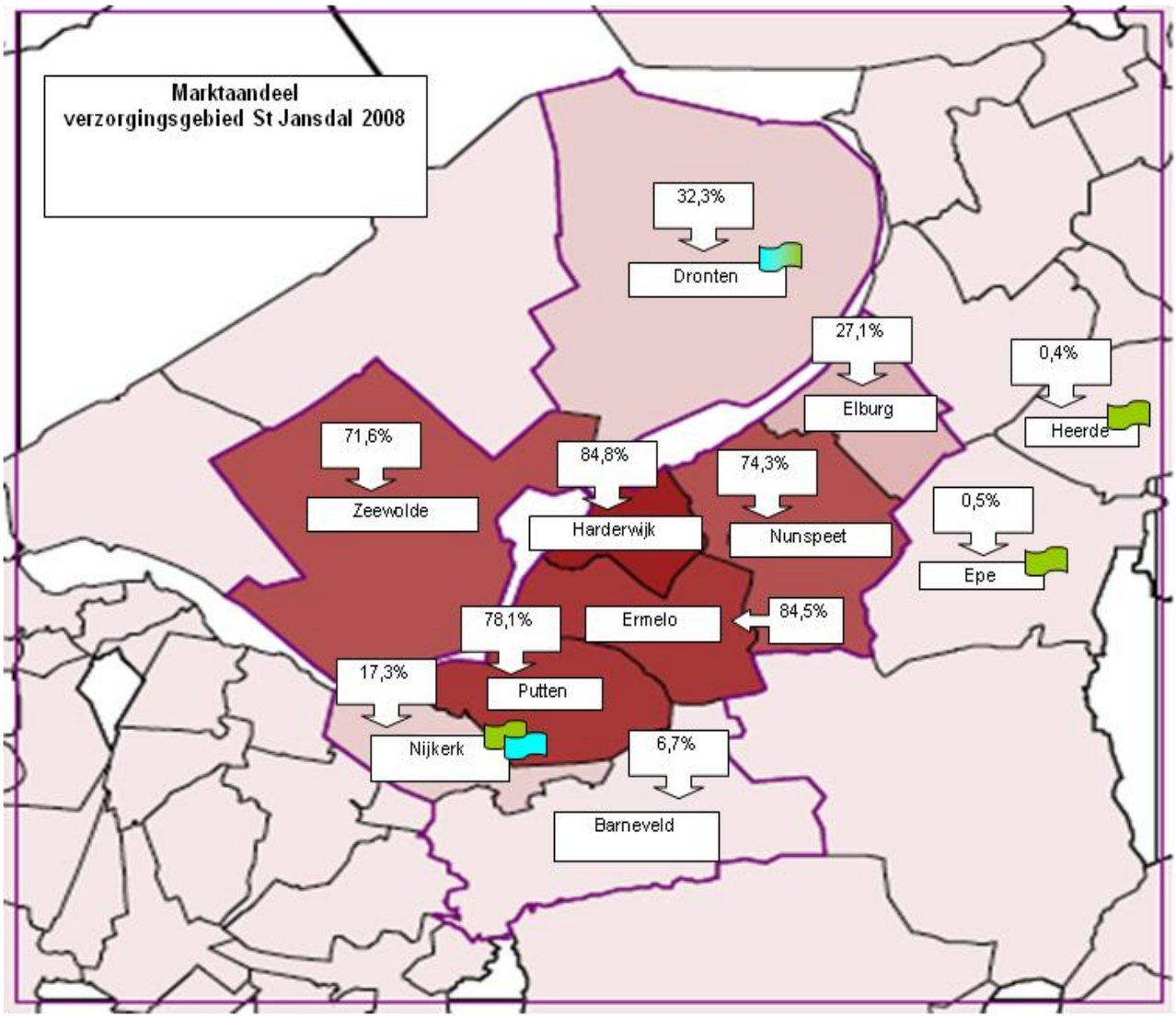
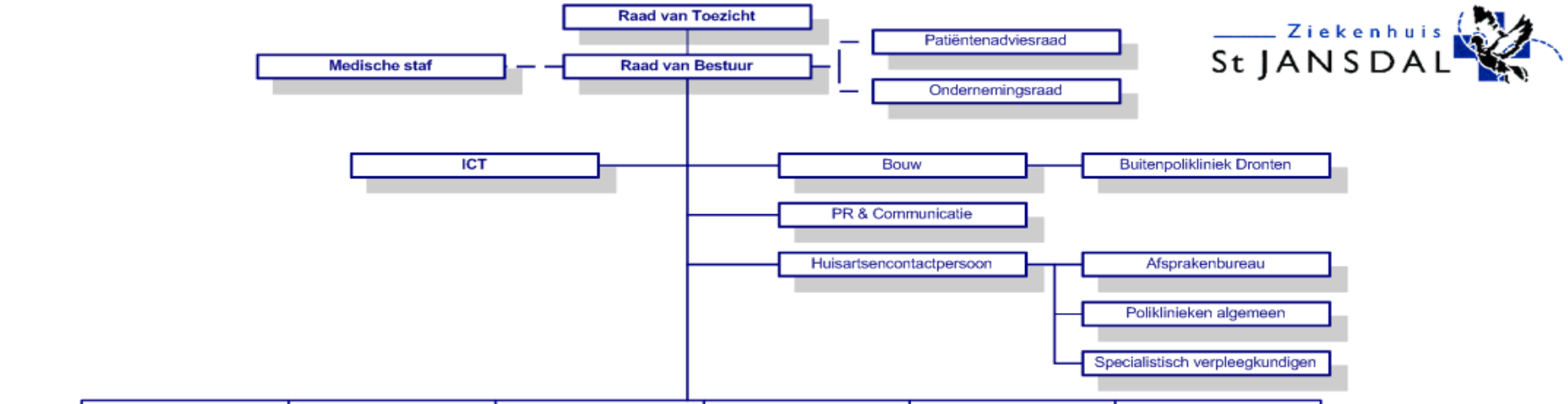


