Design of the process flow of surgical instrument trays

A case study of outsourcing the sterile instrument trays storage of Reinier de Graaf Gasthuis to Combi-Ster

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Reinier de Graaf

TU Delft Delft University of Technology

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A case study of outsourcing the sterile instrument trays storage of Reinier de Graaf Gasthuis to Combi-Ster

by

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Reinier de Graaf

TU Delft Delft University of Technology

Preface

With pleasure I present my graduation thesis. This thesis was written as the final assessment to finish the Master study Transport, Infrastructure and Logistics at the Delft University of Technology. With this research, I was able to combine my interests in both logistics and the healthcare sector.

This thesis is performed at the Reinier de Graaf Gasthuis, a hospital in Delft. I have done my best to design a usable and implementable process flow for the surgical instrument trays for the future situation in the new building.

It would not have been possible to finalize this thesis as it lies in front of you without the support and cooperation of many people. First of all, I would like to thank all my colleagues for their valuable support and interest in my research and me as a person, especially the team that helped me to analyse the current and design the future process flow of the surgical instrument trays.

Second, I would like to thank my thesis committee for their efforts and advices, which have helped me to take this research to the next level. I want to thank Marcel Ludema and Wouter Beelaerts van Blokland for their critical reviews and valuable suggestions to further improve this research. Many thanks go to Annetje Guédon, for the many discussions we have had and for giving me the confidence and support during this research. Thanks to Vivian Hoeijmans for involving me in the ongoing processes at RdGG for this problem and for always being available when I had questions or a problem. I would like to thank Lorí Tavasszy for supervising the committee and for giving me valuable advice.

Last but definitely not least, I would like to thank my parents, my two brothers Remco and Norbert, my boyfriend Jeroen and his parents, and everyone I did not mention for their endless support and inspiration during my study time.

Thekla Rakers,

Delft, April 2015

Summary

This report provides a designed process flow for the surgical instrument trays of Reinier de Graaf Gasthuis (RdGG) and Combi-Ster in order to apply a demand driven delivery system. RdGG is going to relocate to a new building and, where for financial reasons, the choice is made to reduce the storage space of the sterile trays from about 95 m^2 to 14 m^2. This leads to that only a small inventory can be kept, the emergency inventory. Decided is to store the rest of the trays at Combi-Ster, the external sterilization company of RdGG, located at a 10 minute drive by car (Google Maps, 2014). The instrument trays stored at Combi-Ster must be delivered shortly before needed in the operation room (OR). This has several effects on the working- and logistical processes of the instrument trays since these have to change from a push to a pull delivery process. More insight in these processes are needed. Therefore, this research pursued the following objective:

To design a process flow for the surgical instrument trays of Reinier de Graaf Gasthuis and Combi-Ster with the focus on safety and efficiency and to advice on its implementation, in order to handle the future situation.

The healthcare industry mainly focuses on patient logistics, which leads that logistics of goods are neglected (Westerman et al., 2012). This can also be seen within scientific literature where little attention is paid to the optimization of the logistics of sterile items in hospitals (van de Klundert, Muls, & Schadd, 2008) (Villareal, Bhamra, & Schönheit, 2014). Villareal, Bharma en Schönheit (2014) conclude that most research done on the healthcare supply chain mainly focuses on the internal patient flow in hospitals. The supply chain of medical technology, including surgical instruments, is being understudied and thus does not appear to be the focus of much researches (Villareal, Bhamra, & Schönheit, 2014). This research will provide more insights in the process flow of surgical instrument trays and will contribute to the literature known about the application of a demand driven delivery system for instrument trays, which is not (yet) a common phenomenon.

Some information of surgical instruments is given in order to better understand the background of the subject of this research. Surgical instruments are specially designed tools or devices that are used to perform a surgery. The majority of the surgical instruments used in the OR are packed in a metal basket called tray. The content of a tray is specified by the hospital. Surgical instruments have a closed logistic chain between the OR-complex and the central sterile service department (CSSD), see Figure 1.

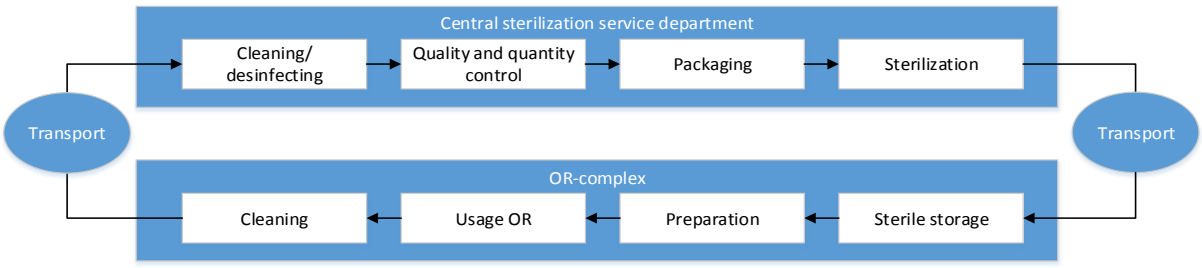

FIGURE 1: FLOW OF SURGICAL INSTRUMENT TRAYS

This research has focused on orthopaedics, a specialism that uses a large amount of instruments during surgery and frequently use loan instrument trays. By using this specialism a good overview of the general flow of surgical instrument trays could be made. The used method for this research to design a process flow with little resistance within RdGG and Combi-Ster is *Participatory Design (PD)*. By applying PD as a guideline a structured design and implementation process can be achieved that supports the communication and collaboration between users and designers (Pilemalm & Timpka, 2008) (Weng et al., 2007). Important aspects within PD are structured design iterations, containing the

steps *analyse, design, test, evaluate* and *decide* and the use of a multidisciplinary team. The users that were involved during this research are specialists, the OR, IT and planning departments of RdGG, and Combi-Ster.

The *analysis* phase contained a literature review and an analysis of the current process flow of surgical instruments at RdGG and Combi-Ster. The literature research to current used supply chain models has shown that just-in-time (JIT) is a very common method for demand driven processes, focussing on producing only what is needed with respect to the necessary quantity and time (Total Quality Management, 2008). There is elaborated on Vendor-Managed Inventory and Continuous Planning Forecasting and Replenishment, the two most recent types of supply chain models concerning inventory management. It became clear that a high level of trust, cooperation, smooth information exchange, and making service level agreements between supply chain partners are of high importance for the changes in the (delivery) process flow as is the case at RdGG and Combi-Ster.

The current process flow is analysed by means of a Healthcare Failure Mode and Effect Analysis (HFMEA). For this a multidisciplinary team of employees of the OR department, planning department, and Combi-Ster was formed. The HFMEA allowed us to analyse a current process with the corresponding failures. Figure 2 gives an overview of the main process steps with the corresponding process time and number of risks.

The *design* has been created together with the IT department and the same multidisciplinary team involved in the analysis phase. Based on design requirements retrieved from the literature review, outcomes of the analysis of the current process, and during the design phase itself a final design is made (Figure 2). The steps that changed most compared to the current process flow are given below, whereof step 5 is a completely new step.

- Step 1: Needs assessment
- Step 2: Ordering
- Step 5: Preparation at Combi-Ster
- Step 7: Preparation at OR-complex
- Step 11: Sending retour and invoicing

The future designed process flow is only possible if changes in the IT-system and workflow at RdGG and Combi-Ster are made. All defined system requirements are possible to implement. Thus, assuming the requirements for the designed process are met, the design has been *evaluated* and *tested* by the same multidisciplinary team during a second HFMEA with again failure modes and corresponding risks of the designed future process as outcome, which made it possible to compare the designed process to the current process. Concluded is that the designed process flow is more efficient and safer.

- The process time for loan trays is decreased with almost one hour. For normal trays there is no change.
- The designed process flow controls more risks compared to the current process by removing these risks by a step later in the process. The total number of high scoring risks is slightly decreased, but the sum of scores of the high classified risks is decreased with almost 20%.
- A shift in the categories of the risks between the current and future situation has occurred. There are almost no risks as regards to a lack of systematics and overview. An increase in the number of unintended human errors is found, but a larger number of these are being removed later in the process.

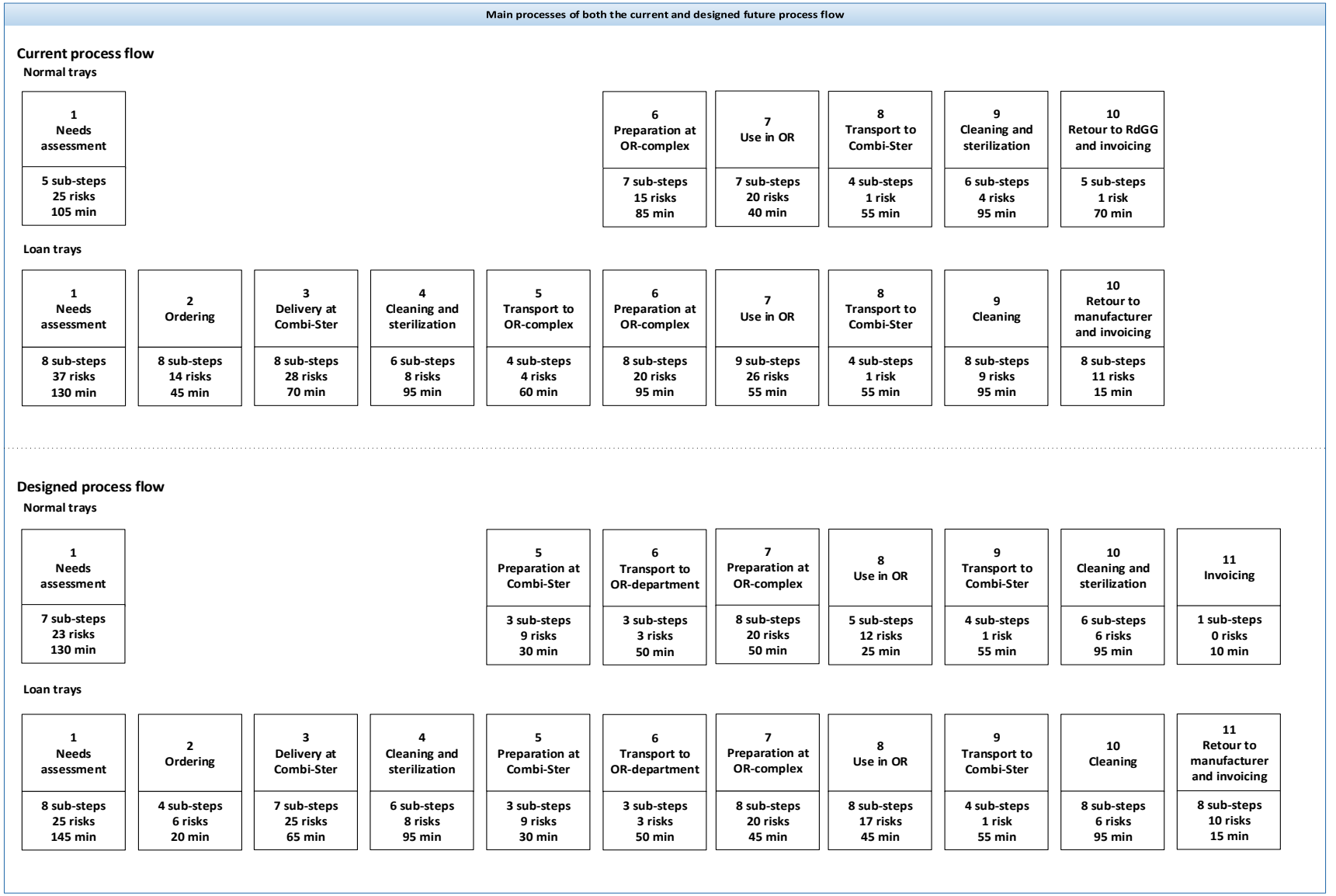

FIGURE 2: OVERVIEW OF MAIN STEPS OF THE CURRENT PROCESS FLOW AND THE DESIGNED FUTURE PROCESS FLOW

A *second iteration* of the PD is done at plastic surgery, which focused on the *evaluation* and *decision* phases. The designed process flow for orthopaedics was submitted to a specialist and field expert of this specialism to check if there are any changes needed for plastic surgery in the designed future process. As expected the design focused on orthopaedics includes all steps relevant for plastic surgery, but also contained irrelevant steps for this specialism like the flow for loan trays.

As final part of this research a preliminary implementation plan is proposed. A Supply Chain Collaboration Maturity Model (SCCMM) is made based on five maturity models found in literature to visualize the current and desired future situation. The levels of the current situation are filled in together with a team leader of the OR and manager of Combi-Ster. The future situation is based on discussed literature and the design phase. Concluded is that especially the level of trust of both companies in each other and the IT-systems must improve. An important aspect to reduce risks is the centralization of information by means of the IT-systems and make this information available for different parties in this process.

To know how the actors should be involved during this research a stakeholder engagement plan is executed. Based on a stakeholder engagement plan the key stakeholders are identified, which are Combi-Ster, the team leader OR, the OR assistants and the IT department of RdGG. These actors must be closely managed by means of a collaboration during the implementation phase. Based on the SCCMM analysis several tasks are identified that must be executed to reach the desired future situation. The preliminary implementation plan is divided in two phases. Phase I focuses on the situation from May 2015 until the rehousing in August 2015. Phase II focuses on the time starting in September 2015 until six months later, March 2016. The designed process flow can be fully implemented approximately six months after the rehousing. For the in-between time a provisional process is suggested. However, one should notice that the risks and time as proposed on the designed process flow are not applicable for this provisional process.

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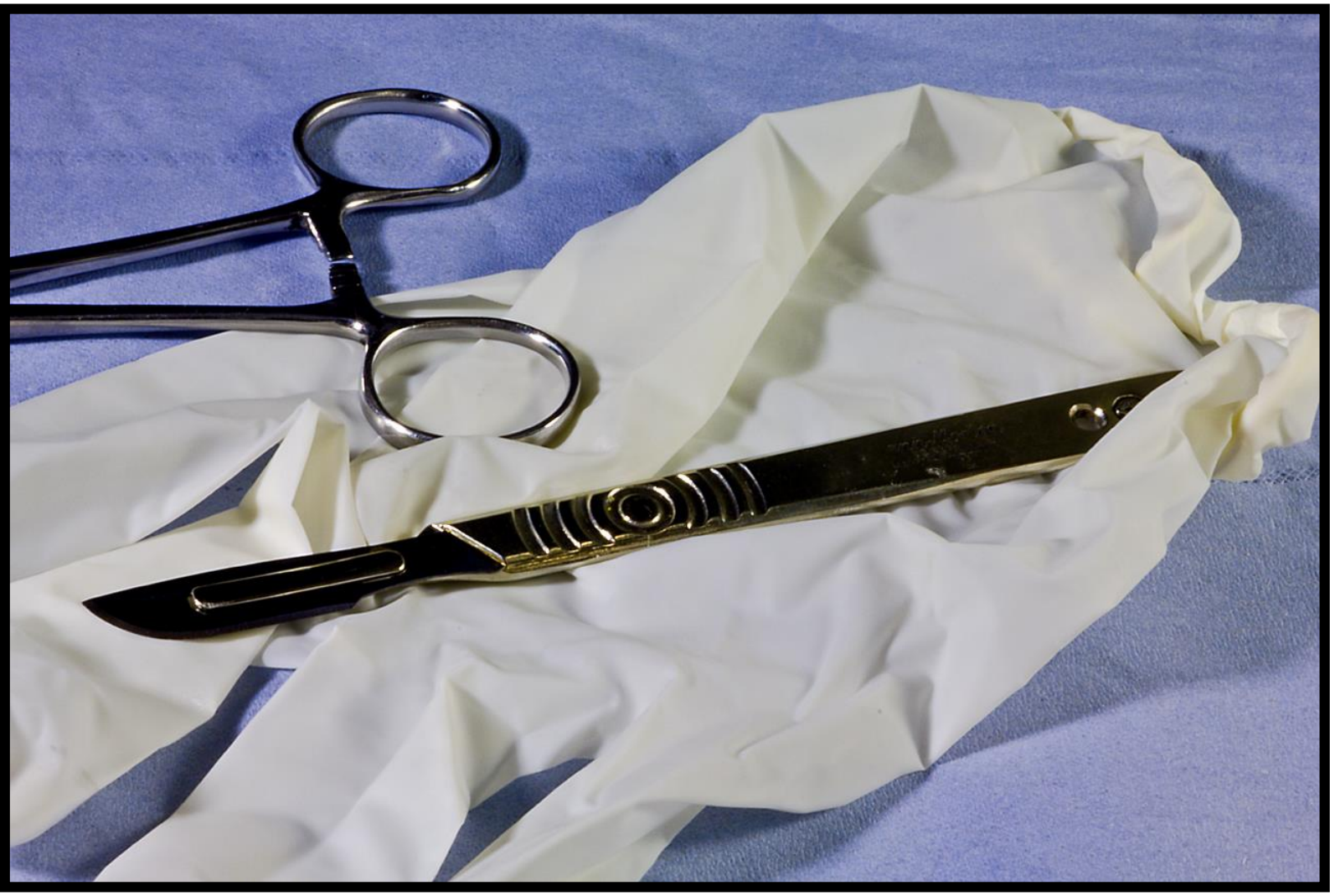


1 Introduction

In the past forty years the Dutch healthcare costs have increased every year, and a continuation of this trend is expected. Healthcare spending often grew faster compared to the national income measured in GDP leading to a bigger proportion of the Dutch income is being spend on healthcare. The majority of these costs are financed by taxes and contributions; in 2010 83% was financed by the government. The remaining part is paid by the users itself in the form of own risk, co-payments and supplementary insurances (CPB, 2011). Reasons for the increased costs are aging, higher expectations, more and better care, and better guidance (Rijksoverheid, n.d.) (CPB, 2011).

To make the Dutch healthcare sector more aware of the expenditures multiple developments have taken place such as the new healthcare system, revision of the healthcare legislation, market forces and new entrants (Goudswaard, 2006). Especially the introduction of market forces and competition have led that hospitals pay more attention to the quality of care by process improvements and managing the costs. Healthcare institutions realize that logistics can help to improve the quality of care and that good logistics management help to make the healthcare processes more efficient.

This research focuses on the process flow of surgical instrument trays. These are metal baskets containing a fixed set of surgical instruments that are used during surgery and cleaned afterwards. First background information of surgical instruments will be given, followed by the problem definition, the research objective and research questions. Finally, the scope of this research and an overview of the structure of this research are given in Section 1.4 and 1.5.

1.1 Background information on surgical instrument

Before introducing the problem an introduction to surgical instrument will be given in this section. A general overview of the logistics flow of surgical instruments will be given in Section 1.1.1 followed by the trends and developments of surgical instruments in Section 1.1.2.

Surgical instruments are specially designed tools or devices that are used to perform a surgery. Every instrument is designed to do a specific task, for example cutting, grasping, clamping together, dissecting, suturing, or ligating. Some instruments are designed for a specific procedure or surgery, while others are for general use. Separated packed instruments are called laminate (Figure 1.3), these are packed in a special plastic packaging. The majority of the surgical instruments used in the OR are included in trays, whereof the content is specified by the hospital (Figure 1.1 and Figure 1.2). There are three kinds of instrument trays. The first kind are the basic trays, these trays can be used for (almost) every specialism. Second, specialism shared trays which are more specific and can be used by a certain specialisms, for example orthopaedics and trauma surgery have some specialism shared trays. The last type of trays are specialism specific trays, these trays can only be used within one specific specialism.

Depending on the size of the hospital the number of owned trays can vary. Academic hospitals have approximately 5.200 trays whereof about 2.500 different kind of trays, top clinical hospitals have approximately 2.000 trays whereof 680 different trays, and general hospitals have on average 1.700 trays of which 500 are unique (Kroon, 2012).

FIGURE 1.1: INSTUMENT TRAY

FIGURE 1.2: INSTRUMENT TRAY

FIGURE 1.3: PACKED LAMINATE

1.1.1 Logistics of surgical instruments

Surgical instrument trays have a closed logistic chain, see Figure 1.4. The OR and the central sterile services department (CSSD) are alternately supplier and client. The OR uses sterile trays that are supplied by the CSSD, which makes the OR client of the CSSD, but at the same time the CSSD is a client of the OR. The CSSD receives the unsterile trays from the OR to process them to sterile instrument trays again. In most hospitals the CSSD is located within the hospital, mostly close to the OR-complex. Some hospitals are exploring the opportunities to outsourcing the CSSD (Goudswaard, 2006) (Raad voor de Volksgezondheid en Zorg, 2011). Although outsourcing of the CSSD in is not common yet The Netherlands, it is a growing trend (CSC, 2008) (SVGB, 2012). Outsourcing the CSSD can lead to higher quality and cost savings, but also to longer turnaround times since transport times most probably increase (de Geyter, 2009). Outsourcing can also mean that only manual labour is outsourced, but the place of cleaning and sterilization will remain within the hospital.

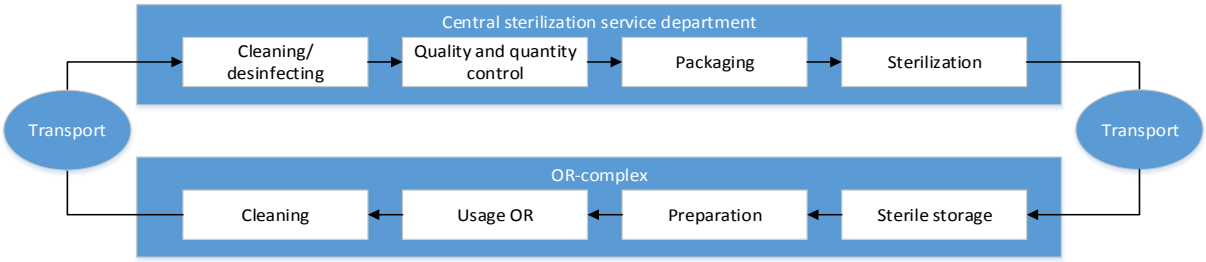


FIGURE 1.4: FLOW OF SURGICAL INSTRUMENT TRAYS

From the OR-complex the used trays are transported to the CSSD. This transport is done in a soiled cart used for soiled instruments. After cleaning and disinfecting the trays in the soiled area the trays will enter the clean area. After the trays are checked on quality and quantity they are packed in a special packaging (Figure 1.2) and sterilized in the autoclave with high pressure and temperatures. The sterilized trays are placed in a clean inner cart that is allowed to enter the OR-complex. For protection during the transport from the CSSD to the OR-complex the inner cart is placed in an outer cart, which is not allowed to enter the OR-complex.

The OR-complex has a sterile storage where the instrument trays are stored until usage. A day before surgery the required trays are taken out the storage and prepared. When during surgery an unforeseen tray is needed this can be taken from the sterile storage. After the surgery the trays are placed at the soiled corridor and placed in a soiled cart.

The healthcare industry mainly focuses on patient logistics, which leads that logistics of goods are neglected (Westerman et al., 2012). This can also be seen within scientific literature where little attention is paid to the optimization of the logistics of sterile items in hospitals (van de Klundert, Muls,

& Schadd, 2008) (Villareal, Bhamra, & Schönheit, 2014). Villareal, Bharma en Schönheit (2014) conclude that most research done on the healthcare supply chain mainly focuses on the internal patient flow in hospitals. The supply chain of medical technology, including surgical instruments, is being understudied and thus does not appear to be the focus of much research work (Villareal, Bhamra, & Schönheit, 2014).

1.1.2 Trends and developments concerning surgical instruments

The Dutch society is changing due to demographic, social-economic, and technological developments, which will lead to changes in the healthcare sector. The years that will be spend healthy increase less rapidly than the total life expectancy, leading to a big increase in the demand of healthcare. The demand of healthcare further increases since technological developments have led to better treatment options (Raad voor de Volksgezondheid en Zorg, 2011). These trends increase the demand of surgical instruments and appliances (CBI, 2009).

Surgeons have to work more often with complicated surgical instruments because the instruments becoming more advanced and fragile. Trends like minimally invasive surgery (MIS) contribute to the difficulty and complexity of surgeries (ILYA, 2012). The higher complexity and fragility of the surgical instruments leads to more labour-intensive processes at the CSSD. Developments of new cleaning and sterilization machines and techniques must be made to be able to process these instruments. Also the knowledge of employees needs to be updated constantly to provide the right treatments (CSC, 2008) (SVGB, 2012).

Unlike the US, most of the surgical instruments used in Europe are reusable, but the use of disposable instrument is growing because a larger range of instruments is provided and the price is decreasing. The consideration between disposable or reusable instruments mostly lies within costs and patient safety since disposable instruments are always sharp and clean but the costs are higher. Another important factor in the Netherlands is the preference of the specialist (Goudswaard, 2006). Next to these developments there is a growing use of loaning devices and instruments (Landelijke Vereniging van Operatieassistenten, 2012), and developments in the computerization and automation fields are taking place. The traceability of the surgical instruments is becoming more important (SVGB, 2012).

1.2 Problem statement

The hospital Reinier de Graaf Gasthuis (RdGG) in Delft currently exists out of two buildings (B- and H-building), but is going to move to one new building at the end of August 2015. The new building is one of the first hospital buildings that is designed and realized without any governmental intervention and (financial) support. To keep the construction costs within control the number of square meters is tried to be limited as much as possible, and the decision is made on forehand to outsource, digitalize, and reuse old real estate as offices for staff of services and management. This decision has among other things led to a decrease in storage space of the sterile instrument trays, which is located at the OR-complex. Currently the storage space for the trays at the OR-complex of the B- and H-building are respectively around 28.5 m^2 and 66 m^2 (including some storage of other articles), see Appendix D. Based on the STE (standard volume unit), 60x30x30 LxWxH, and the size of the cabinet the number of trays that can be stored is calculated. Around 400 trays can be stored in OR-B and around 450 trays in OR-H. However, the new building will only have 14 m^2 available, with a capacity of 270 trays, which means a shortage of 580 trays, thus only a small inventory can be kept in case of emergencies; the emergency inventory. Decided is to store the rest of the trays at Combi-Ster; an already used external sterilization company, located at a 10 minute drive by car (Google Maps, 2014). The instrument trays stored at Combi-Ster must be delivered shortly before needed at RdGG. The change in location of

storing the trays has several effects on the working- and logistical processes of the instrument trays leading to that more insight in these processes are needed.

1.3 Research objective and questions

This research will give more insight in the process flow of surgical instrument trays and will contribute to the literature known about the application of a demand driven delivery system for instrument trays, which is not (yet) a common phenomenon. The context of this study is taken into the fields of efficiency and safety that are connected to the process flow of instrument trays in combination with an outsourced storage facility. The following objective is pursued:

To design a process flow for the surgical instrument trays of Reinier de Graaf Gasthuis and Combi-Ster with the focus on safety and efficiency and to advice on its implementation, in order to handle the future situation.

When focusing on efficiency and safety, actually the opposite of these aspects will be investigated, thus the inefficiencies and insecurities of the process. An enhancement in safety will be seen as the decrease in number and rate of the effects of failures made during the process flow of the instrument trays. Efficiency improvement is seen as a decrease in the process time. In order to meet the objective several research questions are formed as stated below. Chapter 2 will go into the methods used to answer these questions.

1. *What are current used supply chain models concerning collaboration mechanisms for deliveries?*
2. *How does the current process flow concerning surgical instrument trays look like and what are the current problems, inefficiencies and risks?*
3. *How should the process flow of surgical instruments trays look like to minimize the problems and risks for the future situation?*
4. *How should the designed process flow be implemented?*

1.4 Scope

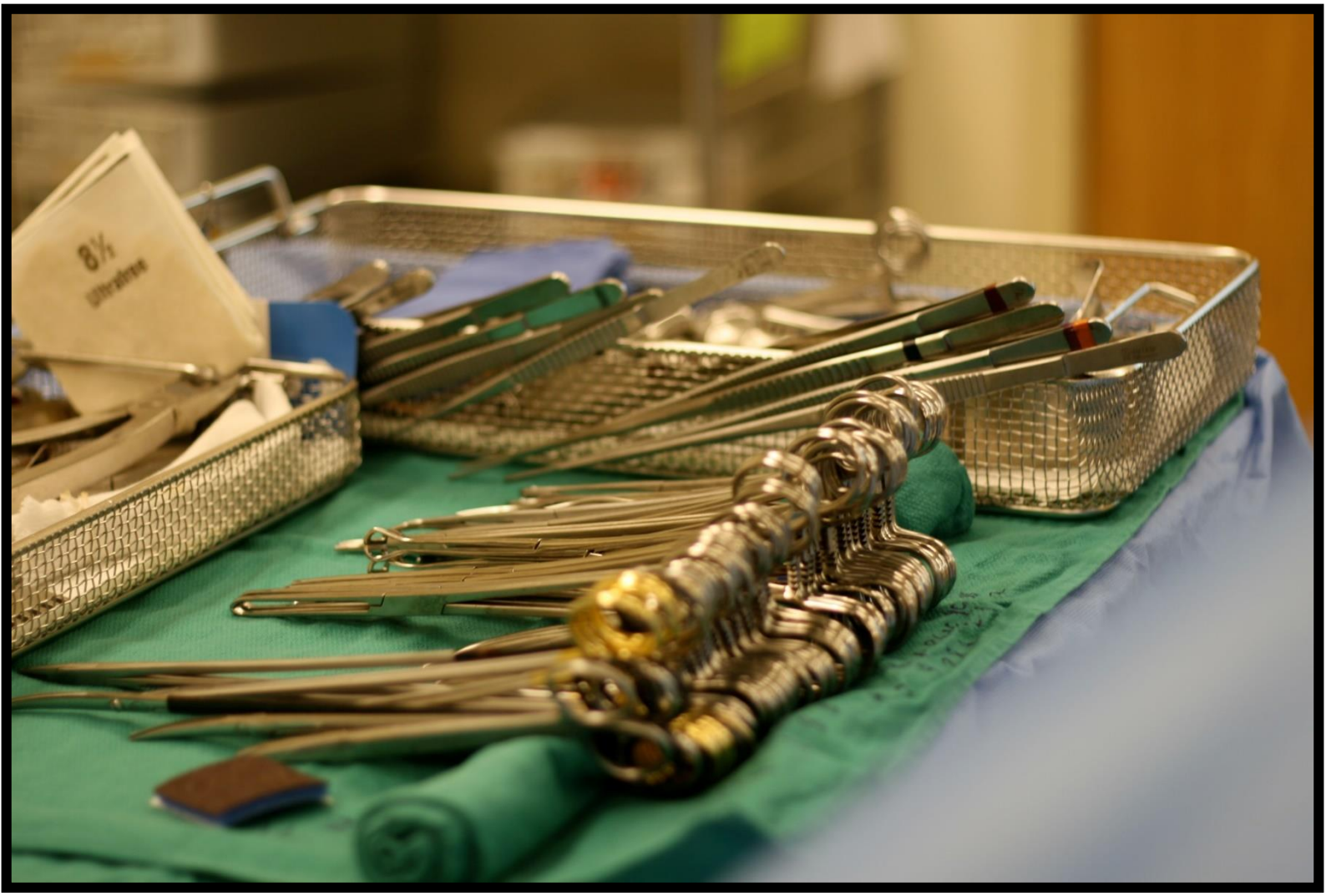
This research focuses on the process flow of the surgical instrument trays, and thus not in the loose instruments (laminate). This research will be a contribution to the limited (scientific) literature available on logistics of goods in hospitals by providing a report focussing on the process and handlings that must be done by staff members that are connected to the process flow surgical instrument trays. This research will focus on the specific situation at RdGG and Combi-Ster where the cleaning and sterilization of the instrument trays is outsourced to an external location.

The design and the layout of the new building is already decided upon and the choice has been made to store the sterile trays at Combi-Ster, thus there will not be looked at other possible storage places, for example within the new building. Also the content of the instrument trays and the inclusion of trays in the emergency storage will be out of scope since this requires specific knowledge about instruments needed at certain surgeries.

The focus of this research will be on orthopaedics, a specialism that uses a large amount of instruments during surgery and frequently use loan instrument trays. By using this specialism a good overview of the general flow of surgical instrument trays can be made. The users that were involved during this research are specialists, OR department, IT department, planning department, and Combi-Ster.

1.5 Thesis structure

The report is structured as follows. In Chapter 2 the methodology of this research will be discussed. Chapter 3 goes into the literature part of this research to investigate research already done on the type of field of this thesis. Aspects that will be looked into are just-in-time and collaborations mechanisms between supplier and customer. Research question one will be answered in this chapter. In Chapter 4 RdGG, Combi-Ster, and important employees will be shortly introduced followed by an analysis of the current process, answering research question two. After the analysis of the current situation the design for the future process will done in Chapter 5, providing an answer to research question three. In Chapter 6 the design will be tested and evaluated. A preliminary implementation plan is given in Chapter 7, answering the final research question. Based on all previous chapters the final conclusions and recommendations are given in Chapter 8. Chapter 9 concludes the discussion. Finally a reflection is given in Chapter 10.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2 Research methodology

This chapter discusses the methods chosen to answer the different research questions and finally the main research objective as presented in the Chapter 1. The changes in the process flow will have direct and indirect effects on the working process of the actors involved during this process. Usability is a critical success factor of an interactive system or product. Poorly designed and unusable systems are often under used, misused or even fall into disuse with frustrated users and high cost for the organization. Involving users in the design phase will help to create a useful design. User-centred design places the users at the centre of the design process, starting at the planning and designing of the system requirements until the implementation of the product (Endsley & Jones, 2011). However, in user-centred design the users are mainly used during the test phase. They have little or no control over the design process itself, and thus they are only involved as evaluators or testers for revealing shortcomings of the design at the end of the design process. It is the designers' task to translate and interpret these users' reactions, which sometimes can give inaccurate results. Contextual Design is used as an approach to collect data from users' own environment by observations. By one-on-one interviews a deeper understanding of the users' work practice can be conducted. It is the designers' task to use this data for the design phase. The users' role is thus critical but passive, their behaviour informs the process rather than their ideas. In Participatory Design the users are seen as the best qualified people to determine how to improve their work (Large & Nesset, 2009). Users are actively involved during the design process and the designers operate as facilitators. Their specific needs become clear and the design can directly take these into account (Baek, Cagiltay, Boling, & Frick, 2008). The process flow of surgical instrument trays is a complex process. For the implementation of the demand driven deliveries of the surgical instrument trays RdGG and Combi-Ster are already doing pilots per specialism. However, at the employees' resistance towards these pilots can be felt as processes are not going faultless. To come up with a designed process flow with little resistance within RdGG and Combi-Ster there is chosen for a design to actively involve the users during the design phase. This leads to the application of Participatory Design (PD) as application of PD in the healthcare is valuable and leads to a (cultural) change in thinking about the healthcare and the healthcare environment (Jaspers, Doting, Nauta, & Schaap, 2012). Below a broader explanation of PD is given.

By applying PD as a guideline a structured design and implementation process can be achieved. PD helps to support the communication and collaboration between users and designers (Pilemalm & Timpka, 2008) (Weng, McDonald, Sparks, McCoy, & Gennari, 2007), leading to a designed product or system that meets the users' specific needs by actively support participation and involvement of a multidisciplinary team into the design and decision-making process (Pilemalm & Timpka, 2008) (Namioka & Rao, 1996). PD provides a structure to define the objectives, vision and requirements of the innovation, based on gained insights in the users' workflow, users' interaction with other users and technology, and involves users in the design process (Guédon, et al., 2014). By applying PD a user oriented design will be achieved, improving actual usage, sustainability, and compliance, and reduced implementation resistance (Pilemalm & Timpka, 2008) (Weng et al., 2007). Important aspects within PD are structured design iterations, containing the steps *analyse, design, test, evaluate* and *decide* and the use of a multidisciplinary team. Two iterations were held during this research, one on the specialism orthopaedics, focusing on the analysis and design part, and the other one on plastic surgery, focusing on the evaluation of the design. One must not see PD as a strict process, but as a guide for the design and implementation process, leading to different structures per case (Guédon, et al., 2014). PD is an ongoing process, and thus will to continue even after this research for further developments and improvements.

The *analysis* step of the *first iteration* contains a literature review and the analysis of the current process flow of RdGG and Combi-Ster. A literature review will be done since it is important to investigate research already done on the type of field of the project, and provides an answer to the first research question "*What are current used supply chain models concerning collaboration mechanisms for deliveries?"*. Various search engines (Web of Knowledge, Scopus, Google Scholar, Google) with the following keywords were used to find related literature: "supply chain surgical instruments", "logistics surgical instruments", "JIT surgical instruments", "JIT sterile instruments", "JIT delivery hospital", "JIT application hospitals", "external sterile storage hospital", "VMI hospital", "CPFR hospital", including Dutch combinations. As already explained in the Chapter 1 little research has been done to goods logistics within hospitals (van de Klundert, Muls, & Schadd, 2008) (Villareal, Bhamra, & Schönheit, 2014). This also made it important to first analyse the current state. Surgical instrument trays have a complex process flow that is not optimally designed. To determine the current process, insights from the practical field will be used. For this a multidisciplinary team of employees from the OR department, planning department, and the manager and team leaders of Combi-Ster is formed. The team will analyse the current process to be able to benchmark the designed process. Insights will be gather by using the Healthcare Failure Modes and Effects Analysis (HFMEA) as described by the VMS praktijkgids (VMS Veiligheidsprogramma, 2012). This analysis focuses on reducing the chances of unwilling effects (Bagian, Gosbee, Lee, Williams, McKnight, & Mannos, 2002). The HFMEA allows us to analyse a current process with the corresponding failures, giving an answer to research question 2 "*How does the current process flow concerning surgical instrument trays look like and what are the current problems, inefficiencies and risks?".* Next to the HFMEA sessions, interviews with involved stakeholders will be held in order to sharpen the current process flow.

Some other methods that could have been used for collecting the information of the current process flow are the Bow-Tie model or the Swiss Cheese model. The Bow-Tie model allows to systematically and efficiently get a complete picture of the risks, preventive measures and improvements for the process (Wierenga & Lien-A-Huen, Bow-tie model: instrument for risks analysis, 2007). The model makes a distinction between preventive and recovery measures (Wierenga, Lie-A-Huen, Voskuilen, & Jurriëns, 2006), though this model gives little possibilities to get a detailed picture of sub-processes. The Swiss Cheese model (Reason, 2000) can be described as a number of barriers between hazards and unwanted outcomes. This model allows an analysis of failures as an outcome of a set of possible casual elements. Both the Bow-Tie model and the Swiss Cheese model already assume that the risks and effects are known. These models mainly focus on defining improvements, where the HFMEA can also be used to identify risks. Outcome of the HFMEA will be an overview of the current process flow of the surgical instruments and a classification of the risks per process step. Since not all causes are known within the current process of the instrument trays the HFMEA would be better to apply. Besides, this research is part of a larger PhD study of Annetje Guédon at the section of Biomechanical Engineering of the TU Delft, focusing on the application of technology in the operation complex to improve patient safety. For this research a HFMEA was already performed at another hospital. By also applying the HFMEA at RdGG and Combi-Ster the retrieved information from these analyses would also be more consistent. A prospective HFMEA will be applied on the proposed design, to be able to compare the current and future situation and see if improvements in the process are made. One must know that this report is a research on itself, though it is partially part of the study of Annetje Guédon. As before this research the HFMEA team was already formed and sessions were already planned. Without this already started-up by Annetje Guédon this research would not have been possible. The analysis of the current process flow and the design phase were in collaboration with Annetje Guédon. The processing of the information and concluding the retrieved findings from these meetings were

only done for this thesis, just as the part of making and elaborating ideas on how to use this retrieved information.

In the *design* phase the third research question will be answered "*How should the process flow of surgical instruments trays look like to minimize the problems and risks for the future situation?".* As described before, PD requires an active approach from the users during the design process. Two ways to engage the team is by organising design sessions or having separate interviews with the members. Because design sessions are very time consuming, especially for the team members, there is decided to have separate interviews to design the process flow. Interviews can be structured, unstructured, or semi-structured. At a structured interview the interviewer has prepared questions that must be answered and the interview gets a more formal structure. During unstructured interviews the researcher only needs a checklist of topics to be covered and there will be no order or script for the interview. The interaction during this interview is more like a conversation than an interview. Semi-structured interviews are between structured and unstructured interviews and allow the interviewee to introduce new ideas. This results in an open conversation where feedback on the process will be given and indistinctness could be clarified. However, on forehand will be decided which steps to discuss. To be able to guide the interviews and focus on the right process steps, but still hold on to the PD where users participate during the design process there is chosen for semi-structured interviews. Together with staff of RdGG and Combi-Ster the design will be made and feedback will be given on the design, resulting in an iterative process of designing the future process flow and checking the process with staff. Next to these interviews also other meetings will be attended and used as input for the design process.

To be able to compare the designed process flow with the current process flow a second HFMEA will be done to *test* and *evaluate* the design. The same multidisciplinary team will be used to define the failure modes and corresponding risks of the designed future process. This is the first time that the group will come together since the design has been made and minor adjustments will be made to fine-tune the designed process.

Since the future design process is focused on orthopaedics but must also be used for other specialities, a *second iteration* of the Participatory Design will be performed at plastic surgery, a specialism that uses less types of trays. This iteration mainly focused on the steps *evaluate* and *decide*. A specialist and field expert will be asked if there are any differences in the designed future process flow.

RdGG and Combi-Ster both need to adapt their workflow to be able to handle the future situation. Therefore the last step in this research will be to propose a preliminary implementation plan as *decision phase*, giving an answer to the final research question "*How should the designed process flow be implemented?*". To be able to make a preliminary implementation plan, the changes that must be made must be identified. An approach to do this is by quantifying the current and desired future status on different criteria of RdGG and Combi-Ster. By scoring each criteria on a predefined scale it becomes clear which aspects are insufficiently developed, which makes it easier to get an overview of the improvements that must be made. A maturity model is able to give a clear overview of the differences between the current and desired level on stated criteria. This model is designed to assess the maturity (i.e. capability, level of sophistication, competency) focused on a selected domain based on a (comprehensive) set of criteria (de Bruin, Rosemann, Freeze, & Kulkarni, 2005). There are three different types of models: descriptive, prescriptive, and comparative. Descriptive models are good for assessing the current situation. They must be seen as single point encounters with no intention to improve the maturity or links to performances. Prescriptive models are good for both assessing the current situation, but also emphasise the relationship to the performances. This model indicates how to improve the maturity. Comparative models are used for benchmarking across industries and regions

(de Bruin, Rosemann, Freeze, & Kulkarni, 2005). For the case of RdGG and Combi-Ster it is desired to get a visualization of the current situation and the desired future situation based on the design and to come up with the required actions that must be done for the implementation of the designed process flow. Therefore there is chosen for a prescriptive model. Since no model was found that fit this case, a Supply Chain Collaboration Maturity Model will be introduced to define the changes needed to achieve the desired future state. This model is based on several models found in literature that are combined and adjusted for this specific case of RdGG and Combi-Ster.

A clear implementation strategy helps planners and decision makers to gain a clear picture of the requirements for implementation and helps them to develop action plans that will raise stakeholder interests (Bryson, 2004). During the analysis and design phases the users were already involved. However, during the implementation phase it is still important to also focus directly on the stakeholders as they still can influence the project (Goggin, Bowman, Lester, & O'Toole, 1990) (Nutt, 2002). This will be done by means of a stakeholder engagement plan. During the analysis and design phase most stakeholders were already introduced and involved in the research. However, when implementing the design it must be clear how each stakeholder must be involved and informed during this phase. Stakeholder analysis is a crucial aspect for problem solving, as some stakeholders can have high power on a project (Bryson, 2004). Analyzing the priority and level of attention of the stakeholders will help to select the proper communication approach for each stakeholder. Different literature based models exists for mapping stakeholders. Among the commonest models of stakeholder mapping are the Power-Dynamism matrix, the Power-Interest Grid and the power, legitimacy and urgency model (Adeyanju, 2013). The power-dynamism model categorizes stakeholders based on the power they exact and the vitality of their attitude. However, the model is mostly used during the development of new strategies. The power, legitimacy and urgency model, also known as the salience model, maps stakeholders' behavior into 7 types, depending on the combination of three characteristics. The stakeholders' power to influence the organization. Legitimacy of the relationship and actions of the stakeholder in terms of desirability or appropriateness. The urgency of the stakeholders' expectations in terms of criticality and time-sensitive (Mitchell, Agle, & Wood, 1997). However, the urgency of the implementation of the project is for all stakeholders the same, as the rehousing to the new building is set on the end of August 2015 and thus does not add a contribution. The power-interest grid determines which stakeholders should be taken into account for a certain (changed) situation (van Ham, 2012). This framework gives a clear visualization of which stakeholders are the key players, context setters, subjects and crowd. This model can be used to point out what type of engagement the organization should have with each of the groups. Therefore the power-interest grid is the chosen model to map the stakeholders. With use of this power-interest grid the engagement style is identified based on the five levels as proposed by IAP2 (IAP2, 2015).

Based on the actions that needs to be done a preliminary planning will be proposed. For project implementations different planning tools can be used like the Critical Path Analysis or Gantt Chart. Since this research will propose a preliminary planning including a planning on a high level and will not include specific tasks, making it hard to find the critical path. Besides, when projects become more complex and larger with more activities it becomes more complicated to find the critical path since all aspects of the project and their time frames and interdependences needed to be identified (Choreotools, 2012). Therefore there is chosen for a Gantt Chart. A Gantt Chart makes it possible to make a clear planning for a project, based on identifying actions and indicating the reserved time and responsible person(s).

PD is an ongoing process, this leads to that after the implementation plan in Chapter 7 changes can still be made in the design. This is also the case in this research since during the implementation phase

it became clear that the rehousing is too close by for all implementations that needs to be done. Therefore a provisional process flow is made for the between time. However, this provisional process flow has not been tested or evaluated. Also after this research this process must be continued, for example after the implementation inefficiencies and/or illogical processes must be changed to further improve the designed process. Figure 2.1 gives a visual representation of this research with the phases of the PD and the corresponding chapters and used methods.

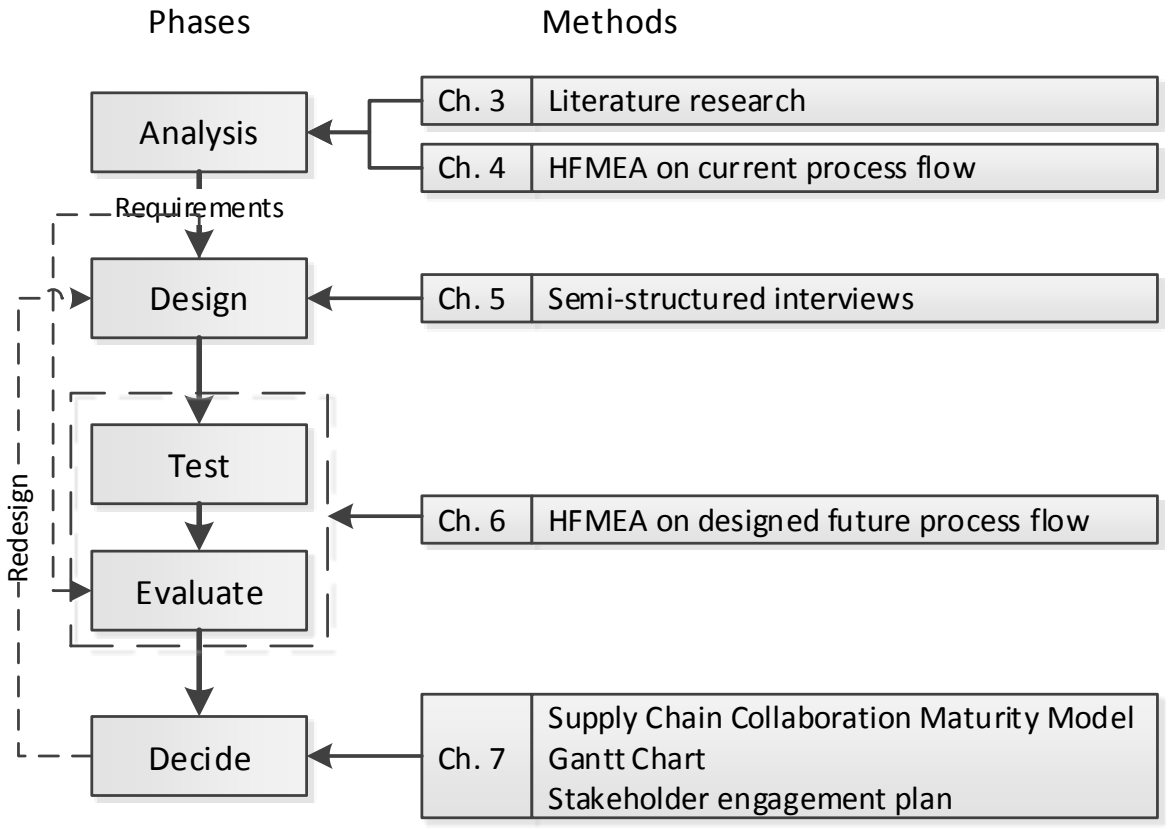
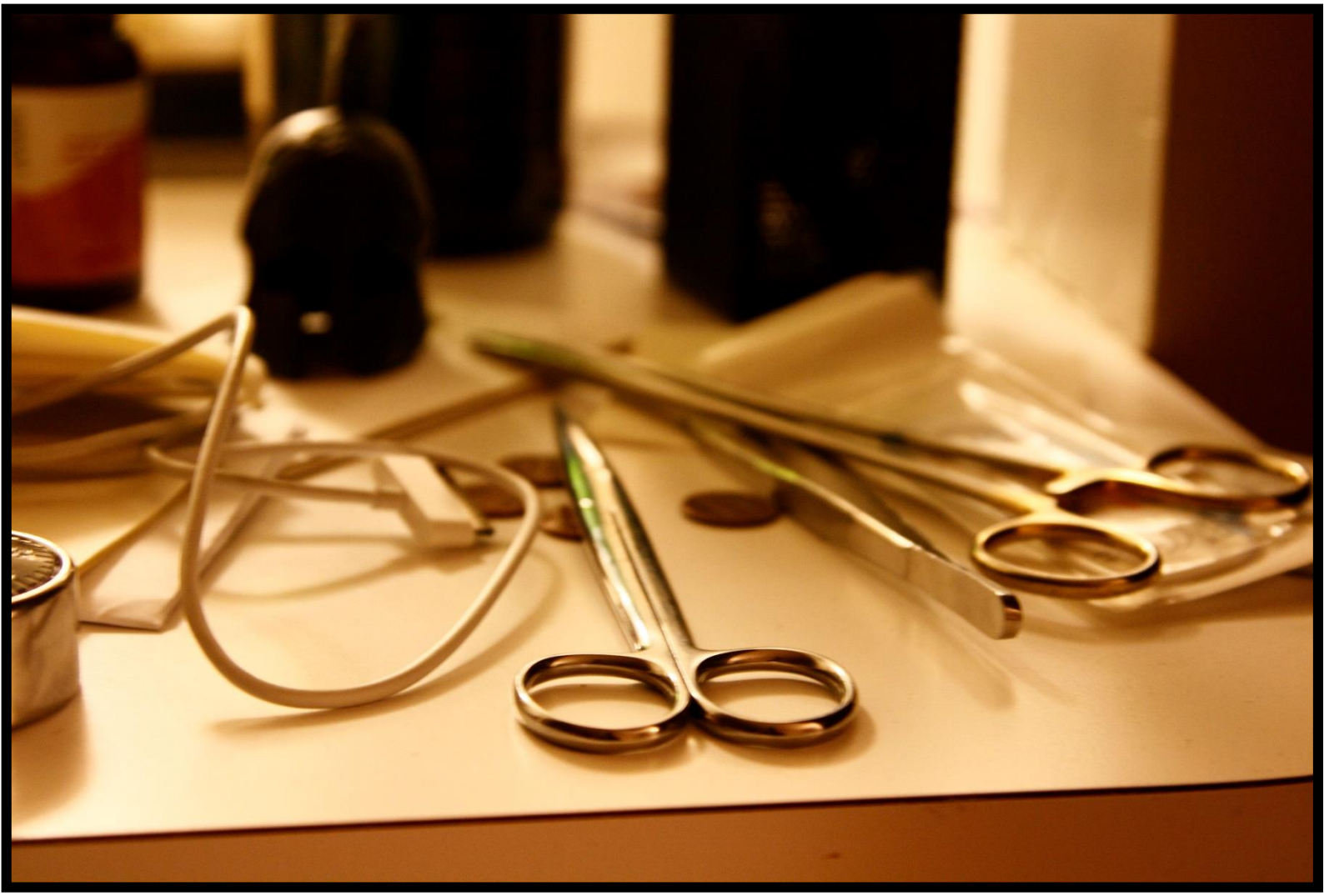


FIGURE 2.1: VISUAL REPRESENTATION OF THE RESEARCH STRUCTURE



3 Existing applications for outsourcing of inventories in hospitals

This chapter is part of the *analysis* phase of the PD and will answer research question one "*What are current used supply chain models concerning collaboration mechanisms for deliveries?".* When Combi-Ster is going to store the sterile trays, the deliveries must be demand driven. This new delivery process of Combi-Ster can be compared to a just-in-time (JIT) delivery process. Although, the motivation of RdGG to get the trays delivered based on the demand is not completely in line with reasons to apply JIT mechanisms.

Section 3.1 will elaborate on the background of JIT and the application of this method in hospitals. Furthermore a literature research to VMI and CPFR, the two most recent types of supply chain models concerning inventory management, will be done in Section 3.2. The chapter will end with a conclusion in Section 3.3, discussing the important aspects found in literature.

3.1 Just-in-time

JIT is a common used method for inventory control, especially in the manufacturing industry. The goal is to have an optimal alignment between the logistical flows and the production process to minimise the company's internal inventories. When JIT is implemented correctly, it focuses on continuous improvements, which leads to an improvement of the company's return on investment, quality, and efficiency (Boundless, n.d.). This section will give some information of the origin of JIT and the application of JIT in hospitals.

3.1.1 Background information of JIT

The premise of JIT is developed and formalized into a management system by Toyota Motor Company of Japan in the early 1980's. The Toyota Production System (TPS) applies "Lean Manufacturing". Lean manufacturing focuses on creating more value for customers while minimizing waste. A key element of lean manufacturing is JIT, which focuses on producing only what is needed with respect to the necessary quantity and time. The concept is based on eliminating inventories or safety stocks during production (Total Quality Management, 2008). To achieve this, a pull-system is required. This means that consumers "pull" the goods or information they need. This is the opposite of a push-system. Here suppliers "push" their goods or information to the consumers. Push-systems are based on forecasting demand, while pull-systems are based on the actual or consumed demand. Flow oriented producing is essential for JIT, which leads to the real bottlenecks in the production will become visible (Benders & Santbergen, 2007).

Since the application of JIT by Toyota, other industries in the world also started applying JIT concepts. Today it is a common used method to reduce or eliminate all kinds of waist, including inventories. In particular the car and aircraft industry are widely known for its use of JIT management. Because JIT focuses on the process itself and not on the product applications in other industries are also possible (Inman & Mehra, 1991) (Yasin, Wafa, & Small, 2003). There is a growing acceptance of JIT in different countries and industries (Gupta, 2012). The idea in the JIT philosophy includes many different disciplines like statistics, industrial engineering, production management and behavioural science. The inventory is seen to hide problems within the production system. By getting rid of the inventory the actual problems become visible (UTS, 2010).

3.1.2 JIT in hospitals

The healthcare sector is being more aware regarding its expenses and thus cost control is an important issue for the this industry. Examples of an improved supply chain by implementing JIT systems can help with this (Gupta, 2012). Hospital operations have the potential to significantly improve by applying JIT concepts (Whitson, 1997). By reducing non-value added activities more time will remain to spend on

value added activities, which leads to higher services for patients and better operating margins. Whitson (1997) suggests to apply the JIT elements in the material management of the hospital to reduce inventories, reduction of paperwork in documentation related processes of physicians and the application of flexible workforce in nursing areas.

From the materials manager's point of view of a hospital the medical supplies to the patient must be available when needed. This leads to large inventories to ensure the supply, but simultaneously also to needless financing, handling and opportunity costs (Berling jr. & Geppi, 1989). Hans Westerveld, senior advisor at Twynstra Gudde, advises to minimalize the inventories in hospitals and the number of intermediate storages. This leads to an important role for the JIT concept. It will be most efficient to have one central point where goods will be collected from among others the CSSD and the storage that facilitates the disposable products. From this central point the ORs will be supplied by program cars containing instruments, disposables, medicines, implants, suture materials et cetera. According to Westerveld, the logistics of soiled materials needs more attention. Currently the ratio of attention is unbalanced between clean and soiled goods (Sibma, 2013).

Benders and Santbergen (2007) write about the outcomes of an unpublished research done in 2005 that investigates the application of lean in Dutch hospitals. During this research only four hospitals in The Netherlands were found that applied lean in 2005. These lean projects were on small scale and mid 2005 they were still in the early stages. Substantively, three aspects were distinguished; lead time reduction, relationship with the supplier, and continue improvements. Most of the lean projects were focused on patient care, the primary process of hospitals. The four hospitals mostly focus on reducing the throughput times by among other things eliminating superfluous steps and optimizing processes. Only one hospital applied lean production on the flow of goods by reducing the number of suppliers and improving supplier relationships in order to reduce inventory levels and generate economies of scale. The hospitals researched paid attention to continuous improvements, improving current processes and creating a mind-set to continuously search for improvements. As said before, JIT is a key element within lean thinking. However, only one of the four hospitals found applied JIT. Benders and Santbergen (2007) emphasize that these findings are a snapshot since at the end of the research done more progress has been made and more lean-projects were started in other hospitals as well (Benders & Santbergen, 2007).

Berling and Geppi (1989) write about introducing a stockless program to reduce inventories in hospitals. This requires a high degree of trust and cooperation between the hospital and the distributor, which leads to an intensive relationship. A smooth information flow is essential to maintain this strong relationship. To minimize delivery lead times, an accurate and fast information exchange is vital. Berling and Geppi (1989) see the distributor as an extension of the hospital's materials management department, while a small in-house inventory for emergencies must be kept at the hospital. The distributor does not only store the goods of the hospital, but also takes care of the "pick-and-pack" operations of central supply. According to Berling and Geppi (1989) stockless programs are in theory the ultimate method to reduce the total inventory, but in practice different institutions will reach different inventory levels due to differences factors like preferences for individual products, proximity to supplier, the desired inventory level for emergencies, confidence in service levels, the level of trust between the hospital and the distributor, and management's incentive to reduce costs (Berling jr. & Geppi, 1989).

The Medisch Centrum Alkmaar is an example of a hospital that introduced a stockless program and has outsourced a part of its logistics. A commercial service provider, Sterima-Vanguard BV, is responsible for the supply of goods to the fourteen ORs of the hospital. Sterima-Vanguard BV provides several services including the cleaning and sterilization process of the surgical instruments and the

composition of procedure based trolleys, which contains sterilized instrument trays and sterile disposables. The deliveries are based on a JIT principle. Planned surgeries will be served based on an order and Sterima-Vanguard BV ensures that the requested materials will be delivered at the right date and time. For every surgery a "ready-to-go" package is provided containing all necessary equipment for the surgery. To save time and preparation for the surgery, the packages are provided on sequence of the surgical-protocol (Kramer, 2014). The Medisch Centrum Alkmaar and Sterima-Vanguard BV use one common system. Based on this system there will be communicated for things like ordering. According to Sterima-Vanguard BV is the use of one common system of high importance for the processes and communication (Kramer, 2014).

3.2 Supply Chain collaboration models

In the future situation of RdGG and Combi-Ster the deliveries of the trays will be based on the scheduled OR-program. To handle this type of deliveries a good collaboration and information sharing between RdGG and Combi-Ster must take place, thus a more integrated supply chain is needed. There are several strategies where collaboration between the supplier and customer is of high importance. Over time several types of strategic alliances or partnerships have evolved. This section will look at the two most recent types of supply chain models concerning inventory management, VMI and CPFR.

3.2.1 Vendor-Managed Inventory

Vendor-managed inventory (VMI) is one of the most widely discussed partnership initiatives for supply chain efficiency. It was popularized by Wal-Mart and Procter & Gamble in the late 1980's. Because of its great success in the wholesale industry other industries also implemented this business model (Waller, Johnson, & Davis, 1999). VMI is a process where the supplier is given the authority and responsible to manage the customers' inventory by inventory replenishment decisions. Thus the customer does not have to generate orders anymore, but has given the supplier this responsibility. To be able to do this the supplier uses shared information from the customer like sales and current inventory levels. The supplier is responsible for placing the orders for the customer based on mutually agreements made. These agreements include information like inventory levels, delivery terms, transaction costs, and the information that the customer has to share. The customer sends based on a prearranged schedule, mostly on daily basis, the sales information to the supplier. The sharing of information is often done based on Electronic Data Interchange (EDI). The supplier keeps track of the inventory levels of the customer to be sure that the customer always has enough supplies (Hall, 2001). VMI is often extended with consignment, this means that the delivered products will not be paid by the customer until they are actually used or sold. This is mostly done with fast turnover products since otherwise the producer can get financial problems when the products need to cover a long period (Williams, n.d.).