Figure 21 The market share of the service area in 2008 of St Jansdal

Municipality	2003	2004	2005	2006	2007	2008
Harderwijk	84,3%	83,3%	82,9%	84,7%	82,9%	84,8%
Ermelo	80,6%	78,6%	80,2%	82,9%	82,7%	84,5%
Putten	71,0%	75,5%	73,9%	76,6%	76,6%	78,1%
Nunspeet	69,5%	70,3%	69,8%	70,5%	71,4%	74,3%
Zeewolde	70,6%	68,0%	69,4%	72,6%	70,7%	71,6%
Elburg	24,3%	23,8%	26,1%	26,5%	26,7%	27,1%
Dronten	24,6%	25,0%	24,1%	26,4%	26,3%	32,3%
Nijkerk	15,3%	14,9%	14,9%	15,3%	15,2%	17,3%
Barneveld	7,0%	5,9%	6,7%	6,4%	6,9%	6,7%
Epe		0,6%	0,5%	0,5%	0,7%	0,5%
Heerde		0,5%	0,9%	0,3%	0,4%	0,4%
Total service area	**47,1%**	**47,0%**	**47,3%**	**48,4%**	**48,5%**	**48,0%**

Table 16 The market share of the service area in percentages per year and per municipality

APPENDIX II THE ORGANIZATION CHART OF THE HOSPITAL ST JANSDAL



Acute zorg
- Algemeen acute zorg
- Activiteiten begeleiding
- ANW hoofden
- BBL/BOL
- Dagopname
- Diëtetiek
- Geestelijke verzorging
- Huisartsenpost
- Hygiëne & Infectiepreventie
- Intensieve Zorg
- Mortuarium
- Nazorg
- Opnamebureau
- Poli cardiologie
- Poli neurologie
- Spoedeisende Hulp
- 1 noord cardiologie
- 3 oost kort verblijf
- 3 west neurologie

Snijdend
- Algemeen snijdend
- CSA
- Gipskamer
- Klinische operatiekamers
  - Anesthesie
  - OK
  - POK
  - Recovery
- Poli anesthesie
- Poli chirurgie
- Poli gynaecologie
- Poli kindergeneeskunde
- Poli KNO
- Poli orthopedie
- Poli pijnbestrijding
- Poli urologie
- B oost kraam/gynaecologie
- B west kinder & tienerafd.
- 1 oost/west chirurgie

Beschouwend
- Algemeen beschouwend
- Bac. lab.
- Functieafdeling
- KCL
- Medische psychologie
- MEVOG
- Poli dermatologie
- Poli geriatrie
- Poli flexpool
- Poli interne/MDL
- Poli kaakchirurgie
- Poli longziekte
- Poli oogheelkunde
- Poli reumatologie
- Poli revalidatie
- Radiodiagnostiek
- Revalidatie & Therapie
- Ziekenhuisapotheek
- 2 oost/west interne geneeskunde

Facilitair Bedrijf
- Algemeen Facilitair Bedrijf
- Bedrijfsbureau
  - Servicemeldpunt
- Catering
  - Productiekeuken
  - Interne voedings-voorziening
  - Bezoekersrestaurant
  - Bedrijfsrestaurant
- Inkoop & logistiek
- Housekeeping
  - Schoonmaakonderhoud
  - Linnenvoorziening
  - Receptie & Veiligheid
  - Vrijwilligers
- Huisvesting
  - Onderhoud
  - Projecten
- MTI
  - Multimedia