In a typical VMI agreement the sales forecast or future demand requirements of the customer are rarely shared and the customer is not involved in any decision making activities like demand forecasting, replenishment planning etc., but is only responsible for sharing accurate and timely sales and inventory levels. Because the supplier does not have the fully visibility of their customers' demand, inefficiencies in production planning and inventory management can occur (Kamalapurkar, 2011).

3.2.2 Collaborative Planning Forecasting and Replenishment

It can be critical for both the customer and supplier to have insights in the future demand requirements, especially in a market with a variable demand environment that deals with production capacity constraints. For fully demand visibility it is thus important that the customer shares its demand forecast and is involved in decision making activities (Kamalapurkar, 2011). Collaborative Planning Forecasting and Replenishment (CPFR) is developed as a response to the shortcoming of VMI.

It is introduced by Wal-Mart during the 1990's and is considered as the latest strategy in the evolution of supply chain collaboration. Where VMI only considers inventory replenishment activities, is CPFR a comprehensive collaboration strategy that provides opportunities to involve both supplier and customer in the demand forecasting and inventory replenishment planning activities. The whole supply chain works together to decrease costs and increase revenues and customer satisfaction (Larsen, Thernøe, & Andresen, 2003). Both the supplier and customer make a sales forecast. Based on a comparison of these two forecast one general forecast will be made. This forecast will be compared to the real sales afterwards to check on differences and find out the causes of these differences. This is done to learn and improve future forecasts (Katz & Hannah, 2000). Based on the sales forecast a planning will be made. Again both the supplier and customer make an individual planning that will be compared and adapted to one general order planning. If the real sales are comparable to the planning, an automatic order will be created as agreed upon in the ordering planning. In case of significant changes in the sales and forecasted planning the automatic order will not be placed and the order planning can be changed for once (Schachtman, 2000). Thus at CPFR the supply chain works together in making one general planning, sales forecasts, and order planning that will be used by everybody.

The collaborative planning within CPFR is based on a strategic level. A business plan is made to record the goal and time of the collaboration. The collaborative forecasting is on a tactical level. Partners bundle their knowledge to make one prediction of the sales and orders on short till medium term. Collaborative supplying is on operational level, here the actual deliveries are done with the order plan as starting point (Involvation, 2002).

3.2.3 Comparison of VMI and CPFR

By aligning the decisions of the different supply chain partners to each other the supply chain can be improved by among other things eliminating double and superfluous processes. An important aspect here is the balance of powers in the chain. Determining the decision making responsibilities of each partner is one of the first steps. The division of these decision making responsibilities depends on the degree of (in)dependency between partners (Involvation, 2002).

- Information sharing - this can lead to cost savings and an improvement of the reliability and reactivity of the supply chain.
- Redistribution of decision responsibilities - one of the parties becomes responsible for determining the order quantities. This task might include the carrying risk for shortages and surpluses. The other company provides information to execute this task. VMI is part of this category.
- Central optimization - one decision-making body is responsible for the supply chain decisions. This mostly happens during vertical integration or a concentrated position of power. Next to the collective responsibilities, decentralized decisions can be made (within preconditioned context). CPFR can be applied as a solution to prevent that one party does not get all the power.

When comparing VMI and CPFR based on responsiveness to replenishment some differences can be found. As explained, within CPFR a general order plan is made, which is leading for the order placements. The joint consultations leads to better forecasts, but also to less flexibility. The order plan must be adjusted in case of significant changes with the real sales, which is time consuming and leads to low responsiveness. On forehand a plan can be made for how to react in certain situations to increase the responsiveness to the market. VMI is more flexible. The supplier places the order for the customer. Decisions for changes can be made by one party since no consultation is needed, which leads to faster responses (Involvation, 2002).

Also in the (collaborative) planning there are different outcomes. VMI does not work with a joint planning, but only considers the sharing of information. In theory CPFR is a step ahead of VMI, both parties process all information to come up with one joint business plan (De Vos, 2002). However, in practice VMI also can apply a joint planning, but this is not common (Involvation, 2002).

When considering forecasting CPFR is performing better, especially in joint forecasts. By making a forecast based on the medium term, improvements in the logistics can be made. Within VMI every party makes their own forecast that will not be shared with others (Involvation, 2002).

3.2.4 Application of VMI and CPFR within hospitals

Applications of collaboration strategies like VMI and CPFR in the healthcare sector are not one-to-one comparable with other sectors like manufacturing and retail. Healthcare supply chains are much more complex compared to other industries, which is the main reason for difficulties in implementing effective supply chain management practices (Scheller & Smeltzer, 2006) (Shah, 2004). The healthcare sector faces different inventory related problems because the responsibility of replenishment is far more critical in this sector. A stock-out in pharmaceutical products or instruments has far more consequences and is not comparable to a stock-out in for example a retail store. In addition, other general difficulties in the application might be unwillingness among other things due to privacy issues or incapability of sharing information. Also a lack of trust and the conservative culture is an additional constraint factor for the implementation of collaboration (Danese, 2006). This adds extra complexity in the implementation and make the realization of the benefits a demanding and difficult task (Matopoulos & Michailidou, 2013).

Outsourcing the supply of materials can have advantages for hospitals, but it is important to have a limited number of suppliers. Outsourcing can lead to costs- and time efficiency for the internal hospital organization. Also the hospital saves storage room since fewer goods needed to be stored within the hospital. A risk of outsourcing (a part of) the logistics is the higher influence of externalities, which can lead to delayed deliveries (Ministerie van Verkeer en Waterstaat and Rijkswaterstaat, 2004). To reduce this risk it is it is important to find a service provider that is closely located to the hospital. Agreements must be made between the hospital and service provider to reduce the risks and maintain the service levels.

Claasen et al. (2008) shows that in general better results will be achieved when purchasing managers invest in the relationship with the supplier and have a good IT infrastructure. Most managers expect benefits like major cost reductions when implementing a collaboration strategy like VMI, but these expectations are often wrong. Benefits can be expected from improved service levels, improved supply chain control, and some cost reductions (Claassen, van Weele, & van Raaij, 2008). Matopoulos and Michailidou (2013) show in their case study to hospital vendor collaborative practices that for the hospital specific and measurable cost reductions are achieved next to other improvements such as better inventory control. According to them limited research is available of the implementation of VMI in the healthcare sector, particularly for its adoptions (Matopoulos & Michailidou, 2013). This is confirmed by Bhakoo, Singh and Sohal (2012), they state that the application of VMI systems within the healthcare sector is largely ignored in literature.

Oliveira and Nightingale (2007) investigated the relationship of two hospitals in the US with a vendor. This research showed significant improvements in areas such as product availability, visibility of data, and reduction of inventory management labour. Collaborative arrangements within the supply chain partners and their respective perceived benefits can vary significantly due to several conditional factors like product characteristics, spatial complexity, regulations, conformity of goals, and the level of trust between organization and physical attributes (e.g. size of hospital, storage capacity, level of IT

adoption), which makes it difficult to learn from each other and to make a comparison based on performances (Bhakoo, Singh, & Sohal, 2012).

3.3 Conclusion of literature research

This chapter contained a literature research on JIT and supply chain models for a pull delivery system. The following research question is answered in this chapter "*What are current used supply chain models concerning collaboration mechanisms for deliveries?".*

The process of the deliveries of the sterile trays from Combi-Ster to RdGG has to change from a push to pull, also known as JIT. However, Combi-Ster cannot produce only based on a pull basis, since they also need to supply for emergency surgeries. Working based on a priority list can be a good solution. When applying JIT changes will occur in the performances of the parties, efficiency will increase, inventory levels will decrease, and the real problems will become visible (UTS, 2010), this makes it possible to increase the safety (and efficiency) of the process. Besides, the numbers of deliveries will mostly increase since there will be no deliveries in large proportions, but only what is needed on that moment. Thus when applying a pull based delivery between RdGG and Combi-Ster changes in the performances are expected.

Based on the literature of JIT, VMI, and CPFR concluded is that the following points are of high importance:

- A high level of trust between the supply chain partners
- A high level of cooperation between the supply chain partners
- A smooth information exchange between the supply chain partners
- Service level agreements must be made between the supply chain partners

The models and applications found in literature are more focused on the manufacturing and retail industry. However, a hospital is different than these industries since safety has the highest importance. The application of JIT and supply chain collaboration models like VMI and CPFR within hospitals is mostly discussed on disposable products, which is a big difference compared to the closed loop system of the instrument trays. For this reason it is important to analyse the current process flow of the instrument trays as well as it is a very complex process. The next chapter will analyse the current process flow of the instrument trays within RdGG and Combi-Ster.

4 Analysis of the current process flow of surgical instrument trays

In this chapter an analysis of the current situation will be done, providing an answer to research question three "*How does the current process flow concerning surgical instrument trays look like and what are the current problems, inefficiencies and risks?"*. This is still the *analysis* phase of the PD.

It is important to have a clear vision of the current processes and occurring problems since this is not clear yet within RdGG and Combi-Ster. The process flow of the instrument trays is very large, which makes it complex. This chapter will start with some background information of RdGG and Combi-Ster in Section 4.1 and 4.2, followed by an introduction of the involved actors in Section 4.3. In Section 4.4 the setup of the analysis of the current process flow will be described followed by the outcome of the analysis in Section 4.5.

4.1 Reinier de Graaf Gasthuis

RdGG is part of the Reinier de Graaf Groep, a partnership between various healthcare providers in the Dutch region Haaglanden, in the province of South-Holland. These healthcare providers are focused on the inhabitants of Delft, Westland, Voorburg, Rijswijk, The Hague South-West, Pijnacker, and Nootdorp (Reinier de Graaf, 2013). The Reinier de Graaf Groep has two locations where surgeries are performed; the Diaconnessenhuis in Voorburg (DHV) with four ORs and the Reinier de Graaf Gasthuis in Delft (RdGG) with eight ORs. It is considered to close DHV in the future due to the decreasing number of surgeries (Appendix A). This research only focuses on the location in Delft, RdGG. More information of the Reinier de Graaf Groep can be found in Appendix B.

Currently the RdGG exist of two main buildings; the Hippolytus building (H-building) and the Bethel building (B-building), see Figure 4.1 (Municipality of Delft, 2005). The RdGG wants to replace the two buildings for one new building because the current hospitals do not satisfy the current (architectural) requirements anymore (FMT gezondheidszorg, 2012). The new building will be located at the central parking area between the H-building and B-building. In 2012 the construction of the new building started and will be completed in 2015. Figure 4.2 shows how the building will look like when finished. The new building will be taken into use at the end of August 2015. More information of the new building and the planning can be found in Appendix C.

FIGURE 4.1: MAP OF THE RDGG AREA (MUNICIPALITY OF DELFT, 2005)

FIGURE 4.2: DESIGN OF THE NEW RDGG HOSPITAL (EGM, N.D.)

4.2 Combi-Ster

Combi-Ster is the external sterilization company of Reinier de Graaf Groep and HagaZiekenhuis. Combi-Ster is a daughter company of Reinier de Graaf Groep and thus they have a close relationship with each other. Combi-Ster takes care of purchasing, managing, and disinfecting and sterilizing the surgical instruments for hospitals and suppliers to the healthcare industry (Company info b.v., n.d.). Instruments that are collected from the hospital are processed at Combi-Ster and as fast as possible returned to RdGG based on a fixed transport time schedule (see Appendix E).

As explained in the introduction, Combi-Ster is also responsible for checking the quality and functionality of the instruments. If an instrument is not working according to the standards Combi-Ster contacts the OR to discuss if the instrument must be taken from the tray and if the tray can still be used or not. Combi-Ster contacts the manufacturer if instruments must be repaired. Combi-Ster has a storage of loose instruments that makes it possible to replace instruments that must be repaired. Not every instrument can be complemented by the loose instrument storage since not every instrument is backed up. If a broken/damaged instrument cannot be replaced the OR has to decide if the tray can still be used. If so, an extra sticker will be placed on tray with the missing instrument next to the sterilization sticker.

4.3 List of involved actors

This section will define the actors that are important within the boundaries of this research. The defined actors will be affected by the implementation of JIT delivery of the surgical instrument trays. Per actor the tasks are describes that are important for this research. The actors are subdivided in two different groups.

- The first defined group are the *internal actors*. These actors are located within the RdGG.
- The second group are the *external actors*. These actors are not located within RdGG, but on other locations.

4.3.1 Internal actors

Every specialism has their own planner, *specialism planner*, who is responsible for scheduling the patients that are registered on the waiting list. Also emergency surgeries might be planned by this person, but this depends on the time before the surgery must take place (the emergency level).

The *OR planner* is responsible for the planning the time of the surgeries based on the planning made by the specialism planner. This is done a few days before surgery, but can still change at the day of surgery. The OR planner has to take several factors into account for planning the order of surgeries, such as the number of trays available and the emergency surgeries that must take place the same day.

The *specialist* is responsible for receiving the patient at the policlinic and placing the patient on the waiting list for surgery. The specialist determines the needs of the instruments for the surgery. The surgeries are performed by the specialist. He or she comes into the OR when the patient and all the equipment is ready, and performs the surgery. For the specialist it is only important that the requested surgical instruments are available.

The *OR assistant* is the one that prepares the OR before surgery and makes sure the instruments are placed back on the trays afterwards. The OR assistant is the key chain for the surgical instruments before and after the surgery. He or she needs to prepares and check the sterile instruments before surgery and after surgery. The OR assistants work in two shifts; starting in the morning at 7:30 till 17:00 and starting at 14:00 till 23:30 called the *shift OR assistant*. The shift starting in the afternoon is callable during the night. Some of the OR assistants are called *field expert* as they have a lot of knowledge about a specific specialism.

The *team leader OR* can be seen as the manager of all staff at the OR-complex, except for the specialist. The team leader is not connected to one (or more) specific specialisms, but to all of them. He or she is the chain between the working staff at the OR-complex and the management of the hospital.

The *orderer* makes the orders of the loan sets at the manufacturer. He or she will be informed by means of an application form made by the OR assistant with the required information to place the order. The orderer does not need to have specific knowledge about surgeries or instruments.

Internal transport is a supportive department of the hospital. Their primary task is to enable an efficient process for the departments in the hospital by delivering the patients and/or goods at the requested time. Externally delivered goods like the instrument trays from Combi-Ster are received at the internal transport.

Within the OR-complex the *logistic employee OR* is responsible for receiving and placing the goods in the storage. Next to this, the logistic employee is the one that prepares the equipment needed for surgery (that will be later be checked by the OR assistant).

After a surgery the *cleaning OR* staff has to clean and disinfect the OR room for the next surgery. They also have to bring the soiled trays that are placed in soiled carts to the desk of the OR-complex, so internal transport can collect them.

4.3.2 External actors

Combi-Ster is a daughter company of RdGG and takes care of the purchase, management, disinfection and sterilization of the loose surgical instruments and instrument trays for hospitals and suppliers of the healthcare industry.

Zorgservice XL (Z-XL) is the purchasing and logistical company of five hospitals in the region of South-Holland, including the Reinier de Graaf Groep. Z-XL is responsible for purchasing of consumables, including loan sets for surgery. Efficiencies of scale are applied by combining the purchasing of goods of the five hospitals. In addition, more efficiency is achieved through the integration of logistical operations and centralizing the digitized invoice flows (Zorgservice XL, 2014).

The surgical instrument *manufacturers* are especially important actors when dealing with loan sets. A hospital can loan one or more sets when they do not own the required sets for a surgery that must be performed. This is mostly the case at specific surgeries that are not performed often, if the purchase costs of trays are very high, or when the instruments for a surgery change often. The medical supply company can loan one or more sets to a hospital. A set can be loaned for single or long term use. Before the loan sets can be used during surgery the trays need to be sterilized at Combi-Ster.

4.4 Setup of the analysis of the current process flow

In the previous Section 4.3 a lot of actors are involved during the process. By investigating which tasks are done and by who a better understanding of the process flow will be obtained. Before starting the analysis of the current situation a plan must be made in order to work systematically. The used method to analyse the current process flow is by means of a Healthcare Failure Mode and Effect Analysis (HFMEA), which contains the following steps.

1. Specify the process to be studied
2. Assembly a multidisciplinary team
3. Analyse the current process by means of breakdown into sub-processes
4. Define risks/failure modes within the process (including causes and effects)
5. Prioritise and classify risks and give possible solutions to reduce the risks.

The HFMEA is a proactive and systematic step-by-step method for identifying and reducing all possible failures and risks, and starts with identifying the process to be studied; the current process flow of the surgical instrument trays. The HFMEA done made use of a multidisciplinary team (Table 4.1). The team can be separated into a user and research group. Annetje Guédon and Thekla Rakers (myself) were part of the research group, the other participants are employees of RdGG or Combi-Ster and are the users. The research team facilitated the users to go through the process flow step by step. Also the clearly writing down and keeping track of the process and failures was part of the research team. In

the beginning of this research Leendert Jan Zonnevelt was the JIT pilot project leader, but is replaced by Vivian Hoeijmans during this research.

TABLE 4.1: THE MULTIDISCIPLINARY TEAM FOR ANALYSING THE CURRENT PROCESS FLOW

Function	Name
Process supervisor	Annetje Guédon
Secretary	Thekla Rakers
JIT pilot project leader	Leendert Jan Zonneveld (DoubleSense)/Vivian Hoeijmans
Specialist (orthopaedics)	Joost van Linge
OR-assistant (orthopaedics)	Sandra Tas; Mieke Schildmeijer
Planning surgeries (orthopaedics)	Bianca van Nelfen
Team leader OR	Marjon Poot
Combi-Ster company manager	John Vermeer
Combi-Ster team leader	Jos Mee; Marjolein van der Toorn

The team has analysed the process flow with the corresponding failure modes. In total five two-hour sessions held. Table 4.2 shows the date and topics of these sessions. Within the sessions the focus was on the process starting at the planning of a surgery untill the return of the (loan-) trays via Combi-Ster to the manufacturer or the sterile storage at RdGG.

TABLE 4.2: HFMEA SESSIONS ON THE CURRENT PROCESS FLOW

Date session	Topic discussed
4th of August 2014	Process flow of surgical instruments
21st of August 2014	Process flow of surgical instruments
9th of September 2014	Risks of process steps concerning surgical instruments
11th of September 2014	Risks of process steps concerning surgical instruments
9th of October 2014	Analysing and classification of the risks

In the first two sessions the current process flow was analysed by breaking down the main steps into sub-steps with time and person who was responsible for the task. After all sub-steps were identified, the corresponding failures and causes were analysed (a failure can have several causes). The scoring of the identified failures and causes is based on a 5-points rating scale for both frequency and severity. The ratings are shown in Table 4.3. A total risk score is made by multiplying the scores given on frequency and severity. A list of high scoring failure modes is made based on minimum score of 10 on the total score and/or a score of 4 or higher on severity. Based on this list the main failures and risks of the current process are derived. Separated meetings between the sessions with the participants of the HFMEA were held in order to fine-tune the process and the list of failure modes.

TABLE 4.3: HFMEA RATING USED ON FREQUENCY AND SEVERITY

Rating	Frequency	Severity
1	Never	No influence
2	Rare (≤ 1 time per quarter)	Surgery proceeds with alternative style of working, no consequence for the patient
3	Occasionally (> 1 time per quarter)	Surgery proceeds with alternative style of working, consequence for the patient (e.g. surgery is delayed, but still on the same day)
4	Frequent (> 1 time per month)	Surgery does not proceeds, consequence for the patient (e.g. surgery will be rescheduled to another day)
5	Often (> 1 time per week)	Surgery does not proceeds, high/serious consequence for the patient (e.g. patient is already anesthetized)

The outcomes of the HFMEA on the current processes are discussed in the next section and Appendices F, G, and H. Based on findings from the analysis of the current process and the literature review done in Chapter 3 a list of design requirements is made in Chapter 5 as input for the design of the future process.

4.5 Analysis on the current process flow

For the process flow of the trays a division is made between normal instrumental trays (owned by the RdGG itself) and loan trays. This is done because processes can differ sometimes between normal and loan trays. A general overview of the main process flow is visualized in Figure 4.3 with the corresponding the number of sub-steps, risks and process time. In Appendix G the sub-steps per main process step are visualized and explained for both the normal and loan trays. In Appendix H the complete list of failure modes, causes and risk scores can be found, including the table of high scoring risks. Based on the HFMEA a report is made which is also send to the participants of the HFMEA, this report can be found in Appendix F. Below a brief explanation per main steps is given.

1. Needs assessment

In this step patient comes to the policlinics and will be placed on a waiting list if a surgery is needed. The surgery will be planned on a date without a time yet. The scheduled surgeries will be discussed by a team at a weekly meeting. Needed loan sets will be reserved at the manufacturer. The time schedule per day for surgeries will be made two days in advance. The patient will be informed one day in advance about the time of surgery.

2. Ordering (loan trays)

After the reservation for a loan set is made in step 1, a request form for ordering a loan set will be filled in by the OR assistant and send to the team leader of the OR who must approve this form. Based on the request form, the orderer will contact the manufacturer to confirm the booking of the loan set. Combi-Ster will be informed about the order by an email that includes the approved request loan form.

3. Delivery at Combi-Ster (loan trays)

The manufacturer will deliver the ordered loan sets to Combi-Ster two days prior to surgery (three days for new sets). Combi-Ster performs a few checks before the set can be processed; is the right set delivered, is the set complete, and can the set be cleaned and sterilized with their equipment. In the IT-system of Combi-Ster pictures of the set are saved and will be adjusted if changes in the set are made by the manufacturer. The set will be prepared for cleaning and sterilization by attaching a label with the necessary information.

4. Cleaning and sterilization (loan trays)

Before the loan set can be used during surgery the set needs to be cleaned and sterilized. First the cleaning in the soiled area will be done. Here the trays will go in the rinsing machine and subsequently in the ultrasonic, after which the instruments will be manually rinsed. The instruments will go in the washing machine and will enter the clean area. In the clean area the instruments will be checked on quality and quantity and packed in a special wrapping were a sterilization sticker will be putted on to be able to recognize the tray. The trays will be sorted per destination and placed on an inner cart and sterilized in the autoclave. The sterilization process must be approved by an employee to make sure the trays are sterile. If the process went wrong the sterilization process must be repeated.

5. Transport to OR-complex (loan trays)

After the sterilization process the inner carts with the trays will be placed in an outer cart in order to keep the trays sterile during transport. The outer carts will be placed in a truck and transported to RdGG. The loan trays are mostly delivered with the transport of 6 AM. The trays will arrive at the central storage where after they will be transported to the OR-complex. The inner carts will be taken out of the outer carts and will enter the OR-complex. The trays will be placed in the sterile storage of the OR-complex or directly placed on a Procedure Based Trolley (PBT).

6. Preparation at the OR-complex

In the morning one day prior to the surgeries the trays will be prepared on PBTs. In these carts trays will be collected and placed per surgery. Missing trays will be added to the PBTs when they arrive at the OR-complex. In the afternoon a check will be done if the PBT's are complete. In case of missing trays an OR assistant will call Combi-Ster to make sure the missing trays will arrive on time. For loan sets the call will be made directly after collecting the trays in the morning, thus before the afternoon check. In the morning of the surgeries again a check on the PBTs will be done to make sure that all trays are available for surgery.

7. Use in OR

Just before the surgery a final check will be done to see if all trays are still available. The trays will be opened and laid out on a table and the packaging will be checked for holes to make sure the trays are sterile. The sterilization stickers are scanned to connect the trays to the surgery (in case of recall actions). If all preparations are done the surgery can start. After the surgery the instruments are placed as neatly as possible back on the trays. Sterile (backup) trays that did not enter the OR are placed back in the sterile storage. Unused sterile loan sets are placed in a plastic bag and placed in a soiled cart together with the unsterile used trays. The soiled carts are placed at the desk of the OR-complex. The OR assistant notes the used implants in the map of the orderer, which will be used for the invoices.

8. Transport to Combi-Ster

The internal transport transports the soiled carts at the desk of the OR-complex to the central storage around three to four times a day. Combi-Ster will collect these trays and delivers empty soiled trays for the coming surgeries. Combi-Ster drives in total six times per day to RdGG to deliver clean trays or soiled carts and pick up clean and soiled carts with instruments. Combi-Ster also facilities the HagaZiekenhuis at The Hague. The transport schedule of Combi-Ster can be found in Appendix E.

9. Cleaning and Sterilization

All entering trays at Combi-Ster will go through the cleaning and sterilization process just as in step 4, except for unused loan sets that are wrapped in a plastic bag, these go the instrument storage. Loan sets that will return to the manufacturer will only be cleaned and not sterilized. The loan set will be checked on completeness and number of trays and placed back in the boxes of the manufacturer.

10. Retour to RdGG/manufacturer and invoicing

Normal trays will be transported back to RdGG after sterilization process is approved. This is done based on a fixed transport schedule (Appendix E). The trays entering RdGG will be placed back in the sterile storage at the OR-complex or directly used for surgery. Each specialization get its own invoice for the cleaned and sterilized trays. Loan trays will be collected by the manufacturer mostly one day after the surgery. The manufacturer checks the quantity and quality of the instruments and makes an invoice. The payment for the loan set will be done via Z-XL, who on its time sends the invoice to RdGG. At RdGG the orderer checks the invoice with the request loan form, shopping cart, and used implants (which are noted after surgery). If everything is correct the invoice will be approved and paid.

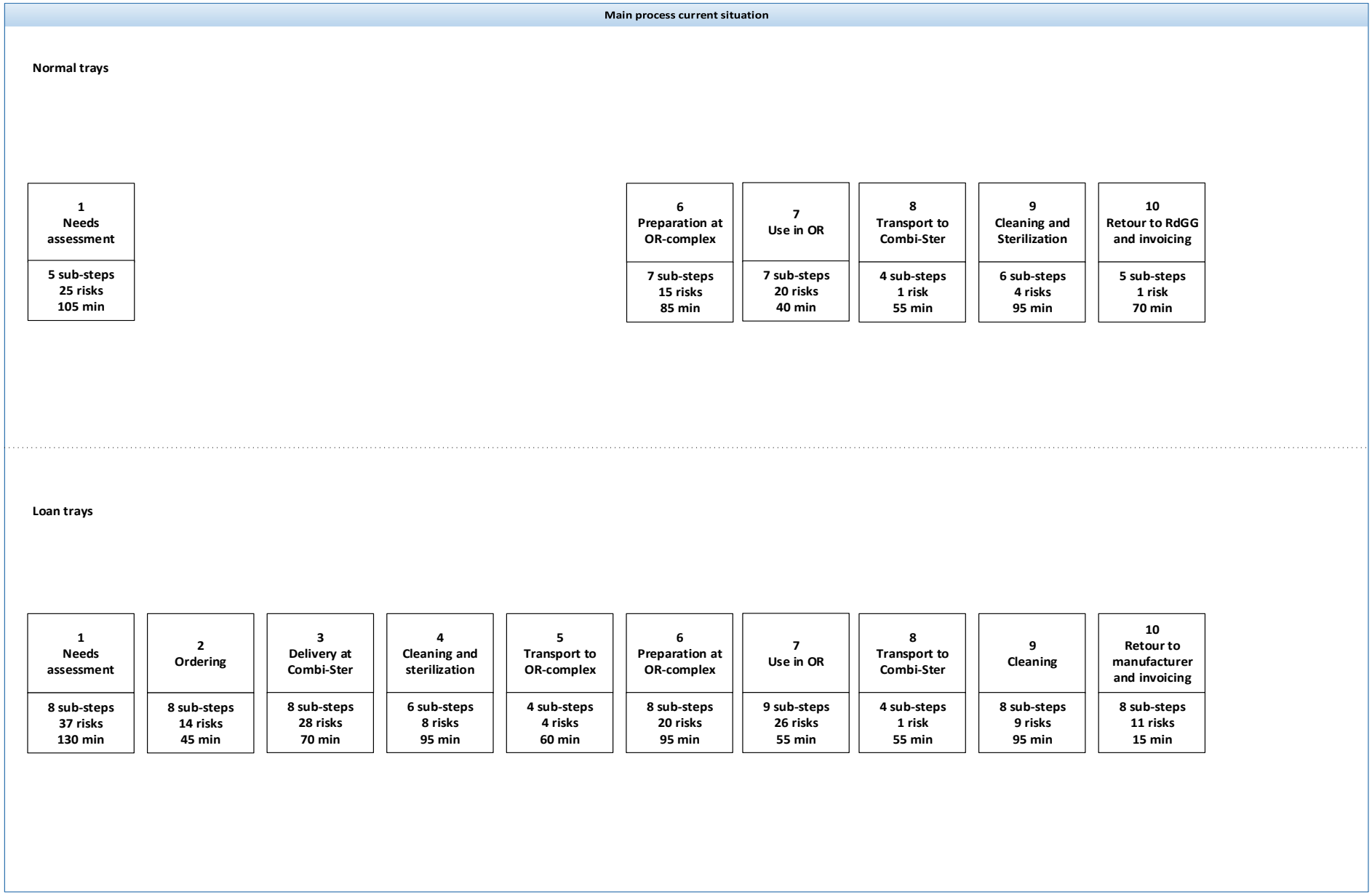


FIGURE 4.3: MAIN PROCESS STEPS OF CURRENT PROCESS FLOW

The HFMEA made it clear to visualize the process flow concerning normal and loan trays and came up with a classified list of risks for each sub-step. Table 4.4 gives a summarized overview of the results of the HFMEA for both normal and loan trays of the number of steps and process time. The process of loan trays is much longer and contains more steps and needs more time. This is mainly due to the extra main-steps that the loan trays contains; ordering, delivery at Combi-Ster, and an extra cleaning and sterilization step. The process time is divided between several groups. The group of the OR staff contains the actors OR team leader, OR assistant, OR planner, logistic employee OR, OR cleaning, and the orderer. The group other includes the planner ortho and the internal transport.

TABLE 4.4: SUMMARIZED OVERVIEW OF CURRENT PROCESS FLOW ON PROCESS STEPS AND TIME

	Normal trays	Loan trays
Total number of process steps	34	71
Total time for the process	450 minutes	715 minutes
- Specialist	30 minutes	35 minutes
- OR staff	180 minutes	270 minutes
- Combi-Ster staff	175 minutes	345 minutes
- Other	65 minutes	65 minutes

The risks are summarized in Table 4.5 and Table 4.6. One should notice that some processes of normal and loan trays share steps, and thus that the column total risks does not have to be the sum of the normal and loan trays. The risks are divided into three types of groups. The risks were considered as accepted if no actions were taken in later a step in the process to remove these risks. The occurrence of these risks are thus “accepted” and the employees have to deal with the consequences if these failures become true. Risks were seen as controlled as a step later in the process is taken to remove this risk, for example by performing a check. These risks are thus controlled later in the process. The risks considered as accepted/controlled are those that are partly controlled, but still can sneak through the controlling step. The process flow of the loan trays has much more risks compared to the steps of normal trays. This was expected since the number of steps for loan trays is also around double the number of steps of the normal process. The number of accepted risks is by far the largest group. However, a lot of these risks are not of high importance as can be concluded from Table 4.6.