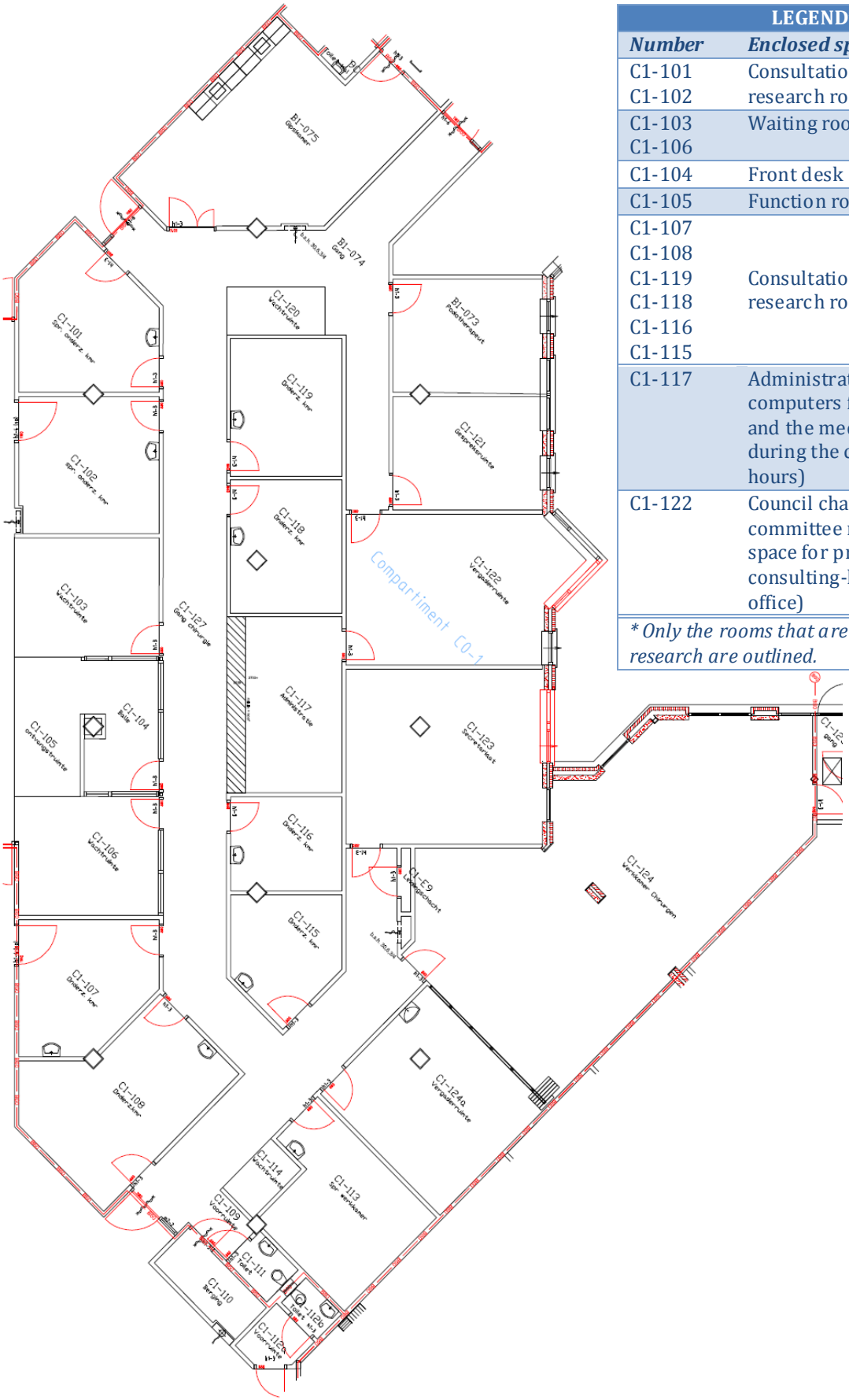
F&I
- Algemeen F&I
  - Interne controle
- Boekhouding
- Bedrijfseconomisch bureau
- PSA
- Zorgadministratie
  - Facturering
  - Medische administratie

P&O
- Adviseurs
- Opleidingen
- Secretariaat

Kwaliteitsbureau
- Kwaliteitsadviseurs
- Patiënten contactpersoon
- Patiëntenvoorlichting

Versie 4
Datum 16-04-2009

APPENDIX III THE FLOOR PLAN OF THE OUTPATIENT SURGERY DEPARTMENT



LEGEND*	
Number	***Enclosed space***
C1-101 C1-102	Consultation room / research room
C1-103 C1-106	Waiting room
C1-104	Front desk
C1-105	Function room
C1-107 C1-108 C1-119 C1-118 C1-116 C1-115	Consultation room / research room
C1-117	Administration (Desks with computers for the surgeons and the medical assistants during the consulting-hours)
C1-122	Council chamber and committee rooms (Enclosed space for preparing the consulting-hours/back office)
** Only the rooms that are a part of the research are outlined.*	