TABLE 4.5: SUMMARIZED OVERVIEW OF CURRENT PROCESS FLOW ON ALL RISKS

	Total	Normal trays	Loan trays
Number of accept	151	63	147
Number of control	7	4	7
Number of accept/control	4	1	3
Total number of all risks	**162**	**68**	**157**

Table 4.6 shows a summarized overview of the high risks; those that have a minimum total score of 10 and/or a minimum score of 4 on severity, as described in Section 4.4. There is a strong decrease of 70% compared to the total number of risks, whereof a decrease of almost 55% for normal trays and 70% for loan trays. Also the sum of the risks is strongly decreased from 1064 to 510 for all steps. Especially the accepted risks are decreased.

TABLE 4.6: SUMMARIZED OVERVIEW OF CURRENT PROCESS FLOW ON HIGH RISKS

	Total	Normal trays	Loan trays
Number of accept	41	27	41
Number of control	4	3	4
Number of accept/control	4	1	3
Total number of high classified risks	**49**	**31**	**48**

Based on the indicated failures and causes a categorization of the type of high risks is made (Table 4.7). The reason why only the high risks are into account is since these have the most impact during the process. There are a lot of unintended and/or human errors during the current process, mostly the reason for these errors is "forgotten or too busy". During the HFMEA it became clear that by making and sticking to clear work process agreements the frequency of occurrence these risks can be limited. When designing the new process flow these categories should be kept in mind.

TABLE 4.7: SUMMARIZED OVERVIEW OF NUMBERS OF CATEGORIZED HIGH RISKS FOR THE CURRENT PROCESS FLOW

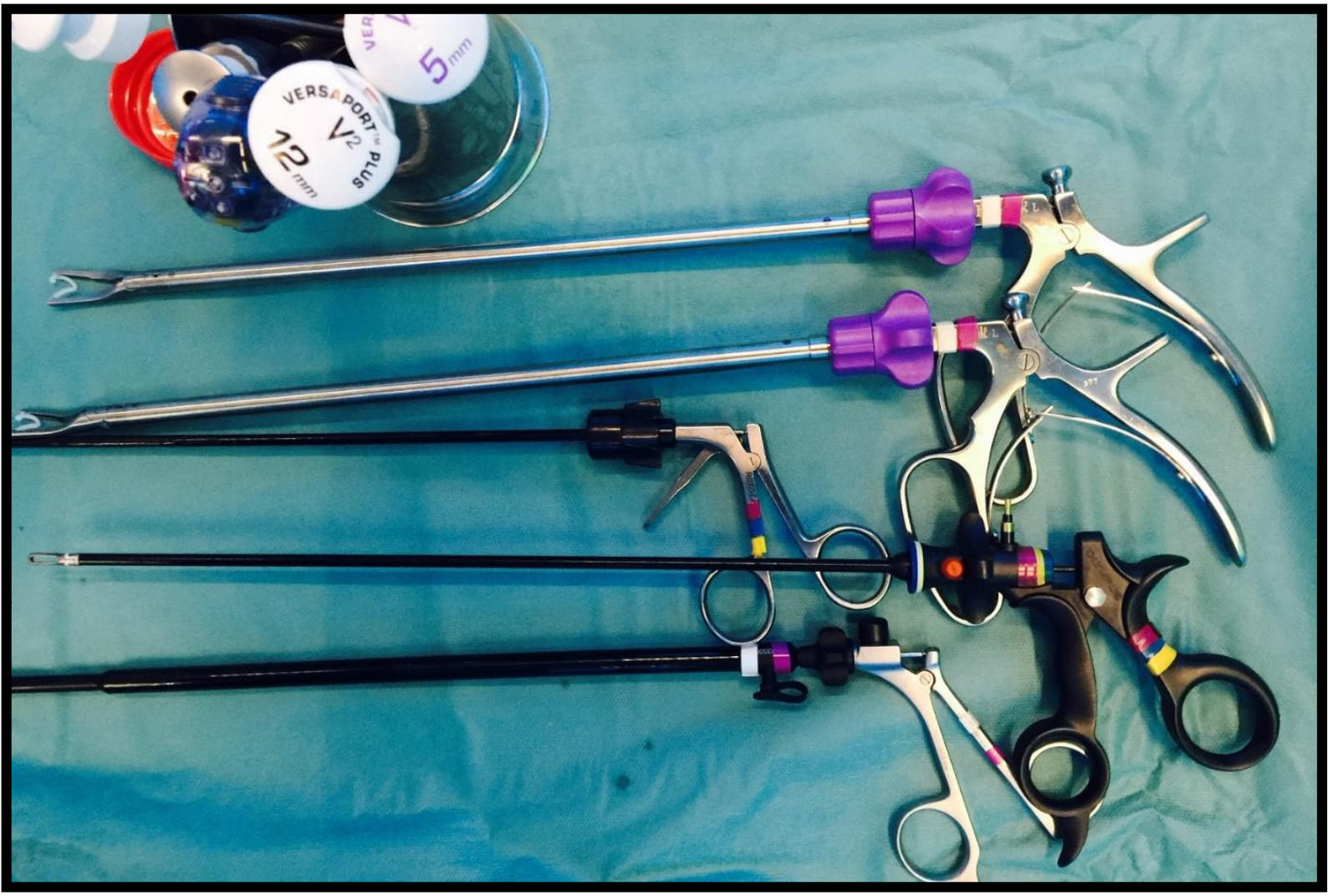
Category	Number
Lack of systematically informing/reporting the required (loan) trays for a surgery	9
Lack of overview of the available trays and the planning of other specialities	7
Pick list/ cleaning specifications are not up-to-date	7
Unexpected development during surgery	3
Unintended/human error	23
Total	**49**

4.6 Conclusion of the current process flow

This chapter provided an answer to the research question "*How does the current process flow concerning surgical instrument trays look like and what are the current problems, inefficiencies and risks?".*

The process flow of loan trays has around twice as many steps compared to normal trays, which results in a higher total number of risks for loan trays. However some of these "extra" risks do not have a big impact as the number of high classified risks is respectively lower. Due to the extra steps the process of loan trays takes almost 4.5 hours longer than the process flow of normal trays. The high risks are categorised in groups that should be taken into account when designing the future process flow. A better overview is needed during the whole process, including the overview of the planned surgeries and (loan) trays needed. A clear registration of information for the surgery is essential to reduce or eliminate extra work later in the process, especially during the first step when patients are placed on the waiting list.

Referring to Chapter 3, when applying JIT changes in the performances like efficiency, safety, and number of deliveries will occur. Where efficiency can be measured by the process times, which are in the current situation 450 minutes for normal trays and 715 minutes for loan trays. Safety can be measured by means of risks, especially the number of high risks are of importance since these have to most impact on the process. The number of high risks of normal trays is 31 and of loan trays 48. Expected is that these performances will improve when applying a pull delivery system for the instrument trays.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5 Design of the future process flow of surgical instrument trays

This chapter will elaborate on the *design* phase of the PD methodology. The design phase consists of semi-structured interviews and a second HFMEA. The same multidisciplinary team as in Chapter 4 is used. The following research question will be answered in this chapter "*How should the process flow of surgical instruments trays look like to minimize the problems and risks for the future situation?*".

In Section 5.1 the setup of the design phase is described. In Section 5.2 the design requirements are stated. Section 5.3 elaborates on the design made, followed by the requirements that must be realized to be able to implement the proposed design in Section 5.4. This chapter ends with a conclusion in Section 5.5.

5.1 Setup of the design phase of the demand driven future process flow

Almost the same multidisciplinary team has been used during the design phase as during the analysis phase. A change is made of the team leaders of Combi-Ster since the involved team leader was Hans Klinkenberg, and not Jos Mee and Marjolein van der Toorn anymore. Hans Klinkenberg is a new team leader who already has some experience with processing based on priority from his previous job at the CSSD at UMCU. Therefore, he has some interesting thoughts and input during the design and test and evaluation phases. Also the planner ortho was not involved any more since this employee's involvement is minor. The multidisciplinary team is shown in Table 5.1 with the number of design meetings held per person.

TABLE 5.1: THE MULTIDISCIPLINARY DESIGN TEAM FOR THE FUTURE PROCESS FLOW

Function	Name	Nr. of meetings held
Process supervisor	Annetje Guédon	-
Secretary	Thekla Rakers	-
JIT pilot project leader	Vivian Hoeijmans	1
Specialist (orthopaedics)	Joost van Linge	1
OR-assistant (orthopaedics)	Sandra Tas; Mieke Schildmeijer	1
Team leader OR	Marjon Poot	2
Combi-Ster company manager	John Vermeer	2
Combi-Ster team leader	Hans Klinkenberg	2

As said in the methodology semi-structured interviews were held in order to safe time for the users, for planning reasons, and to speed up the design phase. Besides the meetings with the design team also Imca Krakau from the IT department was involved to check the possibility of application of the IT-requirements of the design made. In total three meetings were held with her. The minutes of the interviews can be found in Appendix N.

Before starting the design process, design requirements have been formed that are described in Section 5.2. Based on these requirements a setup of the design was made that was used as input of the interviews. New design perspectives came to the front and adjustments in the design were made during these interviews. Besides the hard requirements made as stated in the next section, design decisions are made which are described in Section 5.3.

5.2 Design requirements

In order to develop a solution for the design of the future process flow of the instrument trays requirements are formed based on the literature review done in Chapter 3, the analysis of the current process flow in Chapter 4, and during the design phase itself. The design must meet the following general requirements:

- The risks of the new process must decrease.
- The process time must decrease.
- There must be more insights in the availability concerning the trays, also between specialisms.
- There must be more systematics/consistency in recording and updating information concerning (loan) trays.
- The communication and information exchange between RdGG and Combi-Ster must be more structured.

To be able to see if these requirements are met these must be measurable. The first two requirements are good measurable by means of number of risks and process time. The final three requirements will be measured by a sum of the risks that are covered by these categories.

More specific requirements are retrieved from the JIT pilot meetings, a visit to the University Medical Centre Utrecht (UMCU), and semi-structured interviews during the design phase. Table 5.2 shows the retrieved design requirements ordered on systematics, communication, information, and processes. All the people interviewed were part of the team and their functions can be found in Section 4.4, except Imca Krakau from the IT department. The minutes of the meetings can be found in Appendix N.

TABLE 5.2: DESIGN REQUIREMENTS

Requirement	Based on
Systematics	
The ortho meeting should get more structure.	M. Poot 4-11-2014
The system of Combi-Ster must work with two inventory locations.	Visit UMCU 29-10-2014
Communication	
Combi-Ster and RdGG must be able to get an overview where the trays are (track & trace).	Visit UMCU 29-10-2014
SLA's must be made according to the delivery times for emergency orders.	M. Poot 4-11-2014
The data in the systems of Combi-Ster and RdGG must be unambiguous (e.g. tray names).	I. Krakau 12-11-2014
Combi-Ster must be informed about information of ordered loan sets, such as manufacturer, name of set, delivery date at Combi-Ster, surgery date, location of surgery, surgery/patient number.	HFMEA of current situation
Information	
Digital files of (loan) trays at Combi-Ster must be possible to change/add.	HFMEA of current situation
Identification of cleaning and sterilization prescription must be retrievable from the system of Combi-Ster.	HFMEA of current situation
The system of RdGG must be able to record surgeries with and without treatment code.	I. Krakau 12-11-2014
The system of RdGG should be able to record extra supplies to surgeries with a treatment code.	I. Krakau 12-11-2014
The information concerning a surgery in the system of RdGG must be possible to change/ add until a certain time before surgery.	M. Poot and S. Tas 20-11-2014
The system of RdGG must be able to indicate if entered information concerning the surgery is complete or information is missing/will be added later, e.g. by approving each surgery.	M. Poot 4-11-2014

Requirement	Based on
Processes	
A front office employee of Combi-Ster must be located at RdGG to register incoming and outgoing carts.	JIT meeting 14-10-2014
The trays per surgery must be placed together in the same PBT.	JIT meeting 14-10-2014
The trays must be digitally prepared for surgery.	I. Krakau 12-11-2014
Somebody with knowledge about needed instruments for surgeries must contact manufacturer to reserve the loan trays (thus no orderer).	M. Poot 4-11-2014
There must be worked with clean and soiled carts.	J. Vermeer & H. Klinkenberg 6-11-2014
All trays entering Combi-Ster must be seen as soil.	J. Vermeer & H. Klinkenberg 27-11-2014
Combi-Ster must work according to priority.	J. Vermeer & H. Klinkenberg 27-11-2014
Specialist must not get an extra step to approve surgeries.	J. van Linge 19-01-2015

5.3 Design of the future process flow

Together with employees of both RdGG and Combi-Ster the design has been made (Appendix J). For the design attention is paid to the conclusions from the literature part and the analysis of the current process and the design requirements. Concluded from the analysis of the current process is the lack of systematic information provision. This has mainly influence on step 1: Needs assessment, where the patient is registered and scheduled. Besides, the ordering of the loan trays and keeping track of this often led to ambiguities and needs improvements. When making the design there is tried to minimize the number of steps and to eliminate the number of double checks. In the process of the current situation some sub-steps are in grey (Appendix G), according to the team these steps take unnecessary time and/or cause unnecessary risks. There is tried to improve these steps and to reduce the process time and/or risks. This mainly affects the following main steps:

- Step 1: Needs assessment
- Step 2: Ordering (loan trays)
- Step 6: Preparing at the OR-complex
- Step 10: Sending retour and invoicing (normal trays)

Since in the future process Combi-Ster is going to prepare the carts for the surgeries, a new main step is added to the process; preparation at Combi-Ster. Within this step the trays per surgery will be collected and already placed in the PBTs at Combi-Ster. This also leads to big changes in the process step 'preparation at OR-complex'.

Besides the hard requirements as stated in the previous section also design decisions have been made that were not based on hard requirements. These design decisions were made during the semi-interviews (Appendix N) with the design group based on what is most logical and convenient and by lessons learned from the JIT pilots. The outcome of the iterative design process of designing the future process flow and checking this at staff has resulted in a design of the future process flow. The main steps of the designed process can be found in Figure 5.1, also the number of risks and process time retrieved from the HFMEA on this process are included in the overview. General changes in the process are a better support from the system to systematically enter/retrieve information, interaction between the systems of RdGG and Combi-Ster, systems support for planning of surgeries concerning availability of trays, and that trays will be tracked and traced during the whole process (based on

scanning at fixed moments). At Combi-Ster trays are already scanned during the process, but at RdGG no scanning moments are registered, except to connect used trays to surgeries for safety reason (recall actions). The designed process will only work out if the requirements for both the systems and work processes of both RdGG and Combi-Ster are met, these requirements are described in Section 5.3. Below the main steps are described together with the design decisions made and changes between the current and future process. The bold steps are the ones that are mainly changed.

1. **Needs assessment**

The future design focuses on a more systematic manner to enter and keep track of information. There is decided to support this by changing ChipSoft, the used system of RdGG. RdGG has already made the decision to digitally prepare the trays for the pick list by making use of treatment codes that are connected to trays.

During the design process there is chosen to separate the information in the system to achieve that information will be more systematically entered by the specialist and the right information can be easier retrieved by using filters/searching actions. During a meeting with the OR team leader and OR assistants, and a meeting with the specialist there is chosen to make different fields to enter the treatment code, needed loan set (and concerning information), extra supplies, and needed assistance during the OR. An example for the layout can be found in Appendix N.4. After placing the surgery in ChipSoft the surgery must be planned on a date. There is decided to set the surgery on a preliminary date when planning the surgery to be able to still change the information in ChipSoft. The surgery must be approved when all information is complete, for example by a checkmark. Based on a filter/searching action in ChipSoft the OR assistant can retrieve which loan trays must be reserved at the manufacturer. All information of loan trays will be maintained in ChipSoft, and not in the ortho agenda anymore. The agenda where the information concerning loan sets was noted introduced errors due to unsystematic in reporting the information.

Within RdGG a project is already ongoing to improve the structure during the ortho. During this design phase there is suggested to bring a laptop or computer to this meeting and make use of the real time information from ChipSoft by filtering on specific surgeries with loan trays, surgeries that are not yet approved, and surgeries that have no treatment code. For the surgeries with no treatment code the field expert must manually prepare the trays in ChipSoft, expected is that this will be for 10% of the surgeries (for orthopaedics). The OR planner will still make a time schedule of the surgeries for the coming two days. The IT-system will support this task by checking if the trays will be available. Combi-Ster must know which trays must be send to RdGG and start on time with picking these trays. The task of picking these trays is expected to be 1 FTE (minute N.5). Therefore, there is decided that the OR planner must finish the planning and thus the pick list at 4 PM the day before surgery. The workday of the OR planner stops at 5 PM thus he/she has still the whole day to make adjustments in the planning for the next day. Also Combi-Ster can start picking the trays at 4 PM and still has the whole night to clean and sterilize the missing trays.

Design decisions made:

- Digitally prepare trays for surgery.
- Change the way of entering information in ChipSoft.
- Include filters in ChipSoft to support information gathering.
- Assign a preliminary date when planning a surgery.
- Include loan trays in ChipSoft.
- Do not use the ortho agenda anymore for loan trays.

- Finish planning at 4 PM day before surgery.

2. **Ordering (loan trays)**

The order process has been reduced in number of steps as double checks are left out. Since there is decided to include the information of loan trays in ChipSoft, the request form for loan sets is omitted. The orderer can directly search for requests for loan sets and directly make a shopping cart at Z-XL and does not need a printed and emailed request form any more. The shopping cart must still be approved by the OR team leader. Combi-Ster can retrieve the information of the loan sets from their system.

Design decision made:

- Omit the request loan form for loan sets.

3. Delivery at Combi-Ster (loan trays)

In this step little is changed. Since the information concerning the loan sets is available via the system the agenda at Combi-Ster is not needed any more to use it for the loan sets. The manufacturer must still deliver the loan set 2 days prior to surgery (three days for new sets). Combi-Ster checks the set and will prepare the set for the cleaning and sterilization process. In the IT-system pictures of the set must be updated if the order/content of the set has changed. These pictures will also be available at RdGG via a connection of the systems used.

Design decision made:

- Omit the Combi-Ster agenda for loan sets.

4. Cleaning and sterilization (loan trays)

Almost no changes are made during this step. The loan sets are cleaned in the soiled area and placed in the washing machine. The trays will enter the clean area after the program of the washing machine is finished. The trays will be compiled, checked on completeness and quality, and wrapped in special paper. The loan trays will be placed per customer on the inner carts and be sterilized in the autoclave. The only change made in this step is that after approving the sterilization process the loan set might be placed in the sterile storage (for a short time) instead of going to directly to RdGG.

Design decision made:

- Combi-Ster is going to store sterile trays that are not yet needed for surgery.

5. **Preparation at Combi-Ster**

This step is completely new. As said in step 1, the pick list must be finished at 4 PM the day before surgery since Combi-Ster needs enough time to prepare the PBTs. Expected is that this will take 1 FTE. The pick list contains the trays needed for the OR program the next day and the trays to replenish the emergency storage at RdGG. Combi-Ster will start picking the trays at 4 PM and will add the missing trays later on the PBTs when these are sterilized. The picking of the trays must be finished at 4:30 AM. This gives Combi-Ster a whole night to sterilize and add the missing trays to the PBTs. No later than 5 AM the trays must be scanned and assigned to the PBT and outer cart. The trays must be placed per surgery on the PBT.

Design decisions made:

- Start picking trays based on pick list at 4 PM day before surgery.
- Finish picking at latest 4.30 AM.
- Finish scanning and assigning trays to PBT and outer cart at latest 5 AM.

6. Transport to OR-department

There is decided to have one delivery moment (except for emergencies). At the time of designing this process the JIT pilots at RdGG and Combi-Ster have two delivery moments, one in the morning for the surgeries that afternoon, and a delivery moment in the afternoon for the surgeries in the morning the next day. However, most of these deliveries are not complete as trays are still being processed. According to John Vermeer around 70% of the requested trays are delivered on time (Appendix N.5). By rescheduling the deliveries to a later moment more time will be available to process the trays and there will be more complete deliveries. During this interview there is decided to deliver the trays as latest as possible to be able to complete the delivery as much as possible. There is chosen to have one delivery moment early in the morning to keep the highest flexibility to schedule surgeries so RdGG can still schedule surgeries in the afternoon and the next morning which need the same tray(s). At the OR-complex the trays have to be supplemented with disposables and possibly trays from the emergency storage before the surgeries start at 8 AM. Therefore there is decided that the trays must arrive at the OR-complex at 6 AM, which leads to that the trays must be transported around 5:00 AM from Combi-Ster to RdGG. A check is performed to make sure the trays will fit in one truck (Appendix E). Concluded is that there is enough capacity to have one delivery moment (see explanation of step 6.1 in Appendix J for the calculations). Based on the map of the new OR-complex concluded is that enough space is available for the carts (appendix D).

Combi-Ster transports the carts to the central storage of RdGG. The new building will have a OR-department, which is not sterile yet, and an OR-complex, which is sterile. Decided already by RdGG and Combi-Ster before this research started was to place a front office employee of Combi-Ster at the OR-department to receive and send back the trays from and to Combi-Ster. The carts received at the central storage at RdGG will be brought to the OR-department to the front office employee of Combi-Ster. This front office employee will receive and scan the carts and bring them to the OR-complex at 6 AM.

Design decisions made:

- One delivery moment, transport from Combi-Ster to RdGG at 5:00 AM.
- Install a front office employee of Combi-Ster at the OR-department to receive the trays.
- Bring carts to OR-complex at 6 AM.
- Implement scanning point at the OR-department.

7. **Preparation at OR-complex**

As can be expected lots of steps are changed during this step. The number of checks of the trays needed for surgery are reduced to only one just before the surgery starts. The PBTs will be received at the OR-complex and scanned, the trays for the emergency storage become visible and must be placed in the emergency storage. The PBTs must be supplemented with the required disposable products and possibly with trays from the emergency storage. Per surgery the trays will be brought to the preparation area and checked on completeness. In this area the trays will be opened and prepared on

a table and the packaging will be checked for holes to make sure the trays are sterile. The sterilization sticker will be scanned to connect the trays to the surgery (for recall actions and tracking and tracing).

Design decision made:

- Implement scanning points at the OR-complex.

8. Use in the OR

Compared to the current process the trays are in the designed process already prepared and checked on completeness. Only the tables with the trays must be brought into the OR. The surgery will be performed were after the instruments will be as neatly as possible placed on the trays. Unused sterile trays from the emergency storage must be placed back in the emergency storage and scanned. The rest of the unused trays must be placed in the soiled cart with the rest of the trays. Just as in the current process, sterile loan trays will be placed in a plastic bag and placed in the soiled cart. The soiled carts with trays will be picked up by the front office employee of Combi-Ster and brought to the outgoing goods area. Here the trays will be scanned and weighed before going back via the central storage of RdGG to Combi-Ster. By introducing the weighing step it is expected that less trays will miss instruments among others because they accidentally were thrown away. During pilots in the UMCU the number of incomplete trays entering the CSA has reduced from 25% to less than 1% after introducing weighing of the trays (Van der Burg, 2008). Expected is that the extra step of weighing the trays will pay off by a reduction of incomplete trays during the process at RdGG and Combi-Ster. Directly after the surgery the used loan trays and implants will be entered in ChipSoft by the OR assistant.

Design decisions made:

- Maintaining information of used implants and loan trays in ChipSoft.
- Implement weighing and scanning of the trays.

9. Transport to Combi-Ster

Just as in the current process around three to four times a day the soiled trays will be transported to the central storage. Empty soiled carts will be delivered by Combi-Ster and the soiled carts with the trays or clean empty carts will be taken to Combi-Ster. The transport schedule of Combi-Ster has not changed a lot (Appendix E). Still six times a day transport will take place since also the policlinics are facilitated by Combi-Ster.

Design decision made:

- Six times a day transport between Combi-Ster and RdGG (just as currently is the case).

10. Cleaning and Sterilization

Also the cleaning and sterilization process will not change, except for the last step. The trays will be cleaned and go into the washing machine were after they are checked on quality and quantity. After this step the loan trays will be brought the instrument storage to be prepared for sending retour the manufacturer. The normal trays will be wrapped and sterilized. After approving the sterilization process the trays will be placed in the sterile storage or the PBT. This is different compared to the current process were all trays were placed in an outer cart and were transported back to RdGG.

Design decision made:

- Place trays in sterile storage at Combi-Ster after sterilization (when not needed for surgery or emergency storage).

11. **Sending retour and invoicing**

This step is mainly changed for the normal trays. Since Combi-Ster is going to store the trays there will be no push system any more by transporting the trays to RdGG directly after the trays are sterilized. The transport of the trays to RdGG will only be in step 6. The only step that remains is the monthly invoicing per specialism. For loan trays no changes are made since these trays must be send back to the manufacturer. The manufacturer checks the instruments on quality and sends an invoice to RdGG via Z-XL. At RdGG the orderer checks the invoice with the shopping cart and the used implants entered in ChipSoft. The invoice will be approved if all information is complete.

Design decision made:

- No directly sending trays back to RdGG.

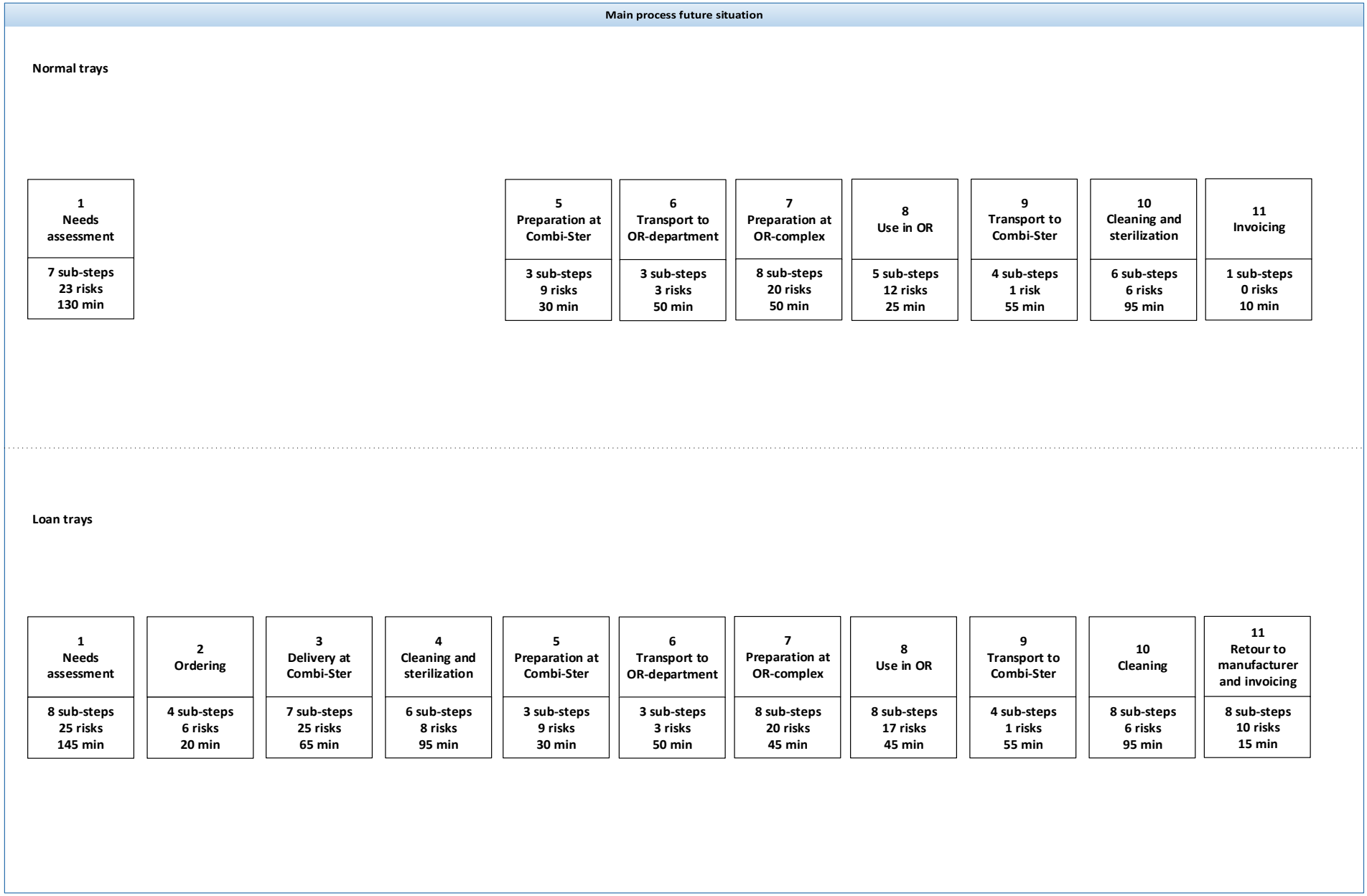


FIGURE 5.1: MAIN PROCESS STEPS OF DESIGNED FUTURE PROCESS FLOW

5.4 Requirements for implementing the designed future process flow

To be able to implement the designed future process, adjustments in both the IT-system and workflow of RdGG and Combi-Ster needs to be realized. RdGG and Combi-Ster both use different IT-systems (ChipSoft and ORLocate). The role of the systems is going to get greater importance. The systems of both RdGG and Combi-Ster needs to further integrate to guarantee the safety, reliability, and efficiency of the process flow of the instrument trays. RdGG and Combi-ster have chosen to implement a connection between the two systems and extension with ChipSoft Steriel at RdGG. The requirements are divided for both IT-system and workflow for both RdGG and Combi-Ster, only RdGG, and only Combi-Ster. The individual system requirements of RdGG and Combi-Ster are subdivided in planning and entering and retrieving information, and the workflow requirements are subdivided in process, IT tasks, and work times. The category IT tasks includes changes in the workflow process where the system is needed. Where possible the tasks are sorted per kind of staff. On top of each requirement there is a number 1 or 2, which refers to the implementation phase, followed by one or more numbers between brackets referring to the implementation task. Chapter 6 will elaborate on the implementation plan. When all requirements are satisfied, it can be stated that the proposed design satisfies the design requirements as stated in the previous section. The system requirements of both RdGG and Combi-Ster, RdGG, and Combi-Ster are checked on applicability (Appendix N). All system requirements are possible to implement.