APPENDIX IV THE ACTIVITIES DURING RUNNING THE CONSULTING-HOURS

Main category	*Activity*
Direct Care	• Afspraak maken met patiënt voor nieuw consult • Chirurg assisteren • Gipsverbandmeester assisteren • Koffie halen voor patiënt • Koffie klaarzetten voor de patiënten in de wachtkamers • Patiënt geruststellen • Patiënt terug naar de wachtkamer begeleiden • Patiënt naar röntgenafdeling brengen • Patiënt te woord staan • Patiënt uit wachtkamer halen en in spreekkamer zetten • Uitleg geven aan patiënt
Documentation	• Dossier van patiënt bijwerken in het systeem voor de chirurg • Dossiers aanvragen uit het archief • Formulier afponsen • In het systeem kijken welke uitslagen er zijn van de patiënt • In het systeem verslag van telefonisch consult typen • Kijken per patiënt welke uitslagen er zijn • Labuitslagen telefonisch aanvragen • Naar röntgenafdeling voor uitslag patiënt • Röntgenfoto's aanvragen op CD • Sticker op dossiers plakken • Uitprinten van het dossier van de patiënt • Voorbereiden van het spreekuur • Zoeklijstje met dossiers maken
Idle time	• Wachten op chirurg, kletsen
Indirect care	• Doormiddel van de dossier kijken welke patiënten aanwezig zijn • Dossiers van patiënten zoeken tussen de dossiers van radioloog Thissing • Formulier aan chirurg geven • Formulier invullen/voorbereiden voor het aanvragen van een onderzoek • Formulier invullen/ voorbereiden voor fysiotherapie • Formulier invullen/ voorbereiden voor röntgen • Formulier invullen/ voorbereiden voor spoedopname • Fout oplossen • In het systeem kijken wanneer patiënt een afspraak heeft • In het digitale dossier van de patiënt kijken waar de patiënt voor komt • Naar het opnamebureau om wat te regelen betreft patiënt • Overleg met chirurg • Overleg met collega • Recept voor patiënt faxen • Spoedopname regelen • Telefonisch contact • Wachttijd op de lichtkrant in de wachtkamer zetten • Zaken regelen betreft patiënt • Ziektebeloop op computerscherm zetten in een spreekkamer.

Not measured	• Niet gemeten
Personal time	• Een schoon jasje aantrekken • Pauze, roken, toiletbezoek, koffie/thee pakken en koffie/thee drinken
Unit related	• Afsluiten van computers, spreekkamers, kantoren etc. • Afwassen • Bellen voor poliuitje • Bestellen van materiaal/ medicijnen • Bezig met project • Chirurg helpen met het oplossen van een probleem met de computer • Computers opstarten • Controleren van spreekkamers • Dossiers naar het secretariaat brengen • Formulieren wegbrengen naar het secretariaat • Formulier halen • Formulier regelen voor aanvraag therapie • Gat in het spreekuur opvullen van plasticus • Gesprek met Henriëtte Fraters, hoofd van de poli • In het magazijn kijken of bepaalde materialen er zijn • Kijken of de lijst met telefonische consulten veranderd is • Kijken of reeds gedraaide spreekuren in het systeem zijn afgesloten • Koffie/thee halen voor de chirurg • Kopjes etc. in de kast zetten • Mail lezen • Mailen • Materiaal bijvullen in de voorraadkast • Notulen lezen • Opruimen • Roosteren • Spreekkamers openen • Spreekkamers opruimen • Spreekuurlijsten wegbrengen • Stickers van vel scheuren • Vieze kopjes etc. pakken voor de afwas • Voorraadkasten in spreekkamers bijvullen • Voorste balie (bij wachtkamer) overnemen • Wachtkamer opruimen • Wachtkamer opruimen + tijdschriften omruilen/bijvullen • Washandjes en handdoeken halen voor de gipskamer

APPENDIX V THE ACTIVITIES DURING THE PREPARATION OF THE CONSULTING-HOURS

Main category	*Activity*
Documentation	• Advies van chirurg aan de patiënt in het ziektebeloop in het systeem zetten • Alle uitslagen op papier scheiden naar arts • Dossier uit het archief tussen de stapel met andere dossiers voegen • In het systeem (Mirrador) dossiers opvragen uit het archief • Kijken in het systeem welke uitslagen van patiënten aanwezig zijn en welke niet • Kijken of status van patiënt in het systeem (Mirador) staat. • Kijken of er afspraken er bij zijn gepland in het spreekuur • Kijken waar patiënt voor komt, welke uitslagen er moeten zijn • Kijken welke statussen aanwezig zijn en welke nog niet • Lijst met namen van patiënten uitprinten die een afspraak hebben tijdens het spreekuur • Op het secretariaat dossier zoeken • Spreekuur compleet maken met alle dossiers • Spreekuurlijst bijwerken • Statussen zoeken die nog niet aanwezig zijn • Stickers plakken op de statussen met tijd van afspraak en naam van de chirurg • Telefonisch consult voorbereiden + de nodige formulieren invullen • Zoekbriefje maken met de statussen die nog niet aanwezig zijn
Idle time	• Wachten op chirurg, kletsen
Indirect care	• In systeem (Mirador) of dossier in het archief ligt • Telefoonnummer van patiënt aan collega doorgeven zodat de chirurg de patiënt kan terugbellen • Overleg met chirurg • Overleg met collega • Probleem patiënt oplossen • Telefonisch contact
Not measured	• Niet gemeten
Personal time	• Afspraak bij afdeling P&O • Pauze, roken, toiletbezoek, koffie/thee pakken en koffie/thee drinken
Unit related	• Afsluiten • Afwassen • Alle kopjes etc. verzamelen voor afwas • Bakken met daarin statussen ophalen bij het secretariaat • Bezig met project • Collega naar de OK-sluis brengen • Formulier voorbereiden voor secretariaat • Statussen naar het secretariaat brengen • Kopiëren • Mailen • Naar de afdeling orthopedie om te vragen of een vergadering

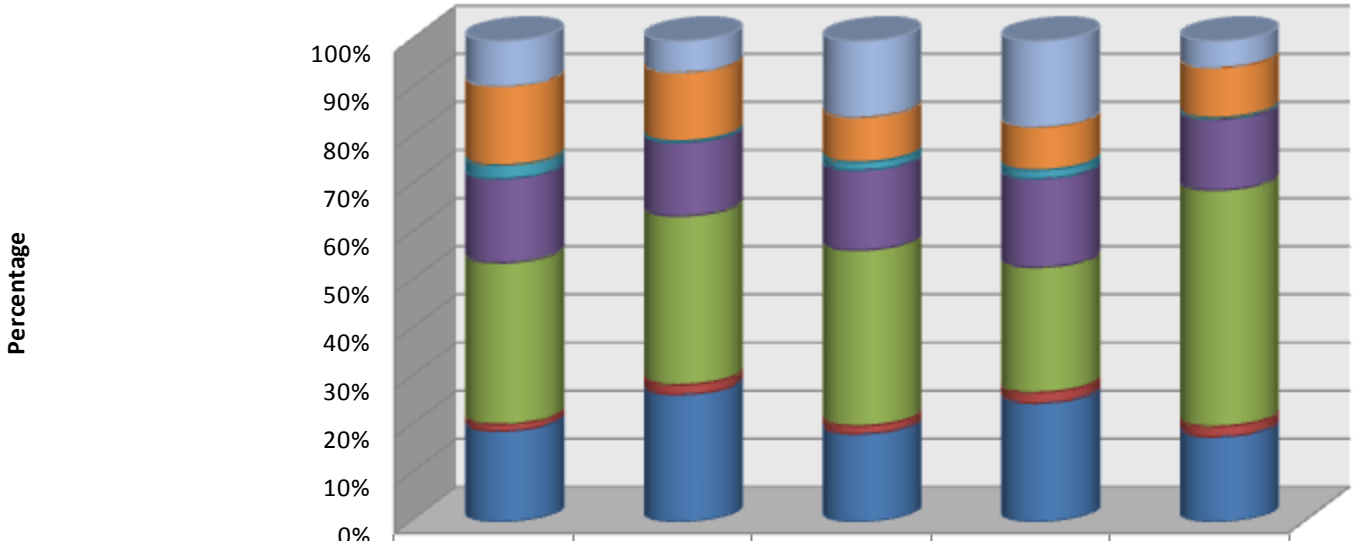
	doorgaat. • Naar het secretariaat • Notulen lezen • Opruimen • Roosteren • Schoonmaken • Statussen ophalen bij het secretariaat • Telefoon bij balie spreekuur draaien beantwoorden • Telefoon spoedlijn overzetten naar een ander toestel • Uitleg over ordermanagement • Voorste balie (bij wachtkamer) overnemen • Wat wegbrengen naar Henriëtte Fraters

APPENDIX VI THE RESULTS OF THE WORK SAMPLE

In this appendix the results of the work sampling during the consulting-hours and the preparation of the consulting-hours are specified extensively.