5.4.1 Requirements for both RdGG and Combi-Ster

This section states requirements affecting both RdGG and Combi-Ster. The systems specifications focuses on the interaction between both IT-systems.

System requirements

1.1 The data in the systems of Combi-Ster and RdGG must be unambiguous (e.g. use same tray names).[1 (5)]

1.2 It should be possible to skip scanning points during the process.[1 (9)]

1.3 Changes in the system of Combi-Ster or RdGG should be real-time visible for other users (e.g. OR planning, priority, content trays, status trays).[1+2 (8;27)]

1.4 The following must be available in the database of both systems:

- 1.4.1 Digital pick list based on planning (incl. loan trays).[1 (8)]
- 1.4.2 Priority status of the trays (e.g. emergency levels, storage).[1 (8; 22)]
- 1.4.3 Status of the trays (out of use, processing time, track & trace).[1 (8)]
- 1.4.4 Digital information of the (loan) trays (e.g. content, weight, pictures, missing instruments).[1+2 (8; 27)]

Workflow requirements

2.1 Service Level Agreements must be made between Combi-Ster and RdGG (e.g. latest time of delivery before OR, time when planning OR will be ready).[1+2 (1; 25)]

5.4.2 Requirements for RdGG

System requirements

<u>Planning</u>

3.1 The date of surgery is preliminary (information can still be changed/added) until surgery is approved.[1 (19)]

3.2 The system must give a warning if trays are not available on time during the process (e.g. sterilization process must be redone).[1 (8; 32)]

3.3 The system must notice conflicts within the planning (e.g. pop-up) (based on planned surgeries and available trays).[2 (8; 31)]

Enter and retrieve information

3.4 The system must support the users to systematically enter information:
- 3.4.1 Record surgeries with and without treatment code.[1 (13; 14; 17)]
- 3.4.2 Include a special assigned box for loan trays.[1 (17)]
- 3.4.3 Include additional information (e.g. needed OR assistance).[1 (17)]
- 3.4.4 Indicate that information is missing.[1 (17)]
- 3.4.5 Indicate the priority level for emergency.[1 (17)]
- 3.4.6 Include order status of loan trays.[2 (30)]
- 3.4.7 Enter used loan trays/implants to the surgery (after surgery).[2 (30)]

3.5 Trays must be assigned to surgeries (recalls).[1 (9)]

3.6 The system must support searching/filtering on:
- 3.6.1 Surgeries with no treatment code.[1 (18)]
- 3.6.2 Surgeries with loan set.[1 (18)]
- 3.6.3 Status of the trays (track and trace).[1 (18)]
- 3.6.4 Surgeries with missing information.[1 (18)]
- 3.6.5 Surgeries not approved.[1 (18)]
- 3.6.6 Surgeries with extra supplies.[1 (18)]
- 3.6.7 Digital information about trays based on (part of) a word.[1 (18)]
- 3.6.8 Order status of loan set.[2 (30)]

Workflow requirements

Process

4.1 Ortho meeting needs to change; only discuss surgeries without treatment code and with loan trays, based on real time overview on computer.[1 (10; 12)]

4.2 Taking the trays from the emergency storage should be according to the expiration date.[1 (10)]

Field expert

4.3 Digitally prepare the trays needed for surgeries without a treatment code (estimated on 10% of all surgeries).[1 (10; 13; 14)]

Logistic employee OR

4.4 Put the unused 'back up' trays back in the emergency storage.[1 (10)]

4.5 Scan trays entering the OR-complex.[1 (9; 10)]

4.6 Scan trays ingoing and outgoing from the emergency storage.[1 (9; 10)]

OR assistant

4.7 Scan when taking trays from the emergency storage.[1 (9; 10)]

4.8 Scan trays just before/ during surgery.[1 (9; 10)]

Front office employee of Combi-Ster

4.9 Scanning incoming and outgoing trays.[1 (9; 10; 21)]

4.10 Collect soil trays after surgery.[1 (10; 21)]

4.11 Weighing outgoing trays.[2 (29; 33; 34)]

IT tasks

Specialist

4.12 Enter information systematically when register new surgeries on the waiting list, supported by the system.[1+2 (10; 17; 30)]

Orderer

4.13 Directly order loan sets at Z-XL based on search/filter in system (no request loan form anymore).[1 (10; 18)]

4.14 Approve the shopping cart at Z-XL (this can also be done by the team leader, not the OR manager any more).[1 (10)]

4.15 Update order status of loan set.[2 (29; 30)]

Team leader OR

4.16 Approval the shopping cart at Z-XL (this can also be done by the orderer, not the OR manager any more).[1 (10)]

4.17 Update order status of loan set.[2 (29; 30)]

OR assistant

4.18 Retrieve from system which loan sets must be ordered (not based on ortho meeting any more, no agenda any more).[1 (10; 18)]

4.19 Digitally prepare loan set for the pick list.[1 (10)]

4.20 Update order status of loan set (add extra info if needed).[2 (29; 30)]

4.21 Enter used loan trays/implants in the system after the surgery.[2 (29; 30)]

Planner OR

4.22 Check for the coming two days if there are surgeries without any assigned trays (through search/filter in system), if so report to field expert.[1 (10; 18)]

4.23 Finish planning for next day before 4 PM, supported by the system.[1+2 (8; 10; 29)]

4.24 Indicate priority level of emergency surgeries in the system and call Combi-Ster.[1 (10; 22)]

Work times

4.25 The logistic employee OR must start working at 6 AM, to gather the trays, laminate, disposables for the check of OR assistants at 7:30 AM.[1 (10)]

4.26 OR assistant must check PBT's at 7:30 AM (surgeries start at 8 AM).[1 (10)]

5.4.3 Requirements for Combi-Ster

System requirements

Planning

5.1 The system must be able to deal with two inventory locations.[1 (21)]

5.2 The trays must be processed and assigned according to the following priority:[1 (22)]

1 Emergency surgeries (three classifications: directly needed, within 6 hours, within 24 hours)

2 Planned surgeries

3 Emergency storage at RdGG

4 Storage at Combi-Ster

5.3 Changes in the picking list after 4 PM must be visible for Combi-Ster (e.g. by a high priority status and an email/call).[1 (8; 22)]

Enter and retrieve information

5.4 Digital information about (loan) trays (e.g. content, pictures, missing instruments, cleaning and sterilization requirements) must be possible to change, add and retrieve.[1+2 (8; 27; 30)]

5.5 System must keep track of the expiration date of trays and indicate if trays are (close to) expire (e.g. by email to team leader Combi-Ster).[2 (35)]

Workflow requirements

Process

6.1 The trays for each surgery must be placed together in a PBT and be clearly recognisable.[1 (23; 34)]

6.2 Taking the trays from the storage should be according to the expiration date.[1 (34)]

6.3 An employee of Combi-Ster must be working at RdGG (front office employee). The tasks of this new function will be:

6.3.1 Scanning incoming and outgoing trays (same as 4.9).[1 (9; 10; 20)]

6.3.2 Collect soil trays after surgery (same as 4.10).[1 (10; 20)]

6.3.4 Weighing outgoing trays (same as 4.11).[2 (29; 33; 34)]

6.4 Scan moments are needed at the following places:

6.4.1 Entering the soil area at Combi-Ster.[1 (9; 20)]
6.4.2 Cleaning the trays.[1 (9; 20)]
6.4.3 Going into the dishwasher.[1 (9; 20)]
6.4.4 Entering the clean area (after dishwasher).[1 (9; 20)]
6.4.5 Checking, compiling and packing the trays.[1 (9; 20)]
6.4.6 Entering the autoclave.[1 (9; 20)]
6.4.7 Entering the sterile area (after autoclave).[1 (9; 20)]
6.4.8 Entering the storage.[1 (9; 20)]
6.4.9 Placing in the PBT.[1 (9; 20)]
6.4.10 Placing in an outer cart.[1 (9; 20)]
6.4.11 Entering the OR department, scanning the cart only (front office employee).[1 (9; 20)]
6.4.12 Leaving the OR department (front office employee).[1 (9; 20)]

IT tasks

6.5 Combi-Ster must be able to retrieve the pick list from the system (at 4 PM the day before the surgeries).[1 (8; 20)]
6.6 Combi-Ster must be able to retrieve from the system when loan trays will arrive (instead of email with request loan form).[2 (27; 34)]

Work times

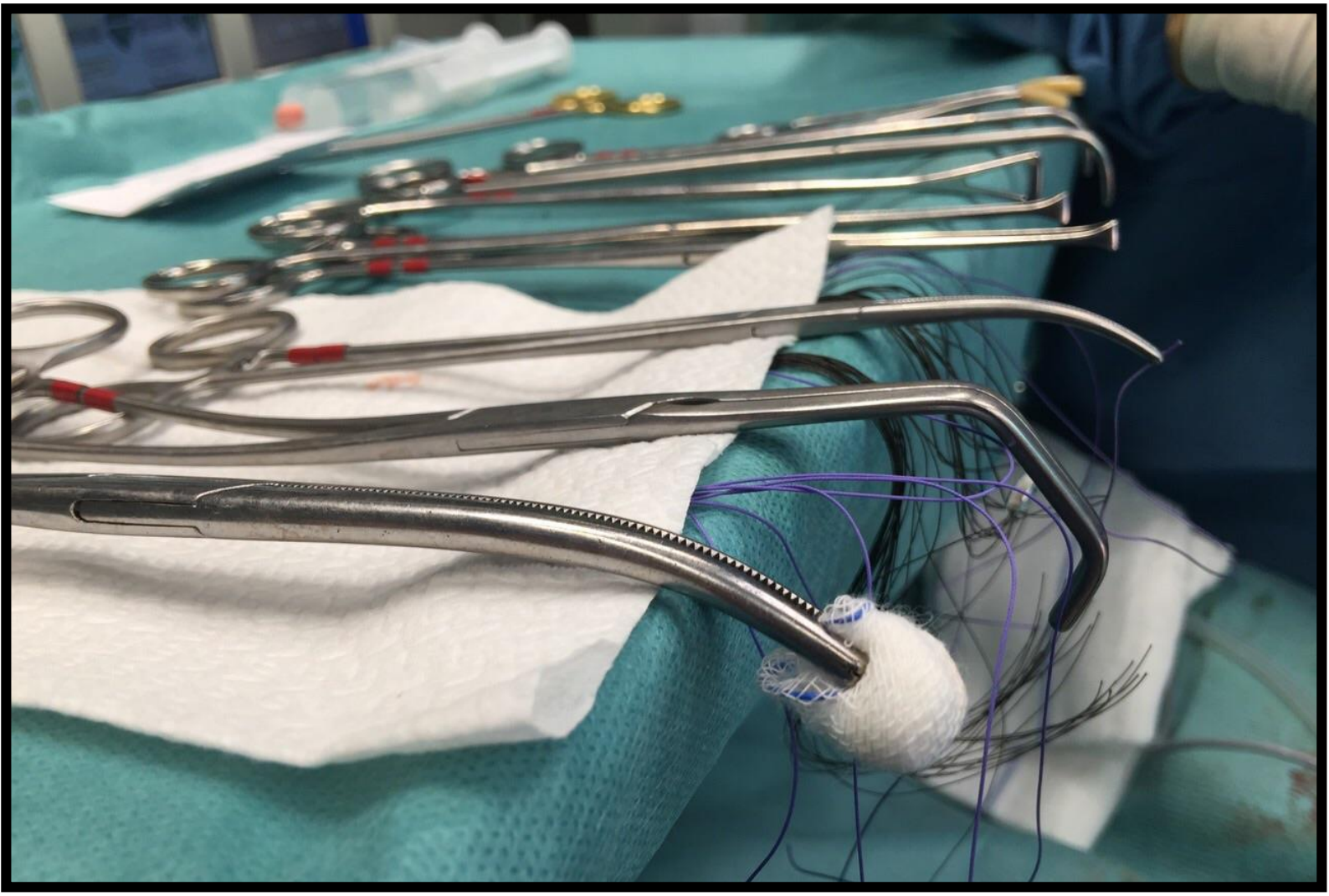
6.7 An employee of Combi-Ster must work during the late afternoon/evening to pick the trays for the PBTs (4 PM – 10PM).[1 (20)]
6.8 An employee of Combi-Ster is responsible for placing the missing trays processed during the night in the PBT's before 4:30 AM.[1 (20)]
6.9 Combi-Ster must deliver at 5 AM (half an hour earlier compared to now).[1 (20)]
6.10 The front office employee of Combi-Ster must start working at 6 AM when the carts arrive.[1 (20)]

5.5 Conclusions of designed future process flow

This chapter described *design* phase of PD and gave an answer to research question four *"How should the process flow of surgical instruments trays look like to minimize the problems and risks for the future situation?".* The next chapter will elaborate on comparing the current and designed process flow.

The design has been made together with the same multidisciplinary team as during the analysis phase. By involving users in the design phase a feasible and user oriented design has been made. To be able to implement the designed future process, adjustments in both the IT-system and workflow of RdGG and Combi-Ster needs to be realized. All IT-system requirements are possible to implement.

When referring to literature the design has both characteristics of both VMI and CPFR as there is no hard line between these two collaboration mechanisms. Combi-Ster will be the only one responsible to replenish the emergency storage of RdGG based on shared data of the trays needed for the planned surgeries (demand), which are characteristics of VMI. However, in the design the surgery planning is done based on the availability of the trays, including the processing times at both Combi-Ster and RdGG based on historic data. The processes at Combi-Ster will be based on priority derived from the planning of RdGG. This lends more towards CPFR.



6 Testing and evaluating the designed future process flow

The previous chapter defined the future process design based on semi-structured interviews and an iterative design process to get feedback. This chapter will elaborate on the *testing* and *evaluating* phase of this design and will elaborate on the risks and problems as stated in research question three "*How should the process flow of surgical instruments trays look like to minimize the problems and risks for the future situation?".*

This chapter starts with explaining the setup of the testing and evaluating phases. Section 6.2 elaborates on the results of this analysis. The design has been proposed to a specialist and field expert of plastic surgery in a second iteration of the PD in Section 6.3. Finally Section 6.4 comes up with the conclusions of this chapter.

6.1 Setup of the testing and evaluating phases of the designed future process flow

Just as during the analysis of the current process flow, this section describes the setup of the second HFMEA done on the designed future process flow. The used method is again a HFMEA, this makes it possible to compare the designed process with the current process flow. During these sessions it was the first time the design team came together again, resulting in some minor adjustments in the process to fine-tune the design. As the process flow was already designed, this HFMEA mainly focused on the last two steps of the analysis as proposed in Section 4.4; defining the risks/failure modes and prioritise and classify risks. This second HFMEA is a prospective analysis since it is on a not (yet) existing process and requires the imagination of the team. The same team as during the design phase is used. In total two two-hour sessions were held (Table 6.1).

TABLE 6.1: HFMEA SESSIONS ON THE DESIGNED PROCESS FLOW

Date session	Topic discussed
4th of December 2014	Risks identification and classification of the designed process steps concerning surgical instruments
9th of December 2014	Risks identification and classification of the designed process steps concerning surgical instruments

To accelerate the sessions the team was asked to do some homework for the sessions and already fill in the failures, causes and rates. Also some failures and rates of the steps that were not changed were already filled in before starting the sessions. All failures, causes, and rates that were filled in beforehand were validated during the sessions.

The same scores were used as during the first HFMEA for analysing the current process, see Section 4.4. However, one should take into account that the scores identified are only valid if the requirements, as described in Section 5.3 are achieved. When this is not the case the scores might increase and extra failures could emerge. The outcomes of this HFMEA on the designed process flow can be found in Appendices I, J, and K. The next section discusses the outcome of the HFMEA and compares this with the outcomes of the HFMEA on the current process flow.

6.2 Outcomes of testing and evaluating the designed future process flow

This section discusses the outcomes of the HFMEA analysis of the designed process flow and compares these outcomes with the outcomes of the HFMEA on the current process flow. Table 6.2 (normal trays) and Table 6.3 (loan trays) give a summarized overview of the results of the number or process steps and times. For both the processes for normal and loan trays, no big differences can be seen in the number of steps. The process flow for loan trays still has a lot more steps compared to the process flow for normal trays. Also the process time for normal trays has stayed the same, but for loan trays this has reduced with almost an hour. Again the process time has been divided in different groups. The

groups have stayed the same as in Chapter 4, thus the group of the OR staff contains the actors: OR team leader, OR assistant, OR planner, logistic employee OR, OR cleaning, and the orderer. The group other includes the planner ortho and the internal transport. The time of the extra job created of the front office employee of Combi-Ster who receives and sends back the carts at RdGG is counted as Combi-Ster process time. Especially the OR staff members need less time to spend on the process flow for both normal and loan trays. However, Combi-Ster needs to spend more time for the process of the trays. This is because they will become responsible for preparing the trays per OR program.

TABLE 6.2: SUMMARIZED OVERVIEW OF PROCESS STEPS AND TIME OF THE CURRENT AND DESIGNED PROCESS FLOW OF NORMAL TRAYS

	Current process	Designed process
Total number of process steps	34	37
Total time for the process	450 minutes	445 minutes
- Specialist	30 minutes	30 minutes
- OR staff	180 minutes	135 minutes
- Combi-Ster staff	175 minutes	215 minutes
- Other	65 minutes	65 minutes

TABLE 6.3: SUMMARIZED OVERVIEW OF PROCESS STEPS AND TIME OF THE CURRENT AND DESIGNED PROCESS FLOW OF LOAN TRAYS

	Current process	Designed process
Total number of process steps	71	67
Total time for the process	715 minutes	660 minutes
- Specialist	35 minutes	35 minutes
- OR staff	270 minutes	185 minutes
- Combi-Ster staff	345 minutes	375 minutes
- Other	65 minutes	65 minutes

Besides the process steps and times also the risks are summarized, see Table 6.4, Table 6.5, and Table 6.6. One should notice that some processes of normal and loan trays share steps, and thus that the numbers at Table 6.4 are not equal to the sum of risks of normal and loan trays in Table 6.5 and Table 6.6. The total number of risks of the designed future process flow has significantly decreased with about 15% compared to the current process flow (Table 6.4). As already explained in Section 4.5 the risks are divided in the groups accepted, controlled, and accepted/controlled. Were risks were considered as accepted if no actions were taken in later a step in the process to remove these risks. Risks were seen as controlled as a step later in the process is taken to remove this risk, for example by performing a check. The risks considered as accepted/controlled are those that are partly controlled, but still can sneak through the controlling step. A shift of these risks has occurred from accepted to controlled risks. This indicates that more risks will be filtered later in the process instead of accepting that things go wrong.

TABLE 6.4: SUMMARIZED OVERVIEW OF TOTAL RISKS OF THE CURRENT AND DESIGNED PROCESS FLOW

	Current process	Designed process
Number of accept	151	87
Number of control	7	46
Number of accept/control	4	4
Total number of all risks	**162**	**137**

When splitting these risks in the processes of normal and loan trays (Table 6.5 and Table 6.6), the same trends can be seen. However, during the process of the normal trays the number of risks is slightly increased, but again these risks are more often controlled. During the process of normal trays the percentage of controlled risks shifted from 6% to 45%, for loan trays this shift is from 4% to 34%. When controlling more steps the failures made in these steps can be solved at a low impact level. This

indicates that the designed process flow is safer than the current process. This same conclusion can be drawn when looking at the high classified risks.

TABLE 6.5: SUMMARIZED OVERVIEW OF TOTAL RISKS OF THE CURRENT AND DESIGNED PROCESS FLOW OF NORMAL TRAYS

	Current process	Designed process
Number of accept	63	39
Number of control	4	33
Number of accept/control	1	2
Total number of all risks	**68**	**74**

TABLE 6.6: SUMMARIZED OVERVIEW OF TOTAL RISKS OF THE CURRENT AND DESIGNED PROCESS FLOW OF LOAN TRAYS

	Current process	Designed process
Number of accept	147	83
Number of control	7	44
Number of accept/control	3	4
Total number of all risks	**157**	**131**

Table 6.7, Table 6.8, and Table 6.9 show a summarized overview of the high classified lists. As also explained in Chapter 4, the high risks are the ones with a total score of minimal 10 and/or a minimum score of 4 at the severity. Again a decrease of about 15% can be seen in the total number of risks. The sum of the scores of the high risks is much lower and decreased with almost 20% from 510 to 414, this indicates that high classified risks are having less high scores for the future process compared to the current process giving another indication that the designed process is safer that the current process flow.

TABLE 6.7: SUMMARIZED OVERVIEW OF HIGH RISKS OF THE CURRENT AND DESIGNED PROCESS FLOW

	Current process	Designed process
Number of accept	41	25
Number of control	4	15
Number of accept/control	4	2
Total number of high classified risks	**49**	**42**

TABLE 6.8: SUMMARIZED OVERVIEW OF HIGH RISKS OF THE CURRENT AND DESIGNED PROCESS FLOW OF NORMAL TRAYS

	Current process	Designed process
Number of accept	27	20
Number of control	3	13
Number of accept/control	1	1
Total number of high classified risks	**31**	**34**

TABLE 6.9: SUMMARIZED OVERVIEW OF TOTAL RISKS OF THE CURRENT AND DESIGNED PROCESS FLOW OF LOAN TRAYS

	Current process	Designed process
Number of accept	41	23
Number of control	4	13
Number of accept/control	3	1
Total number of high classified risks	**48**	**37**

Based on the outcome of the analysis it can be stated that there is a shift in the type of high scoring risks. Both the high scoring risks of the current and future process flow are subdivided in different types (Table 6.10). Most of the problems occurring in the current process as described in Section 4.5 like the lack of unsystematically recording information and the lack of overview of available trays and planning of other specialities are disappeared. However the risks classified under unintentional or human errors is increased in the future process. This is because errors concerning wrongly register

information in the system at either RdGG or Combi-Ster, for example when register a patient or scanning the trays, can increase. Making strict and clear rules concerning the work process can help to control these errors. Besides, the general trend of more controlled risks can also be seen for the human errors. The accepted risks of the current process was good for a share of 83% (19 risks), this has decreased 55% (16 risks) in the designed process, which means a decrease of 16% of accepted risks in the designed process compared to the current process. The numbers of controlled risks have increased in the designed process with 10 risks (10.00%) from 1 to 11 risks, where the share of controlled risks was 4% in the current process this has increased to 38% in the designed process. A decrease of 1 risks can be seen in the accepted/controlled risks, from 3 to 2 risks.

Next to the current existing categories introduced in Section 4.5 a new category is introduced; the restriction of the number of trays. However, an annotation must be made here because it is expected that problems falling within this category are also occurring in the current process. It is assumed that the participants of the HFMEA were not much aware of the fact of the restriction in number of trays at the current process, but deal with the situation on the moment itself and try to find a solution for example by taking another tray containing the same instrument needed. In the future situation this cannot be done anymore since Combi-Ster is going to store the trays, except from the emergency storage at RdGG. This leads to the awareness of the risks that trays cannot be delivered on time before surgery because they can still be in use at RdGG or in process at Combi-Ster.

TABLE 6.10: SUMMARIZED OVERVIEW OF NUMBERS OF CATEGORIZED HIGH RISKS FOR THE CURRENT AND DESIGNED PROCESS FLOW

Category	Current process flow	Future process flow
Lack of systematically informing/reporting the required (loan) trays for a surgery.	9	0
Lack of overview of the available trays and the planning of other specialities.	7	1
Pick list/cleaning specifications are not up-to-date	7	5
Unexpected development during surgery	3	3
Unintended/human error	23	29
Restriction of the number of trays	0	4*
Total	**49**	**42**

* Risks according to the restrictions of the available trays came to the front during the HFMEA on the future process. However, thought is that the risks according to the restrictions of the available trays is also present in the current process, but the HFMEA group was not aware of this.

Again a report based on the findings from the analysis of the proposed future process is made and is shared with the HFMEA group, similar as was done after the HFMEA of the current process flow. The report, proposed future process flow, and list of failure modes, causes and risk scores can respectively be found in Appendix I, J, and K.

6.3 Second iteration at plastic surgery

Since the design is made with the focus on orthopaedics, a second iteration is done according to the PD based on a single meeting with a specialist and field expert of plastic surgery. This specialism uses less different instrument trays compared to orthopaedics. The focus of this iteration was mainly on the evaluation and decision steps. The design made in the first iteration was presented and discussed. The design contains all steps needed for plastic surgery, but also contains irrelevant steps for this specialism, as expected beforehand. The main changes compared to orthopaedics are as follows:

- No loan trays.

- Almost no emergency surgeries (once or twice per month), they can also enter via the policlinics.
- Only a monthly meeting is held, but most contact goes via email and during already daily contacts.
- It does not happen often that surgeries are performed that are not standard.

The *analysis, design* and *test* steps are not emphasized in this iteration, since the design of the first iteration is proposed. From the *evaluation* step can be concluded that the first main step where the needs are determined (especially step 1.1 when entering the patient in ChipSoft), is of very high importance, which was also an outcome of the first iteration. The IT-system must work smoothly since this is going to be more important for a smooth process flow. As the treatment codes must be clear and unambiguous, it is *decided* that the specialist and field expert from this iteration are going to validate these for plastic surgery.

6.4 Conclusion of testing and evaluating the designed future process flow

This chapter focused on the *test* and *evaluate* phase of the designed process flow. In the literature part there was concluded that improvements in the process performances can be seen when applying pull. The number of transports did not change, see Appendix E, but it can be concluded that the new process has improved the efficiency and the safety of the processes, especially for the loan trays. Expected is that an increase in availability of the trays will occur since Combi-Ster can work based on priority of the trays, which leads to an improvement of the customer service. There can be concluded that all design requirements (Section 5.2) are met. The most important conclusions of the designed process flow are as follows:

- The number of steps of the process flow of normal trays increased with 3 sub-steps, but the overall process time stays the same. The process time of the OR staff decreased with 25% where for Combi-Ster the process time increased with 23%. The process flow of loan trays showed a decrease of 4 sub-steps. A decrease of 90 minutes (33%) of process time for the OR staff can be seen. Again for Combi-Ster an increase of the process time has occurred of 9% (30 minutes), which is less than for the process flow of normal trays.
- The total number of risks of the designed process decreased with 15% compared to the current process. The total number of risks of the process of normal trays increased with 9% (6 risks), and the high classified risks increases with 10% (3 risks). For loan trays the numbers of risks decreased with 17% (26 risks), including a decrease of 11 of high classified risks (23%).
- An increase of almost 560% (39 risks) of the controlled risks can be seen for all risks, while there is a decrease of 42% (64 risks) for all accepted risks. For the high scoring risks there is a decrease of 14% (7 risks), whereof a decrease of almost 40% (16 risks) of accepted, an increase of 275% (11 risks) of controlled risks, and a decrease of 50% (2 risks) of partly controlled risks.
- A shift in the categories of the risks between the current and future situation has occurred. All 9 risks regarding to a lack of systematics are dissolved. There is only 1 risk left regarding the lack of overview, which is a decrease of 85%. A decrease of almost 30% can be seen at the risks assigned to the not up-to-date pick lists and cleaning specifications. For the designed process an increase of 30% (7 risks) can be seen for the number of unintended human errors, but as said a larger number of risks is being controlled in later sub-steps.

A second iteration within plastic surgery has been done. Since PD is an ongoing process, it is advised to continue on the iterations and also include other specialities.

7 Preliminary implementation plan for the proposed design

This chapter will propose a preliminary implementation plan of the proposed future design and will provide an answer to the last research question "*How should the designed process flow be implemented?".* This chapter is part of the *decision* phase of the PD methodology.

Section 7.1 will present a Supply Chain Collaboration Maturity Model to identify the tasks that must be done to implement the designed future process. The model is based on five maturity models found in literature. Section 7.2 discusses the evaluation of the model itself. In Section 7.3 a stakeholder engagement plan is presented. The stakeholders involved during the implementation are identified with their corresponding influences. Besides, the ways of communication to involve the actors during the project are discussed.

It became clear that the design made as proposed in Chapter 5 is not able to be implemented before the rehousing, therefore the implementation phase is divided into two phases. Phase I (Section 7.4) focuses on the situation from March 2015 until the rehousing. Phase II (Section 7.5) will describe the situation from the rehousing, September 2015 until six months after. A provisional process is proposed for the first half year after the rehousing. In Section 7.6 a conclusion of this chapter will be given.

7.1 Visualization of the current and designed future situation by means of a Supply Chain Collaboration Maturity Model

Supply chain management is important for business performance. When willing to improve or change the existing supply chain performance it is helpful to have a framework to benchmark current practices and to indicate the current and desired future situation. This can be done by using a maturity model (Sun, Ren, & Yeo, 2010). From the literature research it became clear that trust and data sharing are very important when the sterile trays will be stored at Combi-Ster. This section introduces a new Supply Chain Collaboration Maturity Model (SCCMM) to define the current and the future situation and to define the changes needed to achieve the desired future state, but which can also be used as a benchmark model for other hospitals and CSSDs as well. The maturity framework is based on five models found in literature. The models are partly used and adapted to form the framework that defines the state of the relationship and collaboration that can be applied to define the current and desired situation. An overview of the used models can be found in Table 7.1. Although none of the models focuses on the healthcare sector, the attributes used are quite general and can also be applied for healthcare.

TABLE 7.1: OVERVIEW OF THE FIVE MATURITY MODELS

Authors	Focus	Maturity levels	Model description	Used attribute(s)
Meng, Sun & Jones (2011)	Supply chain relationships in construction	4	Detailed description of 8 attributes at each maturity level	Trust in collaborative party, communication, collaboration, problem solving, process improvements
Succar (2009)	Building information modelling	5	Detailed description of 16 attributes at each maturity level	Knowledge, network, software
Lee, Lee & Kang (2007)	General business process maturity model based that is in compliance with CMM	5	General description of main characteristics at each maturity level	Process improvement
IBM (2007)	Supply chain fulfilment of Mainland China	5	Detailed description of 3 attributes at each maturity level	Customer order management
Sun, Ren & Yeo (2010)	General supply chain management	5	Detailed description of 4 attributes at each maturity level	Communication technology

Sung, Ren and Yeo (2010) describe that supply chain management must be multidimensional in its approach and scope which takes people, process and technology. These three dimensions have a triangular relationship and need to be balanced. Based on this, the attributes of the new framework are divided in culture, process and technology. People has been changed into culture, which is broader and includes the dimension people. *Culture* covers the value and norms of a company. It includes how the company perceives and defines itself and operates, both internally and externally. Attributes included are trust in collaborative party, communication, collaboration, and knowledge. *Process* has to deal with the physical actions, it includes a practice or action done for a specific purpose. It also includes changes that have an influence on the work done or to be done. It includes the attributes customer order management, problem solving, and process improvements. *Technology* supports the processes done by the company and between companies. It includes the attributes network, communication technology, and software.