CONSULTING-HOURS

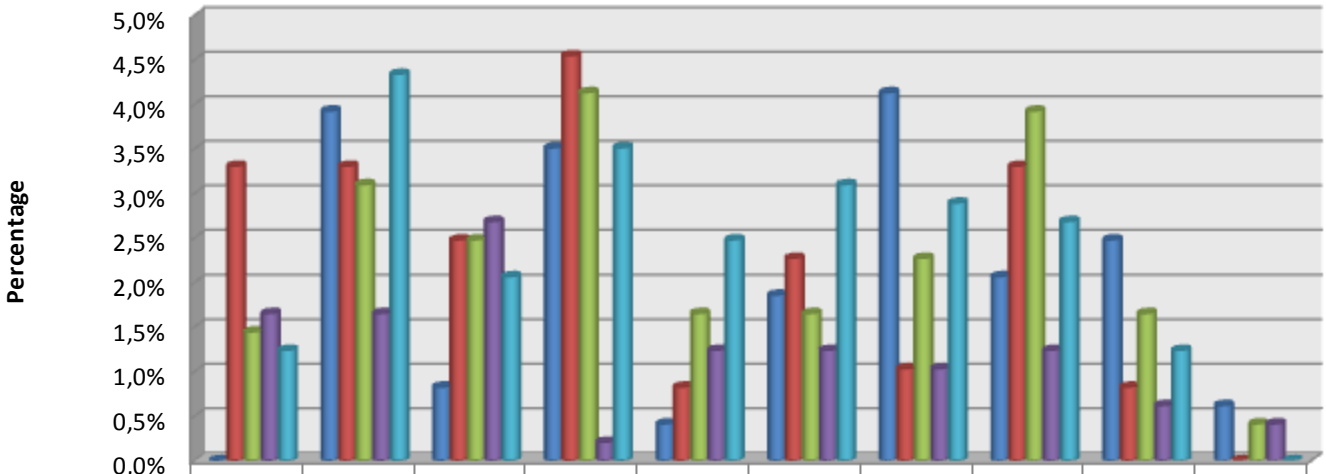
In figure 22 we see that on every day one work activity attract the attention, namely the idle time. At every day the idly time is a high percentage of the time that has been spent by the medical assistants. The next work activity where the medicals assistants spend much of their time on is direct care.



	Monday	Tuesday	Wednesday	Thursday	Friday
Primary activity Unit related	9,4%	6,6%	15,9%	17,9%	5,6%
Primary activity Personal time	16,4%	14,2%	9,3%	9,0%	10,4%
Primary activity Not measured	2,8%	0,3%	1,7%	1,8%	0,4%
Primary activity Indirect care	17,5%	15,2%	16,6%	18,4%	14,7%
Primary activity Idle Time	33,6%	35,1%	36,5%	26,0%	49,4%
Primary activity Documentation	1,4%	2,0%	1,7%	2,2%	2,2%
Primary activity Direct care	18,9%	26,5%	18,3%	24,7%	17,7%

Figure 22 A bar chart of the past time of the primary activities per day

In figure 23 and 24 we see that during running the consulting-hours the idle time is higher at certain time periods of the day than other moments of the day. During the following time moments the idle time stands out in comparison with other time moments: 9:00-10:00, 11:00-12:00 and 15:00-16:00.



	8:00 - 9:00	9:00 - 10:00	10:00 - 11:00	11:00 - 12:00	12:00 - 13:00	13:00 - 14:00	14:00 - 15:00	15:00 - 16:00	16:00 - 17:00	17:00 - 18:00
Monday	0,0%	3,9%	0,8%	3,5%	0,4%	1,9%	4,1%	2,1%	2,5%	0,6%
Tuesday	3,3%	3,3%	2,5%	4,5%	0,8%	2,3%	1,0%	3,3%	0,8%	0,0%
Wednesday	1,4%	3,1%	2,5%	4,1%	1,7%	1,7%	2,3%	3,9%	1,7%	0,4%
Thursday	1,7%	1,7%	2,7%	0,2%	1,2%	1,2%	1,0%	1,2%	0,6%	0,4%
Friday	1,2%	4,3%	2,1%	3,5%	2,5%	3,1%	2,9%	2,7%	1,2%	0,0%