The new framework exists of five maturity levels. Since all but the maturity model of Meng, Sung & Jones (2011) have five levels, Meng, Sung & Jones' model is extended to a five level model. The five maturity levels are generally explained below, see Appendix L for an elaborate description of the attributes:

- Level 1: *Ad Hoc* – The relationship between parties are characterized by high self-interest and mistrust. No information is shared and there is no joint effort for improvements. The parties only focuses on achieving their own objectives and maximizing their own profits, without considering the impact on others. Mutual objectives do not exists at all at this level.
- Level 2: *Defined* – There is little trust between parties based on mutual understanding. Little information is shared and little cooperation exist between parties. There are few common measures and support is only given when it is related to self-interest.
- Level 3: *Linked* – Trust in the other party is improved and checks are greatly reduced. Parties cooperate with each other. Problems are timely recognized between parties. Performance

data is used in an ad hoc manner to improve processes. Information is shared based on intranet within the company. The data flow is documented and well managed.

- Level 4: *Integrated* – Everyone has sufficient confidence in the other's behaviour. Parties collaborate with each other and a problem solving culture is beginning to occur. Knowledge is stored in the company's system and is easy retrievable. Customers can follow their order status. Inter-enterprise communication facilities are realized between parties. The selection of software is based on a strategic viewpoint.
- Level 5: *Extended* – The parties have a close collaboration and most of information is openly exchanged. Performance data is systematically used to improve processes. Software is continuously revisited to enhance productivity. All processes related to interoperable storage and exchange are well controlled and proactively enhanced.

The framework is used to get the current situation in red and the desired future situation in blue. The current situation is filled in together with a team leader of the OR and manager of Combi-Ster (see Appendix N.13). The future is based on discussed literature and the design phase. This represents the situation that must be minimally achieved to be able to work safe and efficient when Combi-Ster is going to store the sterile trays. The framework is shown in Table 7.2.

Appendix L shows the actions needed to be done to reach the right maturity level of each attribute and a reference to the implementation task in Section 7.2 or 7.3. Based on this reference the order of implementing the actions can be derived. The attribute trust cannot be improved by only performing the actions listed. Improving the level of trust must come over time, when the process (and the other collaborative party) has proven itself. Due to problems with the pilots, which are currently taken place the level of trust is decreased to level 1 compared to the current process without JIT deliveries. Several reasons can be identified for this such as the lack of IT support, differences in viewpoints of among other things the emergency storage, problems due to planning, and internal problems.

TABLE 7.2: SUPPLY CHAIN COLLABORATION MATURITY LEVEL WITH AN INDICATION OF THE CURRENT (RED) AND FUTURE (BLUE) SITUATION

Attribute	Level 1: Ad hoc	Level 2: Defined	Level 3: Linked	Level 4: Integrated	Level 5: Extended
Culture					
Trust in collaborative party	• Contractual trust • Little confidence in others' behaviour • Check and double checking	• Contractual trust and mutual understanding • Some confidence in others' behaviour • Checking somewhat reduced	• Contractual and competence trust • Confidence in others' behaviour • Checking greatly reduced	• Short-term goodwill trust • Much confidence in others' behaviour • Almost no checking	• Long-term goodwill trust • Full confidence in others' work • No checks of others' work
Communication	• No information is exchanged openly • No sharing learning	• Little information is exchanged openly • Almost no sharing learning	• Some information is exchanged openly • Some sharing learning	• Much information is exchanged openly • Sharing learning	• Most information is exchanged openly • Continuous sharing learning
Collaboration	• Confrontation or aversive • Mutual blame • No support	• Limited cooperation • Self-defence of interests • Support only with the issues related to self-interest	• Cooperation and sometimes little collaboration • Abandon of blame culture • Sometimes support	• Collaboration • Problem solving culture if not too much effort • Mostly support	• Close collaboration • Problem solving focused culture • Always support
Knowledge	• Knowledge is not recognised as an asset and is typically shared informally between staff	• Knowledge is recognised as an asset; shared knowledge is harvested, documented and thus transferred from tacit to explicit	• Documented knowledge is adequately stored	• Knowledge is integrated into organisational systems; stored knowledge is made accessible and easy retrievable	• Knowledge structures responsible for acquisition, representation, and dissemination are systematically reviewed and enhanced
Process					
Customer order management	• No formal standards for order management • High degree of manual intervention • Information is static, pertaining to a customer transaction that has already occurred	• Formal order management processes within functions, but no consistency across units, products and/or channels • Information is functionally oriented	• Automated order management and invoicing across units • Customer information is shared across the company, but limited to transactions • Formal procedures and policies exists	• Order transaction and movement is visible to supply chain partners • Information is shared with suppliers and supply chain partners	• Online real-time order configuration and updates • Closely integration between customer order management and supply chain planning and execution processes
Problem solving	• No risk identification, no early warning • Problems often lead to disputes • Problems often recur	• Informal risk identification, but no early warning • Problems sometimes lead to disputes • Sometimes problems recur	• Timely warning between parties • Some problems are timely resolved at the lowest level • Few problems are repeated	• Early warning between parties • Many problems are timely resolved at the lowest level • Rare problems are repeated	• Early warning between parties • Most problems are timely resolved at the lowest level • Rare problems are repeated

Process improvement	• No common measures; no formal feedback • Unable to use performance data for process improvement • Improvements are not controlled	• Little common measures; irregular but formal feedback • Using partial performance data in an ad hoc manner for process improvements • Improvements are partially controlled	• Some common measures, regular and formal feedback • Using performance data in an ad hoc manner for process improvement • Improvements are controlled	• Common measures; regular and formal feedback • Systematically using partial performance data to improve and optimize processes • Improvements are partially systematic	• Common measures; formal, regular and continuous feedback • Systematically using process performance data to improve and optimize process • Improvements are systematic
Technology					
Network	• Network solutions are non-existent or ad-hoc • Individuals, organizations (single location/ dispersed) use whatever tools found to share and communicate data • Stakeholders lack the network infrastructure necessary to harvest, store and share knowledge	• Network solutions for sharing information and controlling access are identified within the organizations • At project level, parties have identify their requirements for sharing data/information • Dispersed organizations and project teams are connected through relatively low-bandwidth connections	• Network solutions for harvesting, storing and sharing knowledge within and between organizations are well managed through common platforms (e.g. intranets or extranets) • Content and management asset tools are deployed to regulate structured and un-structured data shared across high-bandwidth connections	• Network solutions enable multiple facets of the process to be integrated through seamless real-time sharing of data, information and knowledge • Solutions include project-specific networks/portals which enable data-intensive interchange (interoperable exchange) between parties	• Network solutions are continuously assessed and replaced by the latest tested innovations • Networks facilitate knowledge acquisition, storing and sharing between all stakeholders • Optimisation of integrated data, process and communication channels is continuously improved
Communication technology	• Traditional communication facilities	• Use information technology to improved communication	• Information sharing and communication based on intranet	• Inter-enterprise communication facilities • Real-time communication	• Global satellite positioning network connectivity • Real-time communication
Software	• Usage of software applications is unmonitored and unregulated • Data usage, storage and exchanges are not defined within organisations • Exchanges suffer from a severe lack of interoperability	• Software usage/introduction is unified within an organisation or project-teams (multiple organisations) • Data usage, storage and exchange are well defined within organisations • Interoperable data exchanges are defined and prioritised	• Software selection and usage is controlled and managed according to defined deliverables • Data usage, storage and exchanges are monitored and controlled • Data flow is documented and well-managed • Interoperable data exchanges are mandated and closely monitored	• Software selection and deployment follows strategic objectives, not just operational requirements • Interoperable data usage, storage and exchange are regulated and performed as part of an overall organisational or project-team strategy	• Selection/use of software tools is continuously revisited to enhance productivity and align with strategic objectives • All matters related to interoperable data usage storage and exchange are documented, controlled, reflected upon and proactively enhanced

7.2 Evaluation of the Supply Chain Collaboration Maturity Model

As the previous section proposed the SCCMM, this section will continue on the evaluation process of the model itself. Helgesson, Höst and Weyns (2011) discuss the evaluation types of maturity models based on analysis of 59 articles of maturity models. They distinguish three types of evaluations that succeed each other. However, it is possible to carry out the evaluations in any order that seems most useful or logical. Type 1 is an "offline" evaluation, which is done only by the author(s) of the article and without any involvement of outside experts. The evaluator can also be the designer of the maturity model itself. This evaluation is done based on the knowledge of the processes and by a comparison with other similar frameworks (Helgesson, Höst, & Weyns, 2012). This type of evaluation has been performed on the proposed SCCMM, as the author of this research looked into different maturity models and finally formed the model based on five models found in literature and has evaluated the model on understandability and internal consistency. It can be concluded that based on this type of evaluation the SCCMM model was seen as valid. The type 2 evaluation can be conducted by involving practitioners who are experts on the process that is intended to be improved by the use of the maturity model. However, these experts must not have been involved during the design and development of the maturity model itself. This type of evaluation can be done with interviews, surveys, or simulated assignments (Helgesson, Höst, & Weyns, 2012). The SCCMM has been proposed separately to Annetje Guédon and Vivian Hoeijmans. They have much knowledge about the process flow of the sterile instrument trays and the application of a demand driven delivery system on this process. During this evaluation the maturity model itself was checked on consistency, clearness and applicability, but also the assignment of the levels of the current and future situation were discussed. It can be concluded that based on these evaluations the model can be seen as valid as the 'experts' saw the model as logic, understandable and realistic. This type of evaluation is not very extensive when considering the evaluation of the model itself, as it has only been done with two people and the focus was not only on the model itself but also the assignment of the levels for both situations. The type 3 evaluation can be conducted by implementing real process improvement activities and using the maturity model in a practical setting. This evaluation type can be regarded as the most costly as it requires the carry out of an assessment. However, the assessment can at the same time also be carried out with the purpose of improving the process, and then the costs can be justified by the expected benefits (Helgesson, Höst, & Weyns, 2012). This last evaluation type was not be performed during this research. There are some evaluations performed on the SCCMM, but these were not very extensive. The SCCMM's validity must be seen over time, but this does not fit within the time frame of this research.

7.3 Stakeholder engagement plan

During the analysis and design phases the users were already involved. However, during the implementation phase it is still important to also focus directly on stakeholders (Goggin, Bowman, Lester, & O'Toole, 1990) (Nutt, 2002). By making a stakeholder engagement plan the importance of the stakeholders for implementing the designed future process flow can be determined. Prioritizing the stakeholders and making a plan on how they can be managed and determining the level of involvement of these stakeholders helps to create a smooth implementation phase.

During the analysis phase most stakeholders related to the implementation of the demand driven delivery system were already identified and introduced. Table 7.3 shows the stakeholders needed for implementing the designed future process flow. Three new stakeholders are introduced compared to the analysis phase, these are ChipSoft, KPN, and the IT department of RdGG. ChipSoft and KPN are the companies that provide the IT-systems and services for RdGG and Combi-Ster. As already said, a connection between these two systems will be developed, and thus they have to work partly together to build this connection. Table 7.3 gives an overview of the stakeholders with corresponding their

priority, how they are related to the demand driven delivery of the trays, and if they are pro- or reactive.

TABLE 7.3: STAKEHOLDER OVERVIEW

Stakeholder	Priority (H/M/L)	Engagement objective(s)	Pro-/reactive
Combi-Ster	H	Most time- and cost- efficient implementation of the future demand driven delivery situation	Proactive
ChipSoft	H	Good business relations with RdGG and Combi-Ster	Proactive
KPN	H	Good business relations with RdGG and Combi-Ster	Proactive
Z-XL	L	Good business relations with RdGG	Reactive
Manufacturer	L	Good business relations with RdGG	Reactive
Specialism planner	M	Good system (and support) to plan the surgeries	Reactive
OR planner	M	Good system (and support) to plan the surgeries	Proactive
Specialist	M	Responsible to perform the surgery with the needed tools and assistance during surgery	Reactive
OR assistant	H	Prepares and assists during surgeries	Proactive
Team leader OR	H	Responsible of managing all staff (except from the specialist) and processes for preparing and performing surgeries at the OR-complex.	Proactive
Orderer	L	Responsible to order the loan trays	Reactive
Internal transport	L	Responsible for transporting the carts to and from the OR-department	Reactive
Logistic employee OR	M	Prepares the equipment for surgeries	Proactive
IT department	H	Responsible for the IT-systems and will be involved when IT-changes are needed.	Proactive

It might be possible that some of the stakeholders are powerful enough to thwart or even block the implementation of the designed process flow, which is undesired. To get a more clear vision on which stakeholders must be taken into account in order for a smooth implementation process, a power-interest grid is made (Figure 7.1). From this grid it becomes clear how to deal with the stakeholders, and the key stakeholders can be identified. The key stakeholders are the ones that should be closely managed and have a high interest and power. But one must not forget that the other stakeholders can also influence the implementation process.

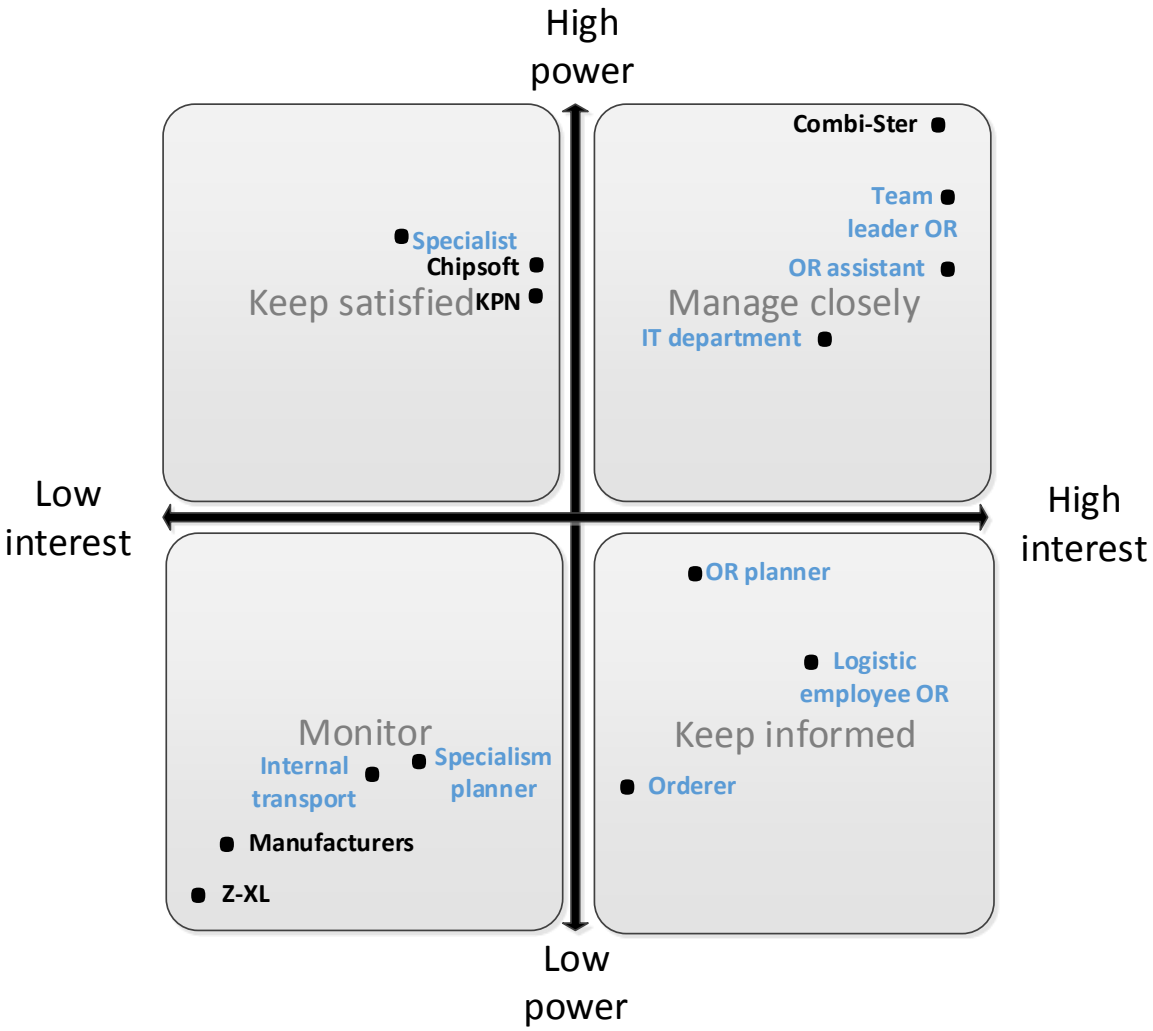


FIGURE 7.1: POWER-INTEREST GRID

- *High power, high interest* – These are thus the key stakeholders, also seen as the *players*. They should be fully engaged. For the implementation of the designed process flow these are Combi-Ster, the team leader OR, OR assistants and the IT department. These stakeholders are closely related to the demand driven delivery system of the instrument trays.
- *High power, less interest* – These stakeholders are also seen as the *context setters* and must be kept satisfied, as they can influence the implementation. However, they must not become bored by the messages received. The specialists are in this quadrant, as they have power within the hospital and have some interest since they need the right instruments for surgery. Also KPN and ChipSoft are part of this group as their interest is not very high but they have a high power to fail or make the design since they have to develop the IT-systems.
- *Low power, high interest* – These stakeholders are the *subjects* and must be informed often. As they have not much power, they can be helpful during the implementation phase. The OR planner, logistic employee OR, and orderer are part of this group as their work will be affected by the future situation.
- *Low power, low interest* – These stakeholders are the *crowd* and must be monitored and require the least effort, but they must not be overloaded with information. The ones that are part of this group are the specialism planner, internal transport, cleaning OR, manufacturers, and Z-XL as their work process is (almost) not affected by the future situation.

With use of this power-interest grid the engagement style is identified based on the five levels as proposed by IAP2 (IAP2, 2015). The levels are explained below and Table 7.4 gives per stakeholder the engagement level.

- *Inform* – Stakeholders must be provided with balanced, objective, accurate, and consistent information. They have to understand the problem, opportunities, solutions and/or choices made. Stakeholders can be informed by communication methods like the website, newsletters, fact sheets et cetera. The stakeholders that must be informed are Z-XL, manufacturers, specialism planner, specialists and the internal transport. Z-XL and the manufacturers are not influenced by the demand driven delivery system between Combi-Ster and RdGG and should be least informed. The internal actors of RdGG must be more often informed by e.g. newsletters as they are more interested. The specialists must be informed and sometimes consulted as they might have interesting thoughts and can signal inefficiencies or risks.
- *Consult* – Stakeholders are used to obtain feedback. This can be done during provisional analyses, outcomes and/or choices made. Possible communication methods can exists of focus groups, surveys and public meetings. The specialists, ChipSoft and KPN belong to this group. ChipSoft and KPN must be consulted/informed, as they are responsible for the deliveries of the IT-systems. As ChipSoft has already indicated that for implementing ChipSoft Steriel a time of about four months must be taken into account. During these months four review days will take place and one day for testing. Beside this implementation of ChipSoft Steriel, also a connection between the two systems of RdGG and Combi-Ster must be developed. To engage KPN and ChipSoft it is thus advisable to organize a few days to come together with several users like the IT department, the team leader OR, OR assistant, OR planner and Combi-Ster. During these days ChipSoft and KPN can reflect on what they have done and how this satisfies the requirements for the IT-systems. Thus, both RdGG and Combi-Ster will be involved by the developments of the IT-systems and can elaborate on the requirements. Next to these days it is maybe needed that both ChipSoft and KPN also organize a separate day to sit together for the connection of the systems.
- *Involve* – The concerns and needs of these stakeholders must be consistently understood and considered, therefore they must be involved during the implementation process. This can be done by separated projects. Examples of communication methods are workshops, forums and deliberative polling. The stakeholders that must be involved are ChipSoft, KPN, OR planner, orderer, logistic employee OR and the IT department, as their work will be affected by the new process. Their knowledge and insights can help to detect inefficiencies and risks during the implementation phase.
- *Collaborate* – These stakeholders becomes a partner for activities like identifying preferred solutions and decision making activities. Possible communication methods are reference groups, experimental projects/pilots and participatory decision-making. The stakeholders in this group are Combi-Ster, the OR assistants, team leader OR and IT department. They will be most affected by the new process. Besides, their knowledge and insights are crucial during the implementation. They have a big understanding of the processes and are one of the first that detect any inefficiencies and risks.
- *Empower* – The stakeholders are giving the responsibility of the final decision-making. Communication methods are the facilitation of direct dialogues between stakeholders and project leader(s), joint planning and delegated decisions. None of the stakeholders must be empowered.

TABLE 7.4: STAKEHOLDER ENGAGEMENT COMMUNICATION OVERVIEW

Stakeholder	Inform	Consult	Involve	Collaborate	Empower
Combi-Ster				X	
ChipSoft		X	X		
KPN		X	X		
Z-XL	X				
Manufacturer	X				
Specialism planner	X				
OR planner			X		
Specialist	X	X			
OR assistant				X	
Team leader OR				X	
Orderer			X		
Internal transport	X				
Logistic employee OR			X		
IT department			X	X	

The analysis of the stakeholders is done about four months before the rehousing. Pilots are already ongoing for more than a year and the developments of the IT-systems are about to start. However, it is important to keep in mind that projects are dynamic and so are both stakeholders and their interest, which might change over time (Thompson, 2015). Keeping track of the stakeholders and their position is thus an ongoing process.

Besides the engagement of the stakeholders to the implementation project, it is also important to look into the type of sanctions possible if there is obeyed to the agreements. To have the sanctions clearly communicated on forehand the stakeholders know what to expect when agreements are not kept. The making of the incentives can also be done together with the stakeholders. Possible incentive for ChipSoft and KPN can be financially related. However for the relationship between RdGG and Combi-Ster this will not be an option since Combi-Ster is a daughter company of RdGG. Making clear agreements and where possible document the responsible person so a conversation can be done to discuss the findings. In the worst case a replacement of employee must be made.

7.4 Preliminary implementation phase I

Based on the made SCCMM and the requirements stated in Section 5.3 it can be concluded that changes are necessary before the proposed process flow can be implemented. These actions are shown in Appendix L in the above section. RdGG is going to upgrade their current system to ChipSoft HIX, which is planned approximately six months after the rehousing. Therefore, the current policy within RdGG is to avoid big changes/improvements within the parts of the IT-system that are going to change by this transition. The implementation process is divided into two phases. This section will elaborate on the first phase and focuses on the tasks that must be done before the rehousing and the situation when the rehousing to the new building has taken place, but the transition to HIX is not yet implemented. Based on the requirements from Section 5.3 and the actions that must be done to improve the maturity level at Appendix L, a Gantt Chart is made as a proposal for the implementations needed in the first phase (Table 7.5). This phase focuses on the situation from May 2015 until the rehousing in August 2015. Per task is indicated who is responsible. Some of the tasks must be done in both phase 1 and phase 2.

A point that is suggested is to implement a key performance indicator (KPI) report. By recording the reasons of failures and the corresponding action(s) to solve the failure a good quantitative overview can be made of the performances. This KPI report can also be used for process improvements, for

example by making process adjustments to eliminate or reduce failures. Meetings between RdGG and Combi-Ster are recommended to discuss these performances, process improvements, and other important businesses. By these meetings the two parties can learn from each other and adapt the processes better on each other. It is suggested to have more often meetings in the beginning before and right after the rehousing (e.g. monthly), and reduce this gradually to finally once per quarter or half year. In May the meetings for the coming months should be planned. In August the recurrence should be again discussed as the rehousing takes place and thus the process changes. Also the making of clear work process agreements should be made in May and evaluated and possibly revised in August.

A provisional process flow for the first half year after the rehousing has been proposed (Appendix M). When the actions of phase I are implemented and RdGG has moved to the new building this provisional process must be followed. The grey steps in this process flow are the steps that are adapted compared to the proposed design process. Some steps are not changed, but will take more effort like planning the surgeries per day since the underlying checks by the system will not be possible yet. One should take into account that the risks and times as presented in Chapter 5 are not applicable for this process. Expected is that the process flow will take more time, and possibly some risks increase since steps that control previous risks are not yet available. In the Gantt Chart (Table 7.5) Combi-Ster has been abbreviated to C-S.

TABLE 7.5: GANTT CHART FOR IMPLEMENTATION PHASE I

Nr.	Phase	Task	Responsible	Concerning requirements	May	June	July	August
		RdGG and Combi-Ster						
1	1+2	Make SLAs	JIT project leader + C-S manager	2.1				
2	1+2	Plan meeting with RdGG and C-S on regularly basis (e.g. monthly in beginning and less later)	OR team leader + C-S team leaders					
3	1	Make KPI report	JIT project leader + C-S manager					
4	1	Make list with data that must be shared (and keep supervision)	JIT project leader + C-S manager					
5	1	Make data in both systems unambiguous	I&I + C-S manager	1.1				
6	1	Become known with each other's processes	JIT project leader + C-S manager					
7	1	Create understanding of interdependence	JIT project leader + C-S manager					
8	1+2	Implement connection between systems of RdGG and C-S (track & trace; pick list; info trays; protocols)	I&I + C-S + ChipSoft + KPN	1.3; 1.4.1- 1.4.4; 3.2; 3.3; 4.23; 5.3; 5.4; 6.5				
9	1	Implement all scanning points	I&I + C-S + ChipSoft + KPN	1.2; 3.5; 4.5-4.9; 6.3.1; 6.4				
		RdGG						
10	1+2	Make clear work process agreements	OR manager + JIT project leader	4.1-4.10; 4.12-4.14; 4.18; 4.19; 4.22-4.26; 6.3.1; 6.3.2				
11	1	Update (and maintain) digital protocols	OR manager + I&I					
12	1	Change structure of ortho meeting	OR manager	4.1				
13	1	Assign trays to treatment codes	I&I	3.4.1; 4.2				
14	1	Check relevant treatment codes and trays with each specialism	I&I + specialist + field expert	3.4.1; 4.2				
15	1	Assign communication person(s) (at both RdGG and C-S)	JIT project leader + Combi-Ster					
16	1	Assign contact person for system/software problems (at both RdGG and Combi-Ster)	I&I + Combi-Ster manager					
17	1	Change layout for enter new surgery in ChipSoft	I&I	3.4.1-3.4.5; 4.12				
18	1	Implement filters in system	I&I	3.6.1-3.6.7; 4.13; 4.18; 4.22				
19	1	Implement possibility to change/add information in system after planning surgery	I&I	3.1;				
		Combi-Ster						
20	1+2	Make clear work process agreements	C-S manager + team leaders	4.9; 4.10; 6.3.1; 6.3.2; 6.4; 6.5; 6.7-6.10				
21	1	Implement two inventory locations in the system	C-S IT + KPN	5.1				
22	1	Implement priority levels of the trays in the system	C-S manager + KPN	1.4.2; 4.24; 5.2; 5.3				
23	1	Assign communication person(s) (at both RdGG and C-S)	JIT project leader + Combi-Ster					
24	1	Assign contact person for system/software problems (at both RdGG and Combi-Ster)	I&I + Combi-Ster manager					

7.5 Preliminary implementation phase II

After the rehousing phase II will start. This phase will focus on the time from September 2015 until March 2016, six months after the rehousing. By this time RdGG will update their ChipSoft IT-system to HIX. Here the final requirements will be implemented as shown in Section 5.3 and Appendix L. Again a Gantt Chart is made to show the planning proposed for the required tasks to be implemented (Table 7.6). In the Gantt Chart Combi-Ster has been abbreviated to C-S. When all implementations are done, the designed process from Chapter 5 and Appendix J can be applied with the corresponding risks and times of the process flow as presented in Chapter 5 and Appendix I and K.

Some tasks must be done in the beginning and end of this phase as some process steps change. The service level agreements made should be evaluated and possibly revised in both September and March. This also holds for the work process agreements made and the planning of the meetings between RdGG and Combi-Ster.

Action 28 “implementing a way to systematically use data to improve processes” is shown in grey since this process is not required for the designed process. It is an additional action to further improve the maturity of the attribute “process improvement” to level four. By systematically obtaining and using data, processes could be improved for example by actively identifying trays with a shortage in availability for purchasing to prevent surgery delays or cancellations due to tray unavailability.

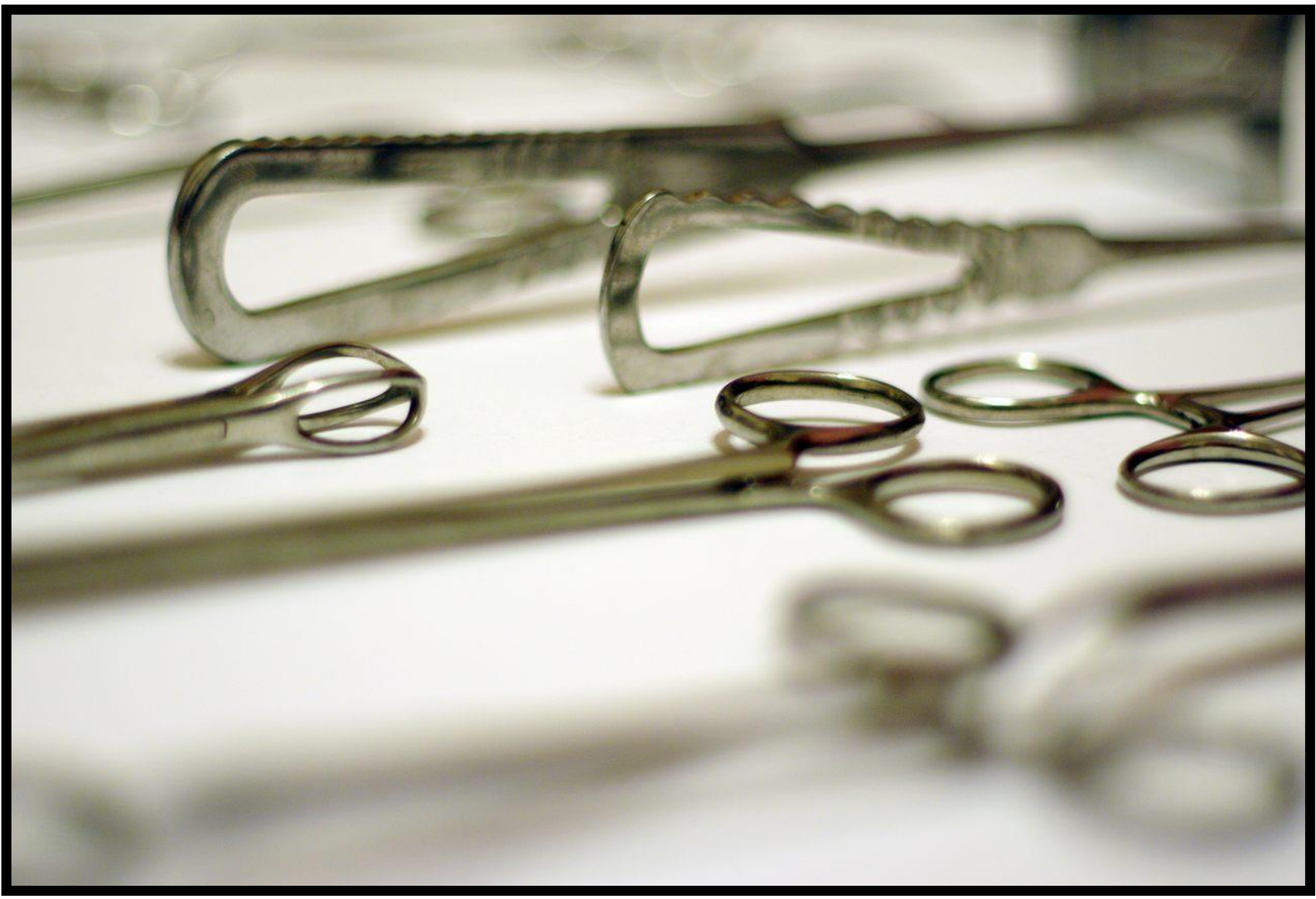
TABLE 7.6: GANT CHARTT FOR IMPLEMENTATION PHASE II

Nr.	Phase	Task	Responsible	Concerning requirements	September	October	November	December	January	February	March
		RdGG and Combi-Ster									
25	1+2	Make SLAs	JIT project leader + C-S manager	2.1; 6.1							
26	1+2	Plan meeting with RdGG and C-S on regularly basis (e.g. monthly in beginning and less later)	OR team leader + C-S team leaders								
27	1+2	Implement connection between systems of RdGG and Combi-Ster (info loan trays; info weighing)	I&I + C-S IT + ChipSoft + KPN	1.3; 1.4.4; 5.4; 6.6							
28	2	Implement way to systematically use data to improve processes	I&I + C-S IT								
		RdGG									
29	1+2	Make clear work process agreements	OR manager + JIT project leader	4.11; 4.15; 4.17; 4.20; 4.21; 6.3.4							
30	2	Include information concerning loan trays in system (order status, used trays/implants)	I&I	3.4.6; 3.4.7; 3.6.8; 4.12; 4.15; 4.17; 4.20; 4.21; 5.4							
31	2	Implement connection of the OR planning in the system to availability of the trays (conflicts must be noticed/denoted by system)	I&I + ChipSoft	3.3							
32	1	Implement warning system if trays are not available on time during the process	I&I + ChipSoft	3.2; 4.23							
33	2	Implement weighing of trays	I&I + ChipSoft	4.11; 6.3.4							
		Combi-Ster									
34	1+2	Make clear work process agreements	C-S manager + team leaders	4.11; 6.1; 6.2; 6.3.4; 6.6							
35	2	Implement ability in system to keep track of expiration date of trays	C-S IT + KPN	5.5							

7.6 Conclusion of the preliminary implementation plan

This Chapter included the *decision* phase of PD and looked at the preliminary implementation plan for the designed process flow in Chapter 5 and provided an answer to the final research question "*How should the designed process flow be implemented?".* Concluded is that the current state is not yet developed enough to directly implement the designed process. By introducing and using a SCCMM the current situation and the desired future situation are easily visualized. Concluded is that especially the level of trust in each other and the IT must be increased. Just as during the analysis and design phase, the actors are also important during the implementation phase (Goggin, Bowman, Lester, & O'Toole, 1990) (Nutt, 2002). To know how to involve each actor a stakeholder engagement plan has been performed. By analysing the priority and level of attention of the stakeholders the proper communication approaches for each stakeholder are identified. The key players are Combi-Ster, the team leader OR, the OR assistants and the IT department of RdGG. These actors must be closely managed and involved during the implementation phase. However, one should know that the keeping track of the stakeholders is an ongoing process, as both the stakeholders and their interest might change over time (Thompson, 2015).

The implementation is divided into two phases. The designed process flow can be fully implemented after around half a year after the rehousing, for the between time a provisional process is suggested (Appendix M). However, one should notice that the risks and time as proposed in Chapter 5 are not applicable for this provisional process.



8 Conclusions and recommendations

8.1 Conclusions

This report proposed a design for the process flow of surgical instrument trays for the future situation of RdGG and Combi-Ster, where Combi-Ster is going to facilitate the storage of the sterile instrument trays. This means that the delivery process will change from push to pull. The context of this study is taken into the fields of efficiency and safety, which are connected to the process flow of surgical instrument trays. Therefore, the following objective was formulated:

To design a process flow for the surgical instrument trays of Reinier de Graaf Gasthuis and Combi-Ster with the focus on safety and efficiency and to advice on its implementation, in order to handle the future situation.

The chosen method is Participatory Design (PD), which provides a guideline for a structured design process. PD leads to a designed product that meets the users' specific needs by actively supporting participation and involvement of a multidisciplinary team into the design and decision-making process (Pilemalm & Timpka, 2008) (Namioka & Rao, 1996). The involved users during this research were from the OR, IT and planning departments of RdGG, and the manager and team leaders of Combi-Ster. PD is an ongoing process and thus must continue even after this research is ended. This research focused on orthopaedics, a specialism that uses a large amount of instruments during surgery and frequently use loan instrument trays.

The most important changes of the designed process flow compared to the analysed current process flow are that trays will be tracked and traced during the whole process (based on scanning at fixed moments), information is more digitalized in one central system and more systematically entered/retrieved, and an interaction exists between the systems of RdGG and Combi-Ster. During various process steps support is given by IT systems, for instance when planning surgeries based on the availability of trays and priority at Combi-Ster.

Literature states that by applying a pull based delivery system the efficiency and safety should increase. Concluded can be that this is also the case when applying a pull based delivery for the sterile instrument trays. However, no decrease in the overall inventory levels will occur as we are dealing with a closed loop system and most of the inventory will only shift from RdGG to Combi-Ster. The number of deliveries stays the same, as these are also used to deliver and retrieve goods to and from the policlinics. An increase in the availability of the trays is expected since Combi-Ster can process the trays based on priority, leading to an improvement of the customer service. The most important findings when comparing the current with the designed future process flow are:

- The overall process time for normal trays stayed the same at around 450 minutes, whereof the process time of the OR staff decreased with 25% and the process time of Combi-Ster increased with 23%. For loan trays the total process time decreased with almost one hour to 660 minutes. There is a decrease of 85 minutes for the OR staff which is equal to 31% and an increase in process time for Combi-Ster of 30 minutes, which is equal to a 9% increase.
- The total number of risks of the designed process of normal trays increased with 9% (6 risks), and the high classified risks increased with 10% (3 risks). For loan trays the total number of all risks has decreased with 17% (26 risks) whereof 11 (23%) of high classified risks.
- The sum of the scores of the high risks is greatly reduced with almost 20% from 510 to 414, indicating that the designed future process is safer. The total number of high scoring risks is decreased with 14% (7 risks).

- The designed process flow shows a decrease of 42% of total accepted risks (64 risks). More risks are controlled later in the process, meaning that these risks are removed later in the process. 38 risks (540%) are more controlled in the designed process compared to the current process. For the high scoring risks there is a decrease of almost 40% (16 risks) of accepted and 50% (2 risks) of partly controlled risks, and an increase of 275% (11 risks) of controlled risks.
- A shift in the categories of the risks between the current and future situation has occurred. All 9 risks regarding to a lack of systematics are dissolved. Only 1 risk left regards to a lack of overview, which is a decrease of 85%. A 40% decrease can be seen at the risks assigned to the not up-to-date pick list and cleaning specifications. For the designed process an increase of 30% (7 risks) can be found for the number of unintended human errors is found, but of these risks also a number is being controlled in later sub-steps. Making strict and clear rules concerning the work process can help to control these errors.
- It can be concluded that the first main step where the needs are determined (especially step 1.1 when entering the patient in ChipSoft), is of very high importance. The IT-system is being more important this must work smoothly.

A second iteration is done according to the PD based on a single meeting with a specialist and field expert of plastic surgery. This specialism uses less different instrument trays compared to orthopaedics. The process proposed during this meeting included all required steps but also additional steps, as was expected beforehand because orthopaedics uses a lot of different instrument trays, including loan trays. This expectation also holds for other specialities, but this has not been verified.

Both RdGG and Combi-Ster are not yet ready to implement the designed process flow. The future situation sets high standards for the underlying IT-systems. An integration of the systems of both RdGG and Combi-Ster is needed to at least guarantee the same safety, reliability, and efficiency of the current process flow of the instrument trays. An important aspect to reduce risks is the centralization of information by means of the IT-systems and make this information available for different parties. More insights in the differences between the current and needed situation are created by the introduction of a new Supply Chain Collaboration Maturity Model. Concluded from this model is that one of the most important bottlenecks are the IT-support and level of trust, which has in the past year been further decreased by failures during the pilots. As it is important to also involve actors during the implementation phase (Goggin, Bowman, Lester, & O'Toole, 1990) (Nutt, 2002), a stakeholder engagement plan is executed. By analysing the priority and level of attention of the stakeholders the proper communication approaches for each stakeholder are identified. The key players are Combi-Ster, the team leader OR, the OR assistants and the IT department of RdGG. These actors must be closely managed and involved during the implementation phase. The implementation is divided into two phases. Phase I focuses on the situation from May 2015 until August 2015, when the rehousing takes place. Since not all actions can be implemented before the rehousing a provisional process flow is proposed. Phase II describes the situation when everything must be implemented, ranging from September 2015 until March 2016. For both phases a planning is proposed in the form of a Gantt Chart.

8.2 Recommendations

The change in storage location of the trays has several effects on the working and logistical processes of the instrument trays. This research elaborated on these processes and has proposed a process flow for the future situation of RdGG and Combi-Ster. This section will give some recommendations for RdGG based on the research done. Firstly, this process has been designed according to the Participatory Design methodology. Since Participatory Design is an ongoing process, it is recommended to continue this even after this research is ended. This can be done by involving other specialities to

further refine the process flow for each specialism and lowering the risks when implementing the design. By involving other specialities, the implementation resistance will decrease.

Second, the total score of high classified failure decreases with almost 20% compared to the current process. It is highly recommended to implement the design in two phases and make use of the provisional process (see Appendix M). By splitting up the implementation tasks more time will be available to implement the actions correctly in once. One of the important things that must be done correctly is the implementations of the IT-systems as recording and sharing the right information is a key process. It is of high importance to reserve enough time for this process to discuss the needs with the software companies ChipSoft and KPN. Chapter 7 already presented recommendations in a preliminary implementation plan with actions grouped by phase. These actions must be further elaborated in a more detailed implementation plan.

Third, during the HFMEA on the designed process flow risks were identified based on the limitation of the number of trays. It is expected that this is not only a risk in the designed process, but also already in the current process. As currently the OR staff can combine instruments from different trays to still be able to perform the surgery, this might not be possible any more in the new building. Advised is to investigate trays that have a structural availability shortcoming. This can be done by recording tray demand and unavailability. By systematically obtaining and using this data, bottleneck trays can be identified earlier and purchased to prevent surgery delay or cancellation due to tray unavailability.

Fourth, it is of high importance to standardize the trays, as there are currently differences between the trays at RdGG and DHV. Within RdGG projects are already ongoing to standardize some trays. It is important that the results of these projects are well communicated, as this is out of scope during the JIT project within RdGG, but is an important factor.

Fifth, as in the current process unused sterile trays are placed back in the storage of the OR-complex, Combi-Ster sees all incoming trays as soiled and thus cleans and sterilizes all incoming trays. Investigating the number of sterile trays transported back to Combi-Ster will give insights if a clean flow from RdGG to Combi-Ster will be beneficial since sterile trays will not be cleaned and sterilized again, thus saving money and increasing tray availability. However, clear agreements must be made for this process because it is unaccepted if unsterile trays will be used during surgery.

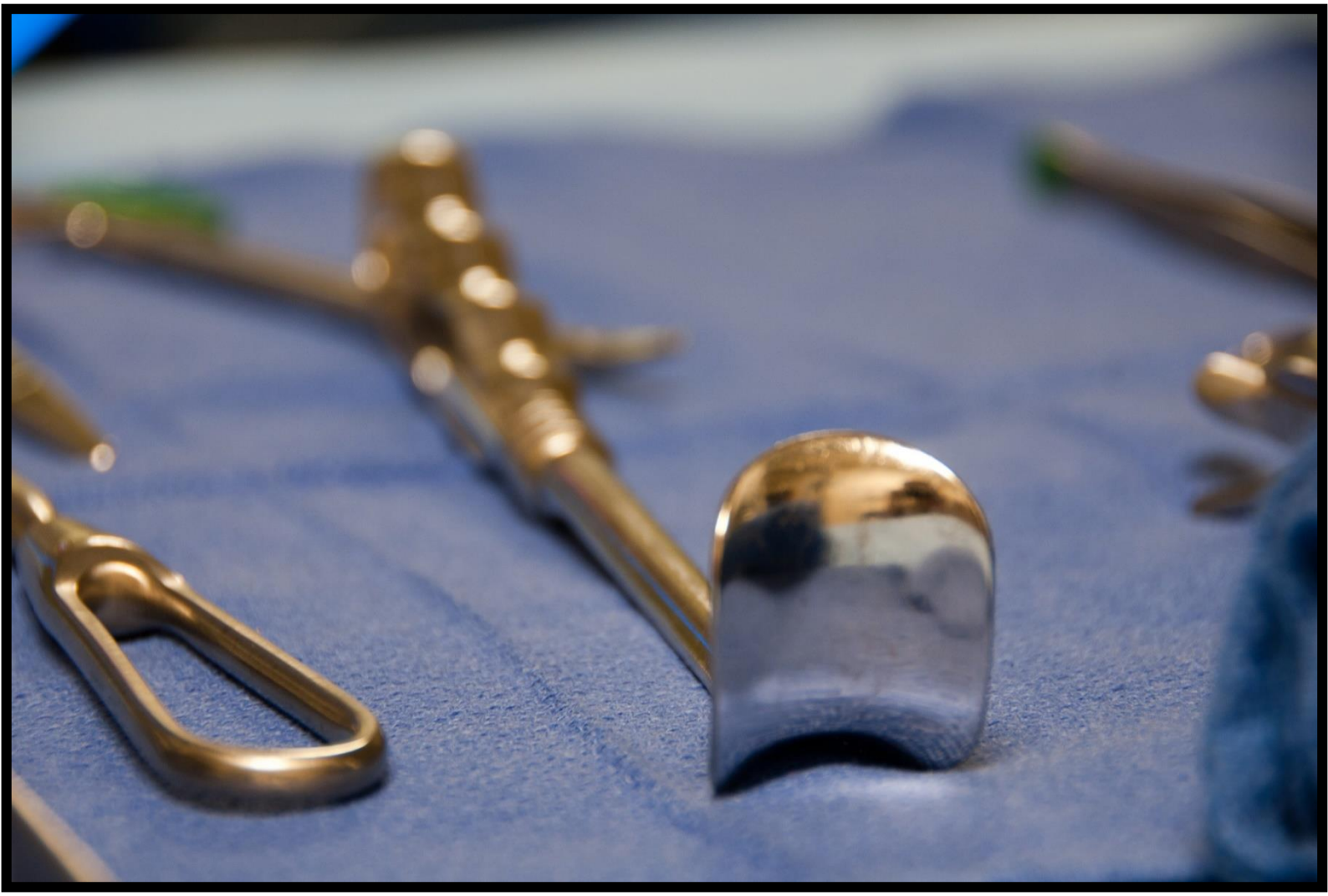
Sixth, it is suggested to start up a research to the occurrence and causes of torn packages of sterile trays. Torn packages lead to that trays become unsterile and must be packed in a new wrapping and sterilized again. During the analysis of the current situation it was indicated that this happens weekly (or even more often) and the impact can be high since it is often not recognised until just before surgery. This can lead to delays at the OR.

Seventh, another point that appeared during the second HFMEA is that it happens quite often that trays are not correctly composed and instruments are missing or a wrong instrument is placed on the tray. This can have a big impact since this will only be noticed just before or during surgery. A solution for this can be the implementation of RFID tags on all instruments separately and to automatically perform a check when composing the tray at Combi-Ster. Investigating in the possibilities and the costs and benefits of such an application is recommended.

Eighth, for the long term it is recommended to elaborate on the possibility to share the inventory of trays with the HagaZiekenhuis, since RdGG and HagaZiekenhuis are merged. HagaZiekenhuis also uses Combi-Ster to clean and sterilize trays. By also storing the sterile trays of HagaZiekenhuis at Combi-Ster one central storage can be created for both hospitals. This requires that the planning of surgeries

must be aligned and Combi-Ster must have enough space to be able to store all these trays. However, this point of recommendation would be for long term and should be thoroughly investigated.

Finally, it is advised to investigate the possibilities of custom made trays at Combi-Ster based on the needed instruments for surgery. This can lead to a decrease in number of instruments needed for surgeries, as only the instruments will be delivered that will be used instead of a whole pre-packed tray. However, little is known about this in literature and more investigations are needed before applying this. This point is thus for the long term.



9 Discussion

This chapter discusses the research done. As there was no literature found about externalizing the sterile tray storage it is expected that this has is not (yet) frequently been applied. This research designed a process flow for a demand driven (pull) delivery system for the instrument trays and the change in risks compared to a push system by use of the Participatory Design (PD) method. Reflecting back on this methodology it was a very helpful method. The process flow of the instrument trays is complex and elaborated. Using a team of users to visualize this process and designing a new process flow was helpful. During the design for the future situation resistance was noticed under the employees towards the implementation of the JIT Project. PD therefore was a good method since it involves users in the design process and reduces the implementation resistance. Though, one can question the assignment of the designer role to the users, as they might not have experience with designing processes. Since the users have a lot of knowledge and understanding of the current processes it might have been that the outcomes of the design would be less innovative and only minimal changes are made in the current process design. However, this was not experienced during the design phase. The design was focused on a demand driven process flow and did not require the most innovative designs. Besides, it is still the task of the researcher to facilitate and participate during the design process from a designer's perspective. When reflecting on PD as methodology concluded is that it was a good method for this research.

As already mentioned in the methodology (Chapter 2), this research is partially part of a larger PhD research of Annetje Guédon, but one must know that this report in front of you is a research on itself and is my own product. Annetje Guédon had already started the organisational parts of the PD before this research started by assembling a multidisciplinary team and scheduling dates for the HFMEAs. During this research she was also the contact person towards RdGG and Combi-Ster, as she already had the contacts. Without the already start-up of Annetje Guédon this research would not have been possible. The HFMEA sessions of the analyses phase, the design meetings and the HFMEA sessions of the designed process were done in collaboration with Annetje Guédon. Processing of the information and concluding the retrieved findings from these meetings were done by myself. It was also my task to come up with the following steps on how to use this information. As already in the beginning of my research I was invited to several meetings, a visit to UMCU, and IT-system demonstrations of both ChipSoft and KPN, where Annetje Guédon was not involved with.

For the analysis part of the current process and to test the designed process two HFMEAs were performed. One must know that the determination and scoring of the risks are depended on the opinions of the team members, which may have increased the subjectivity. The first HFMEA was based on an existing process, where the second HFMEA was prospective and thus on a not existing process. This prospective analysis can have led to that risks are missing, but this can only be checked after the implementation of the designed process. The analyses of the current and designed process flow are thus not totally consistent with each other since the second HFMEA expects the imagination of the participants. Also the pilots could have influenced the team by scoring the risks. During the sessions of the HFMEA a lot of concentration of the participants was requested. Even considering the downsides of the HFMEA, I still think this was the best method to identify the risks on both the current and designed future process flow.

From the HFMEA it became clear that failures due to human errors were by far the largest group of risks. However, during the research the focus was more on applying a pull system and reducing the occurring risks and inefficiencies instead of actively reducing the number human errors. This can be seen as illogical. However, the new process has taken these errors into account by controlling these later in the process, but does not directly prevents them. Human intervention in a process always

comes with possible failures. Providing the right environment and making clear work agreements can help to minimize these failures.

The analysed risks in this research are all related to a specific process step. There are also some residual risks that did not come out nor were investigated during this research as they were out of scope, but should not be neglected. Five of those risks are described below.

1. The focus of this research was on the instrument trays, however also the procedure trays must be demand driven delivered after the rehousing. These procedure trays are manufacturer pre-packed packages containing disposable products like sutures, gauzes, covering materials for the patient, syringes and needles. How to include these in the demand driven delivery must still be investigated. A possible solution can be to see these procedure trays as instrument trays and 'order' them just as normal trays via ChipSoft. However, when digitalizing the inventories of these procedure trays the system must keep into account that these procedure trays are for single use and thus do not return to the inventory, but must be ordered at the manufacturer again.
2. A second residual risks is the bottleneck in the number of trays. It was already recommended to start an investigation to bottleneck trays. It can be that these trays are going to need a lot of attention and guidance from the users to prevent delays or even cancellations of surgeries as trays that can stand in for the missing instruments are less accessible. This may lead to inefficiencies in the process. This risk already partly became clear from the HFMEA on de designed process flow, but was not further taken into account.
3. Thirdly, there is no designed emergency procedure for when the IT-system(s) is/are down. There must be thought of an emergency process flow that must be started when support from the IT-systems is not possible. An important aspect is that both RdGG and Combi-Ster are clearly up-to-date about when and how to start and perform this procedure.
4. Fourth, it is not clear yet for lower level disturbances in the process how to systematically tackle these, e.g. when a tray is not delivered (or the wrong tray is delivered). When implementing the proposed design these procedures must be investigated. This can be done with help of the identified risks. A step-by-step approach must be designed for these cases. This must be created besides the already recommended clear (service level) agreements between RdGG and Combi-Ster.
5. The final residual risk is that over time extra checks might be implemented in the designed process flow as users find it difficult to relinquish responsibilities. These extra checks will cost time and make the process less efficient. Though it sounds contradictory, extra checks can also introduce more risks as tasks are done with less attention since the thought is that work will be checked later on. The slip-in of these extra checks must be closely watched to prevent this to become a standard step. Attention must be given by RdGG and Combi-Ster to these residual risks when implementing the designed process flow.

During this research a parallel project of RdGG and Combi-Ster was ongoing for the preparations of accommodating the sterile trays at Combi-Ster by means of pilots and meetings. This made the research more difficult because decisions were made during this research, for example the choice for the IT-systems. The question if a connection between the two systems was going to be implemented or if Combi-Ster would to switch to ChipSoft and thus one system would be used was answered after the design was made. Next to this it is not totally clear if the suggested IT solution will be as proposed.

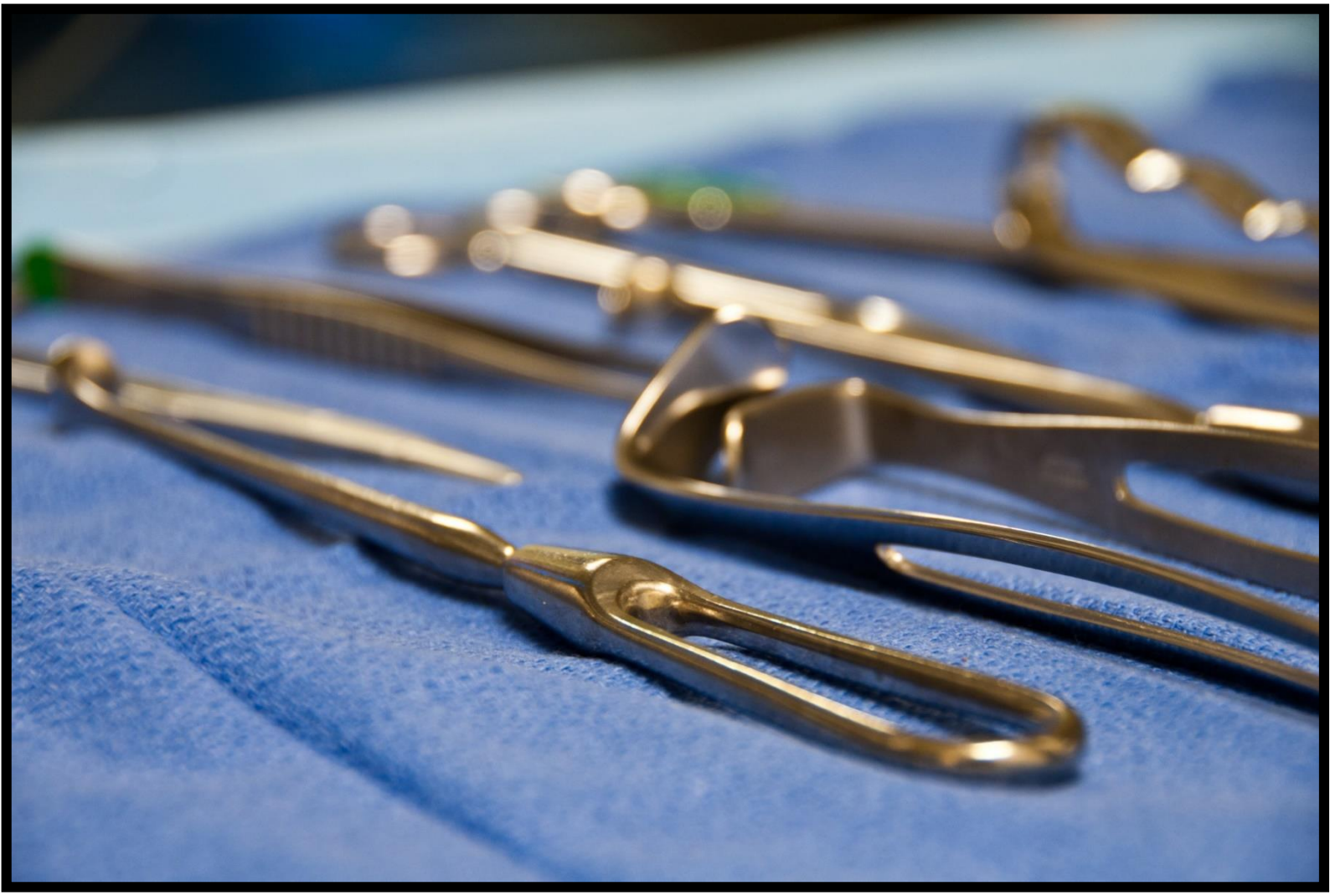
The user-friendliness is of high importance since these have lots of consequences for the processes. How these changes will be received by the employees is not thoroughly investigated.

As a supply chain collaboration maturity model (SCCMM) is proposed in Chapter 6, one should know that this model has not been been evaluated extensively. As explained the evaluation is done by myself (type 1 evaluation) and by Annetje Guédon and Vivian Hoeijmans that were seen as 'experts' of the process where the SCCMM was applied on (type 2 evaluation). However, during these meetings it was not clearly communicated that their insights would be used as evaluation of the model. When considering the application of the SCCMM and the usage of the outcome I think that the types of evaluations were enough, as the model was used as support and not as a central part of this research. The SCCMM is mainly used to see where the biggest improvements must be made within RdGG and Combi-Ster. Together with the implementation requirements set in the design chapter (Chapter 5) tasks were formed to be able to reach these maturity levels during a certain time period.

When asking the question if externally storing sterile trays outside the OR-complex and implementing a pull delivery system is a good decision there is no direct answer. However, implementing such a process takes a lot of attention and actions. The total score of high classified risks decreased with almost 20% for the case of RdGG and Combi-Ster, but if this is identical for any other hospital cannot be said. In this case a decrease in process time for loan trays can be seen. However, based on data of Combi-Ster and RdGG can be concluded that loan trays are only used in 3% of all surgeries. There are thus no huge time saving by introducing a pull based delivery system. Cost savings will mostly occur based on the time shift from the OR department to Combi-Ster since employees of Combi-Ster are cheaper compared to the OR employees. An estimation of these costs is difficult to make based on the outcomes of this research, because the indicated times are not always per tray or surgery. For example the ortho meeting, which is a 15 minute weekly meeting the surgeries and needed trays for the coming two weeks are discussed. Dividing these 15 minutes per tray is not possible as the number of trays discussed per meeting varies. In the process time of the analysed and divided process flow this step is set on 15 minutes as dividing and assigning these 15 minutes to each tray is thus not possible. Besides, cleaning the trays in the washing machine and sterilization in the autoclave is performed with multiple trays at once. However, the indicated times for the current and designed process are consistent with each other.

For the sterilization department clear improvements can be seen as they will be able to distribute the workload by the introduction of tray priority, leading to better and more considered choices of which tray should be first processed. Trays that must be processed to replenish the Combi-Ster storage do not have to be processed directly, and can be processed on times when the workload is less high.

It is advisable when considering a pull delivery system for the trays to first research the costs and benefits and have a clear plan before really applying. Making clear (service level) agreements on forehand, preferably on paper is an important task.



10 Reflection

This chapter gives the reflection on the performed research. It focuses on the research process and the results and on my own personal development.

10.1 Research process

At the start of this research it was difficult to determine the scope and the precise direction of this research. The literature research took more time than expected as little scientific research on this topic was found, making it difficult get a clear view of the topic. This also led to that the research methodology was not clear. This was also noticed during the kick-off and mid-term meeting. My choices were not as transparent and clear for others as I wanted to. A good explanation of the choices made is essential as it might not be as clear and logical as I think it is. I learned to take a step back sometimes and to consider the larger picture again with a helicopter view, which enabled me to structure the report better. I learned that by overlooking what I already had achieved I was able to continue in the right direction. For this it is important to realize that things must be done one step at a time instead of taking big steps. As a result I learned to accept that doing a research is a more iterative process and it sometimes helps to let the research rest for a bit instead of always wanting to continue. Overall, by this process I have learned to structure a report and my thoughts.

This research focuses on a practical problem, which resulted in limited scientific findings. The literature found of JIT, VMI and CPFR was mostly applied on user goods, but surgical instrument trays have a closed loop system. Therefore, the literature found was not always useful. With this research I have contributed to the literature with the focus of logistics of goods within hospitals, or to be more specific, of the application of a demand driven delivery process from the CSSD to the OR-complex of the sterile instrument trays.

This research is done to obtain my MSc title of the TU Delft and the assignment came from the RdGG. Where the TU Delft requires a scientific value, the RdGG was mainly interested in the practical application. It was therefore important to find a balance between these two expectations. Fortunately, the RdGG gave me enough freedom to do my own research. Looking back I believe I have achieved both interests.