Figure 23 A bar chart of the total idle time per day categorized by time periods

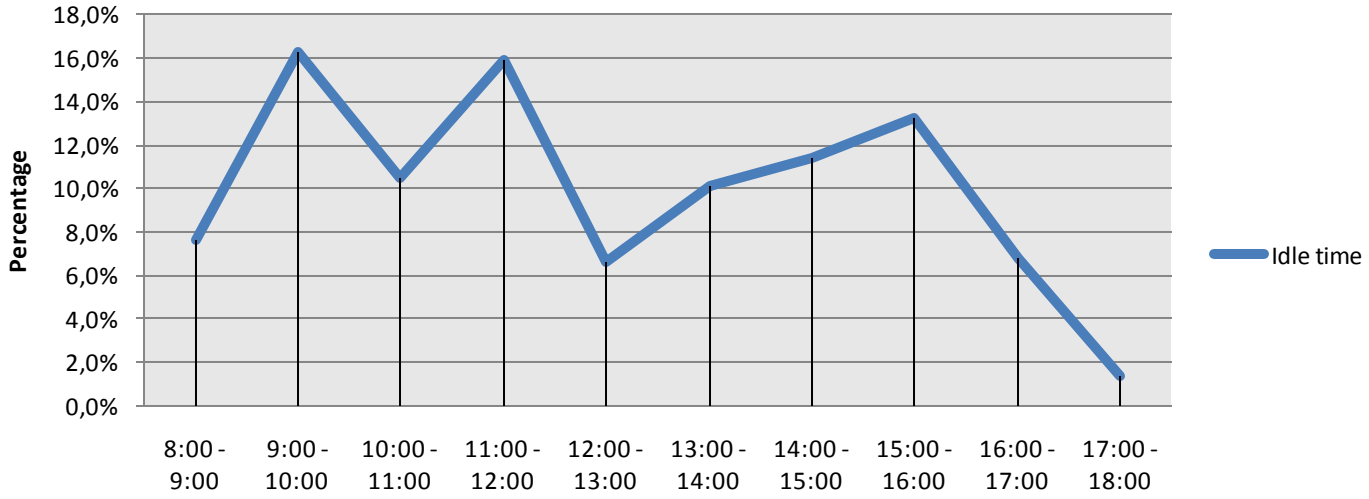
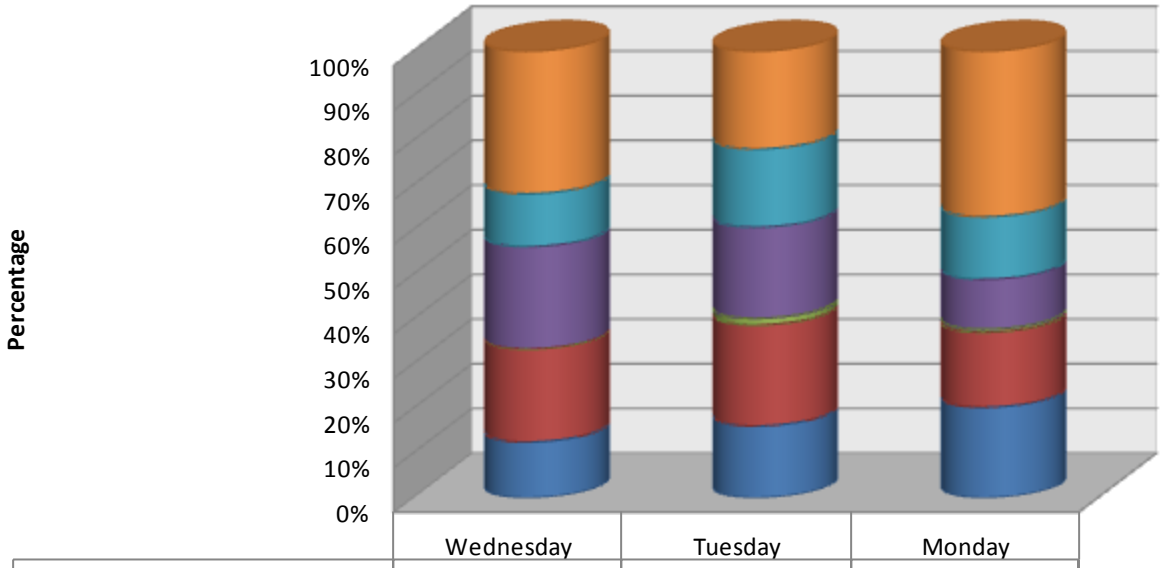


Figure 24 A linear display of the total idle time categorized by time periods

PREPARING THE CONSULTING-HOURS

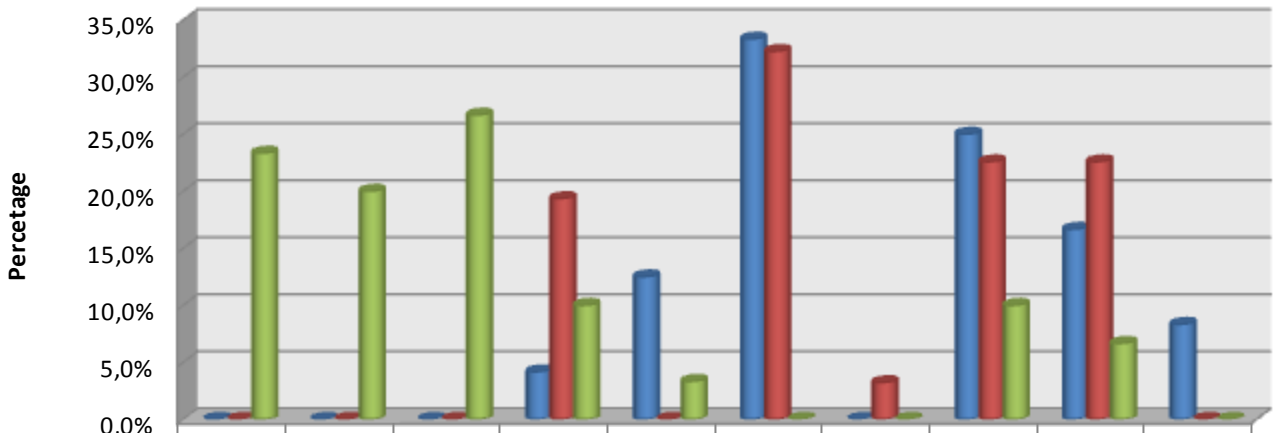
In figure 25 we see that on every day two work activities attract the attention, namely the unit related activities and idle time. At every day the unit related activities are the biggest percentage of the time that has been spent by the medical assistants. The next work activity where the medicals assistants spend much of their time on is idle time.



	Wednesday	Tuesday	Monday
Primary activity Unit related	31,9%	21,9%	37,1%
Primary activity Personal Time	11,8%	17,5%	14,0%
Primary activity Not measured	22,9%	20,4%	11,2%
Primary activity Indirect	0,0%	1,5%	0,7%
Primary activity Idle Time	20,8%	22,6%	16,8%
Primary activity Documentation	12,5%	16,1%	20,3%

Figure 25 A bar chart of the past time of the primary activities per day

In figure 26 and 27 we see that during the preparation of the consulting-hours the idle time is higher at certain time periods of the day than other moments of the day. During the following time moments the idle time stands out in comparison with other time moments: 9:00-10:00, 15:00-16:00 and 16:00-17:00.



	8:00 - 9:00	9:00 - 10:00	10:00 - 11:00	11:00 - 12:00	12:00 - 13:00	13:00 - 14:00	14:00 - 15:00	15:00 - 16:00	16:00 - 17:00	17:00 - 18:00
Monday	0,0%	0,0%	0,0%	4,2%	12,5%	33,3%	0,0%	25,0%	16,7%	8,3%
Tuesday	0,0%	0,0%	0,0%	19,4%	0,0%	32,3%	3,2%	22,6%	22,6%	0,0%
Wednesday	23,3%	20,0%	26,7%	10,0%	3,3%	0,0%	0,0%	10,0%	6,7%	0,0%

Figure 26 A bar chart of the total idle time per day categorized by time periods

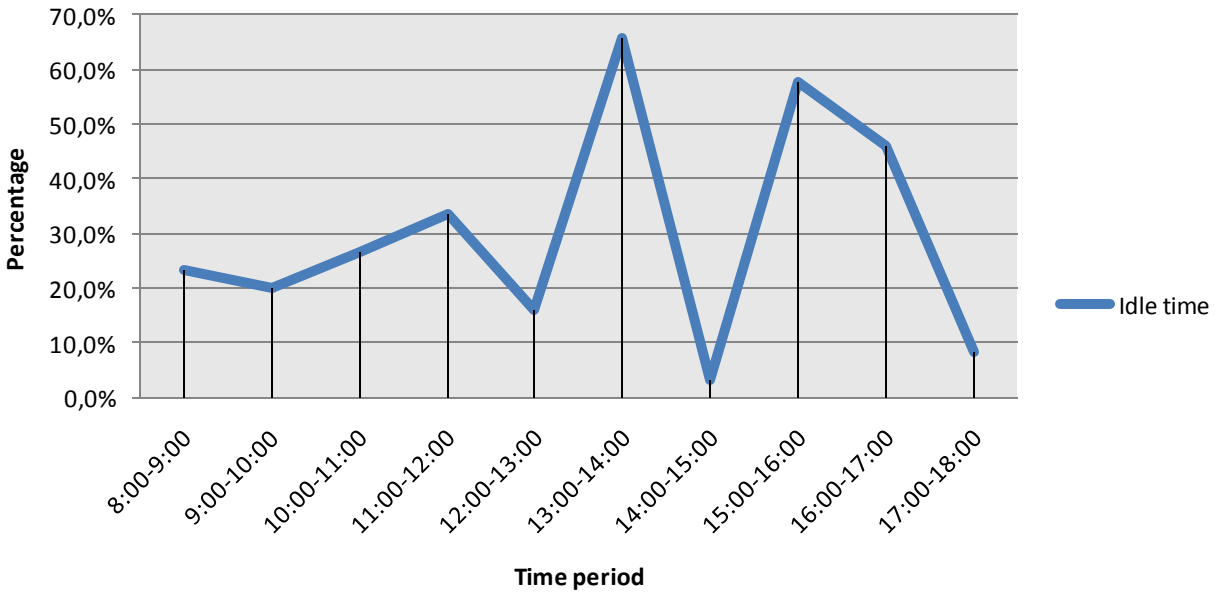


Figure 27 A linear display of the total idle time categorized by time periods