10.2 Research results

This research has involved the users during the design and decision processes. It was important to identify implicit design decisions made and explicitly record these in this report, as outsiders need an explanation of the decisions made. I have experienced that it sometimes can be difficult to recognize all decisions made and it would have been easier when directly identify these decisions. However, I was able to manage this which has improved my report and have learned from it for next times. By designing with the users I have noticed that the theory is not always accepted in practice, especially when safety is an important aspect. Within a hospital there are employees that have to make important decisions and deal with a lot of responsibility. Therefore, they do not just accept changes if it is said to be better.

During the analysis phase the identified process changed sometimes and I have learned that not every time somebody knows the right answers. As in a previous meeting steps were identified, the next meeting these same steps were said to be incorrect. I have learned that being straightforward, specific and as simple as possible in asking questions mostly leads to the best answers.

As already said in the discussion, during this research parallel projects of RdGG and Combi-Ster were ongoing that had some common ground with this research. This sometimes made it difficult to do this research, as I the decisions that were to be made could affect my design. Within RdGG a lot of projects

are ongoing were I was not aware of. This made it difficult to not make decisions that were part of another project. During this research I have noticed that the focus should not be only at the physical flow, but also on other fields like the IT systems and governance.

10.3 Personal development

When reflecting back on my personal development I have learned a lot during this research project. As in the beginning performing a thesis by yourself seems scary and difficult, there is a lot to learn from it. In the beginning of this research I did not know a lot about hospitals and surgical instrument trays. Over time I gained more knowledge and insights of the processes within the hospital. Accepting that I became an 'expert' on the topic researched and that my thesis supervisors were there to guide me through the process, instead of them knowing the answer was a learning process for me. During the meetings with my supervisors I received a lot of feedback, which I learned to receive and accept instead of seeing it as criticism. It is important to understand and evaluate the given feedback in order to process it in an appropriate way.

As not everything immediately succeeds and some steps take longer than expected, it is important to accept the setbacks. I learned to accept that some things cannot be done at once, especially if you dependent on other people. I had to learn and accept that taking a break or continue on a later moment can be more beneficial as the outcome will be of higher quality. Writing a thesis can sometimes feel as a lonely and endless process. I learned that by staying positive and being realistic about the goals really helps to manage this process. Besides, it is important to give yourself credits for the things you already have achieved.

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A. Graph of surgeries performed at Reinier de Graaf

In Figure A. a graph of the surgeries performed in the Reinier de Graaf per month from 2012 until July 2014 can be seen. The monthly numbers contain all kinds of surgeries performed. Concluded can be that the number of surgeries performed are decreasing.

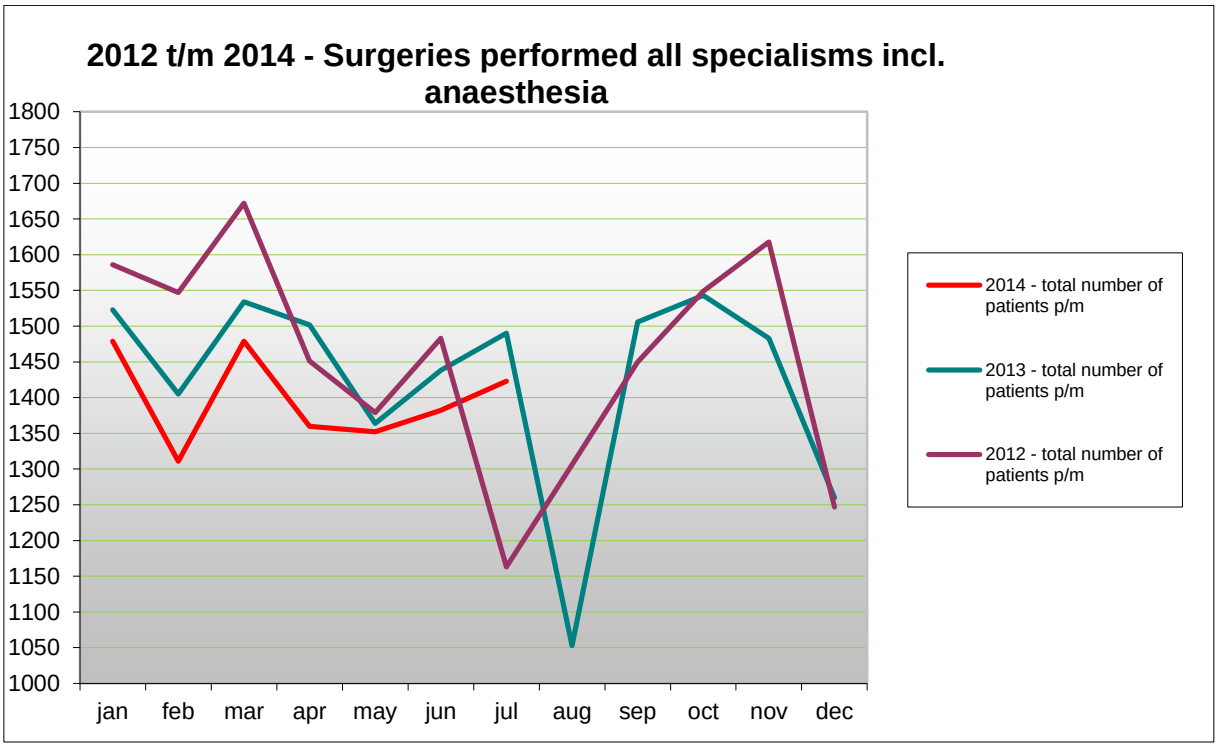


FIGURE A.1: NUMBER OF SURGERIES PERFORMED PER MONTH AT THE REINIER DE GRAAF (2012-JULY 2014)

B. Characteristics of the RdGG

Hospitals in The Netherlands are usually distinguished between regular hospitals, independent treatment centres and private clinics. The biggest group of these three are the regular hospitals, which includes the general hospitals, categorical hospitals, top clinical hospitals and academic hospitals (Raad voor de Volksgezondheid en Zorg, 2011). Table B.1 gives an overview of the different types of regular hospitals, and the number and supply of this type of hospital in The Netherlands.

TABLE B.1: TYPE OF HOSPITALS: NUMBER AND SUPPLY (RAAD VOOR DE VOLKSGEZONDHEID EN ZORG, 2011)

Type	Number	Supply
Regular hospitals	128	
Whereof		
General	60	Broad range of basic patient care
Academic	8	Broad range of basic patient care, top clinical/ top-referent care, research, education
Categorical	32	Specific basic patient care
Top clinic	28	Broad range of basic patient care, part of top clinical/ top-referent care, education
Private clinics	97	Treatments outside the basic health insurance
Independent Treatment Centres	129	(Specific) treatments within and outside the basic health insurance

RdGG is one of the 28 top clinical teaching hospitals of The Netherlands. These hospitals are also seen as high cure hospitals. Next to the basic healthcare also top clinical services are provided. Top clinical care is high specialized care like cardiac surgery, neurosurgery, IVF, et cetera. Additionally, high level of intensive care is also seen as top clinical care. These kinds of treatments require relatively expensive and specialized facilities. Top clinical hospitals usually have a superregional function (STZ ziekenhuizen, n.d.). RdGG also provides patients care outside their own region and includes 57 top clinical services (Reinier de Graaf, 2013).

The vision of the RdGG is that by centralize coherence and forming a single unit, professionals of the RdGG can provide better care, more compassion, clear information and greater patient satisfaction. This attitude must also lead to more efficiency, a smoother patient flow, reduced failure costs and lower mortality. This coherence also comes to the front in the daily care of RdGG, allowing general practitioners to have direct insights in the provision of care, care process and waiting times (Reinier de Graaf, 2013).

RdGG wants to be the best hospital of The Netherlands in 2016. This will be tried to accomplish by actively searching for connections to and between staff, patients and their family, (family) doctors, therapists and other supply chain partners and new (medical) talent in the health care market. Key policy issues are hospitality, expediency, quality and safety (Reinier de Graaf, 2013).

Table B.2 shows the number of beds and the (poly-) clinic production rates of the RdGG from 2010, 2011 and 2012.

TABLE B.2: NUMBER OF BEDS AND PRODICTION NUMBERS (POLI-) CLINIC (REINIER DE GRAAF, 2013)

	2012	2011	2010
Authorized beds (actually in use)	881 (590)	881 (590)	881 (590)
Of which beds for post-IC high care	4	4	4
Cradles	24	24	24
Specialist places (weighted)	109	109	102
Bed occupancy rate *	93%	93%	93%

Hospitalizations (unweighted)	28.341	29.663	28.265
	2012	**2011**	**2010**
First outpatient visits (unweighted) **	121.381	138.020	164.985
Day admissions normal	28.722	28.955	26.341
Day admissions heavily	5.110	4.549	4.350
Nursing days	128.684	132.094	134.933
Average length of hospital stay	4.5	4.5	4.8
Wrong number of hospital stay	3.040	4.168	4.882
Percentage of wrong number of hospital stay	2.4%	3.2%	3.6%

* Calculated on the basis of hospitalizations, excluding day treatments.

** As from 2011, no more first outpatient visits are calculated for the B-segment. In 2012 the shift from A to B segment occurred.

The RdGG consists of the following surgical specialisms, see Table B.3.

TABLE B.3: SPECIALISMS AT REINER DE GRAAF GROEP (REINIER DE GRAAF, 2013)

Eye surgery	**Plastic surgery**
Ear, nose and throat surgery	**Trauma surgery**
General surgery	**Urology**
Gynaecology	**Vascular surgery**
Orthopaedics	

The Reinier de Graaf Groep and the HagaZiekenhuis of The Hague form together the umbrella foundation Stichting Reinier Haga Groep. Both hospitals independently provide the comprehensive package of care to their patients, including 24/7 (trauma) emergency care, IC and mother and child care. The hospitals have a joint Management Board and one Supervisory Board (Reinier de Graaf, n.d.).

C. Map of the current instrument tray storages

This appendix shows a map of the current storages of instrument trays at OK-B and OK-H. The shelves of the cabinets in OR-B are adaptable, thus it is difficult to say how many trays can be stored. To make an estimation the STE (standard volume unit), 60x30x30 LxWxH, is employed. Based on this it can be said that OR-B can store around 400 trays. OR-H has in total 6 cabinets to store instrument trays in. The height of the cabinets in OR-H are around 185 cm means that according to the STE only 6 level of trays can be stored. However, the cabinets have each 11 levels to store the trays. Thus this does not corresponds with the STE. Decided is to calculate the number of trays based on the 11 levels. Next to this storage facility OR-H also has 5 cabinets in another room to store trays. These are the same cabinets as in OR-B. This means that OR-H can store around 450 trays.

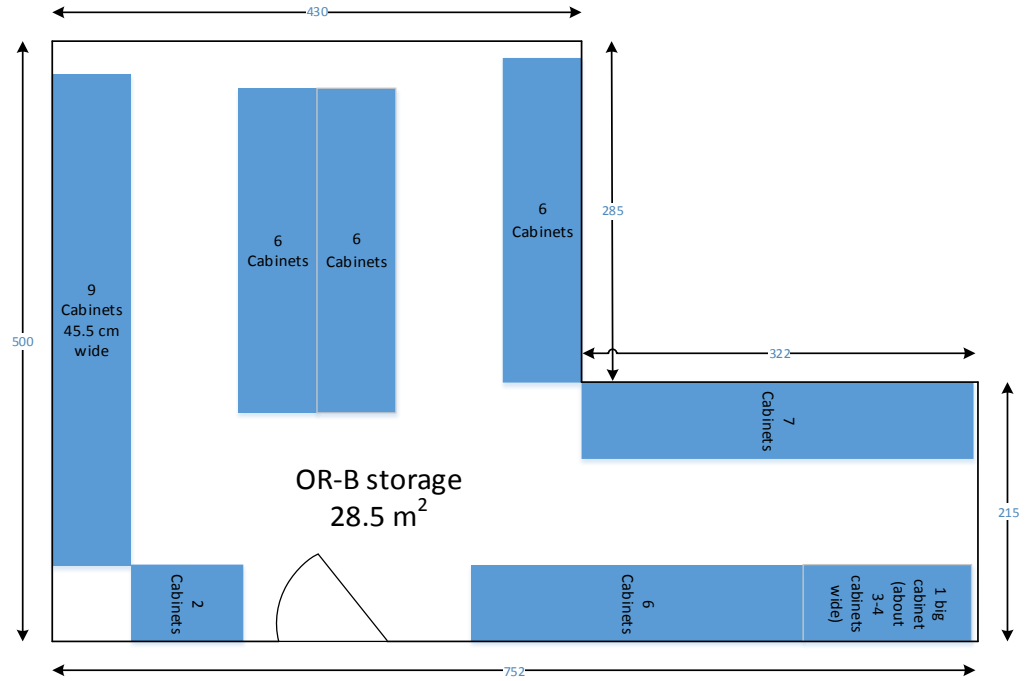


FIGURE C.C.1: MAPP OF STORAGE FACILITY AT OR-B

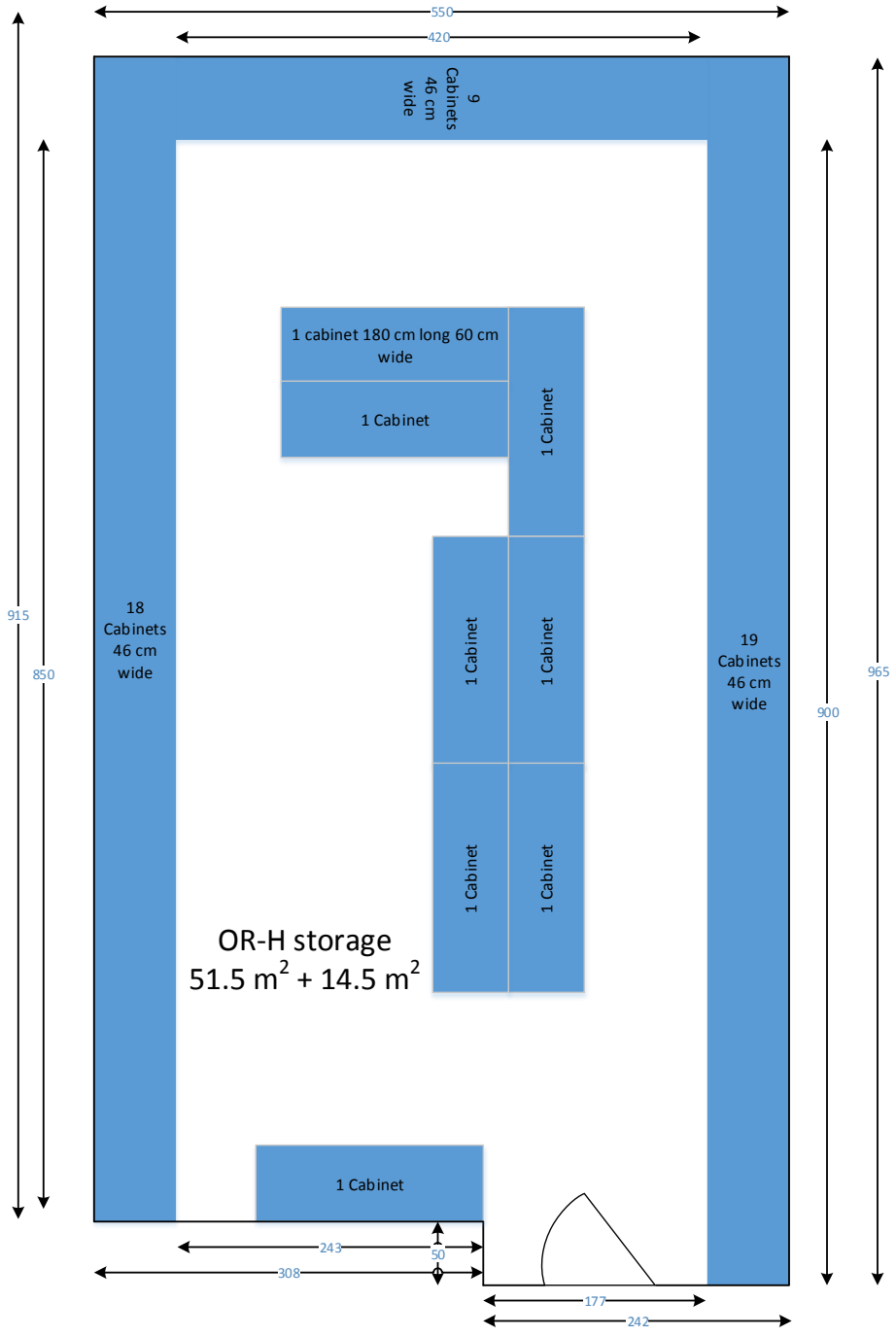


FIGURE C.2 MAPP OF STORAGE FACILITY AT OR-H

D. The new building

The project in general

Basis for the design of the new building was a "connected hospital", which involves matters such as compact, clear, daylight, easy orientation, view of the city and overlooking green, flexible and extensible. Next to this, the building must provide more efficient logistics and lower energy and maintenance costs to ensure lower operating expenses. A third requirement concerned the location, the new building must be placed the two current B- and H-building (Schreiber, 2012).

The new building consists of six floors that are horizontally connected by a central axis, see Figure D.1. The design of the building is based on a medico, the old Greek symbol for medicine. The different departments "swing" around the axis. The central hallway provides a clear overview that makes it easy for patients and visitors to quickly and easily find their way. The shape of the building and the extensive use of glass provide lots of daylight into the building. In the open inlets of the building will be used as patio with lots of green (Schreiber, 2012).

The design of the building is partly based on input from the staff. Smart Working will be introduced; doctors are going to work at flexible workplaces. This will lead to a better collaboration of the doctor and nurses around the patient. All polyclinics and most of the functional departments are housed at the first floor, which is reachable by an escalator. This comforts the patient when different departments must be visited (Reinier de Graaf, n.d.).

Planning

The construction consortium van der Linden/Kuijpers Installaties has been selected to construct the building. At the end of July 2012 the contractor agreements were signed. The construction of the new building will approximately take three years (Reinier de Graaf, 2013). Table D.1 gives a brief overview of the planning.

TABLE D.1: PLANNING CONSTRUCTION NEW BUILDING RDGG (REINIER DE GRAAF, N.D.)

Date	Task
July 2012	Sign contractor agreements
September 2012	Start construction preparation
October 2012	Start construction work (30 months)
March 2015	Completion construction
March 2015	Start establishment
(end of) August 2015	Relocation
After relocation	Demolish current buildings and finish field work

Negotiations with a previous construction consortium that did not reach an agreement, as well as the completion of the tender specifications have led to delays. Initially the site preparation would start beginning 2012, but is delayed until September 2012. Immediately after the summer of 2012 the engineering is started. At 31st of October the piling is started. This went without problems for local residents, patients, staff and private buildings and where completed earlier than expected.

The new building is being constructed at a former parking facility for staff between the B- and H-building. In the autumn of 2012 a temporary parking with sufficient capacity is made available at the back of the B-building. This to make the construction site available for construction and to cope with expected increasing parking pressure.

FIGURE D.1: MAPP OF THE 6TH FLOOR OF THE NEW RDGG BUILDING

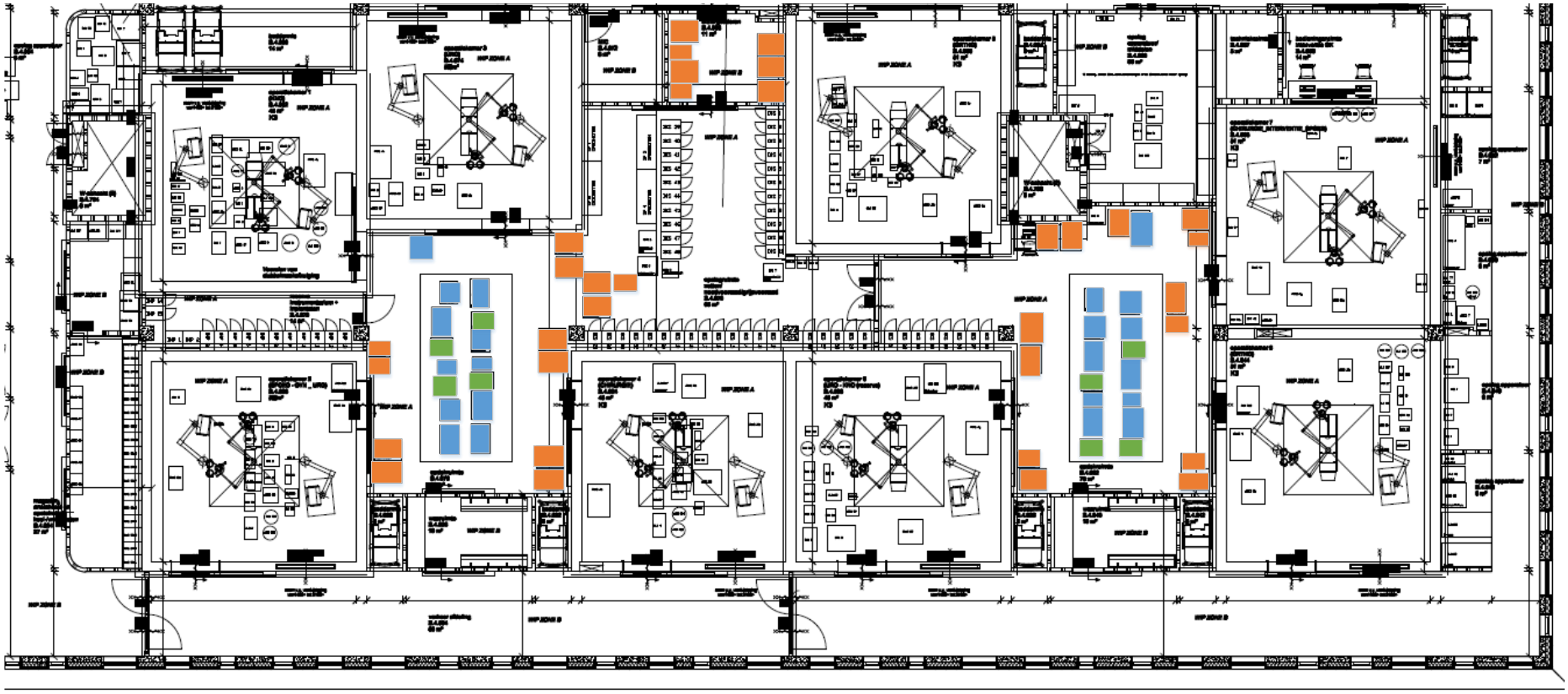


FIGURE D.2: MAP OF THE OR-COMPLEX

Figure D.2 shows a map of the OR-complex of the new building of RdGG. The orange boxes shows the places for the PBTs, in total 33 PBTs can be placed at the OR-complex. Based on this map concluded is that there is enough space at the OR-complex to store all PBTs when having a single delivery moment from Combi-Ster to RdGG, as the maximum number of carts in a truck is 16.

E. Transport Schedule of Combi-Ster

TABLE E.1: CURRENT TRANSPORT SCHEDULE OF COMBI-STER

Tijd	Vertrek CS	Aankomst OK B	Vertrek OK B	Aankomst OK H	Vertrek OK H	Aankomst OK DHV	Vertrek OK DHV	Aankomst CS
Rit 1	05.30	05.40	05.50	06.00	06.10	06.30	06.40	07.15
		OK B, afd + Poli B	OK B	OK H, afd + Poli H		OK DHV	OK DHV	
Rit 2	Vertrek CS	Aankomst OK H	Vertrek OK H	Aankomst OK B	Vertrek OK B	Aankomst CS		
Tijd	07.40	07.55	08.05	08.30	08.40	09.15		
			OK H, afd + Poli H		afd + Poli B			
Rit 3	Vertrek CS	Aankomst OK B	Vertrek OK B	Aankomst CS				
Tijd	10.00	10.30	10.40	11.00				
			OK B					
Rit 4	Vertrek CS	Aankomst OK DHV	Vertrek OK DHV	Aankomst CS				
Tijd	11.15	11.40	12.00	12.20				
			OK DHV, IVF					
Rit 5	Vertrek CS	Aankomst OK H	Vertrek OK H	Aankomst OK B	Vertrek OK B	Aankomst CS		
Tijd	12.35	12.50	13.00	13.05	13.10	13.20		
		OK H, Uro/oog	OK H, URO OK H	OK B	OK B			
Rit 6	Vertrek CS	Aankomst OK DHV	Vertrek OK DHV	Aankomst OK B	Vertrek OK B	Aankomst CS		
Tijd	14.00	14.30	14.45	15.00	15.15	15.30		
		OK DHV, afd + Poli DHV	afd + Poli DHV+ OK DHV		OK B			
Rit 7	Vertrek CS	Aankomst OK DHV*	Vertrek OK DHV*	Aankomst OK H	Vertrek OK H	Aankomst OK B	Vertrek OK B	Aankomst CS
Tijd	16.00	16.25	16.40	17.00	17.15	17.30	17.45	18.00
				afd + Poli H (alleen vrijdag)	OK H		OK B + Kaak	
Rit 8	Vertrek CS	Aankomst OK B	Vertrek OK B	Aankomst OK H	Vertrek OK H			
Vrijdag	Op verzoek CS	OK B + afd + poli B + Kaak		OK H				

BCW op dinsdag en vrijdag 06.20
Reef op aanvraag om 11.25

Steriel instrumentarium
Besmet Instrumentarium

* Op vrijdag vervalt in Rit 7 OK-DHV en loopt de chauffeur in het H gebouw VPA 5 west en de VK uit

For the proposal of the new transport schedule is tried to minimize the changes. The first transport has to start at 5 AM. Calculated is that one delivery moment is possible concerning the number of carts that must be transported. Assumed is that the number of trays used per day is maximal 96, which is based on data of the used trays per day of the year 2014 and the assumption that this amount will not increase (also when knowing that the number of surgeries is decreasing, see Appendix A). In total 16 carts can be placed in the truck that each can include 16 trays of 10 cm high. There are also trays of 15 cm high, this leads to less capacity. Assumed is that the capacity is than 10 trays per cart. Based on the assumption of maximal 96 trays per day, there are 6 carts needed if all trays are 10 cm high or 10 carts if all trays are 15 cm high. This easily fits in the truck. If extra trays needs to be delivered to RdGG when picking up soiled trays.

TABLE E.2: PROPOSED TRANSPORT SCHEDULE FOR COMBI-STER

Tijd	Vertrek CS	Aankomst OK RdGG	Vertrek OK RdGG	Aankomst OK DHV	Vertrek OK DHV	Aankomst CS
Rit 1	05.00	5:15	5:40	6:10	6:30	7:00
		OK RdGG, afd + Poli		OK DHV	OK DHV	
Rit 2	Vertrek CS	Aankomst OK RdGG	Vertrek OK RdGG	Aankomst CS		
Tijd	07.40	7:15	7:25	7:40		
			OK RdGG, afd + Poli			
Rit 3	Vertrek CS	Aankomst OK RdGG	Vertrek OK RdGG	Aankomst CS		
Tijd	10.00	10:30	10:40	11:00		
			OK RdGG			
Rit 4	Vertrek CS	Aankomst OK DHV	Vertrek OK DHV	Aankomst CS		
Tijd	11.15	11.40	12.00	12.20		
			OK DHV, IVF			
Rit 5	Vertrek CS	Aankomst OK RdGG	Vertrek OK RdGG	Aankomst CS		
Tijd	12.35	12:50	13:05	13:20		
			OK RdGG			
Rit 6	Vertrek CS	Aankomst OK DHV	Vertrek OK DHV	Aankomst OK RdGG	Vertrek OK RdGG	Aankomst CS
Tijd	14.00	14.30	14.45	15:00	15:15	15:30
		OK DHV, afd + Poli DHV	Afd + Poli DHV+ OK DHV		OK RdGG	
Rit 7	Vertrek CS	Aankomst OK DHV*	Vertrek OK DHV*	Aankomst OK RdGG	Vertrek OK RdGG	Aankomst CS
Tijd	16.00	16.25	16.40	17:00	17:20	17:35
					OK RdGG, afd + Poli	
Rit 8	Vertrek CS	Aankomst OK RdGG	Vertrek OK RdGG			
Vrijdag	Op verzoek CS	OK B + afd + poli B + Kaak				
BCW op dinsdag en vrijdag 06.20			Steriel instrumentarium			
Reef op aanvraag om 11.25			Besmet Instrumentarium			

* Op vrijdag vervalt in Rit 7 OK-DHV en loopt de chauffeur in het H gebouw VPA 5 west en de VK uit

F. HFMEA report of current situation

HFMEA levering en gebruik van instrumentennetten

Fase 1: huidige proces

November 2014

Annetje Guédon, Thekla Rakers

Samenvatting

Doel
Een risicoanalyse is uitgevoerd over het huidige proces vanaf het inplannen van een orthopedische ingreep t/m het retourneren van de benodigde (bruikleen) instrumentennetten via Combister aan de OK of de firma.

Resultaat
Een overzicht van het proces rondom normale en bruikleen instrumentennetten en een complete lijst en classificatie van de risico's per processtap zijn weergegeven.
Voor normale netten:
- Totaal aantal processtappen: **34**
- Totaal aantal risico's: **68**
- Totaal aantal hoog risico's: **31**
- Totale tijd: **450 min**

Voor bruikleen netten:
- Totaal aantal processtappen: **71**
- Totaal aantal risico's: **157**
- Totaal aantal hoog risico's: **48**
- Totale tijd: **715 min**

Conclusie
15 van de 34 stappen voor de normale netten en 22 van de 71 stappen voor de bruikleen netten kosten onnodig veel tijd en brengen onnodig veel risico's met zich mee.

Advies
Het proces zou her-ontworpen moeten worden voor de JIT situatie in de nieuwbouw met minder processtappen en een systematischere informatie voorziening.

1- Focus, methode en team

Focus
Het proces vanaf het inplannen van een orthopedische ingreep t/m het retourneren van de benodigde (bruikleen) instrumentennetten via Combi-Ster aan de OK of firma.

Methode
Een risicoanalyse is uitgevoerd door een multidisciplinair team volgens de Healthcare Failure Mode and Effects Analysis (HFMEA) methode (VMS praktijkgids Prospectieve Risico Inventarisatie; maart 2012). Het stappenplan van een HFMEA ziet er als volgt uit:
1. Specificeer onderwerp
2. Stel een team samen
3. Analyseer het huidige proces d.m.v. opdeling in deelprocessen
4. Bepaal risico's van het proces (incl. oorzaken en effecten)
5. Bepaal prioritering van risico's en geef mogelijke oplossingen om risico's te beperken
Het gehele traject zal omvat zes sessies van twee uur verspreid over twee maanden.

Team
Een team van elf mensen vanuit verschillende functies die te maken hebben met het proces rondom de (bruikleen) instrumentennetten en implantaten.

Procesbegeleider	Annetje Guédon
Secretaris	Thekla Rakers
JIT pilot projectleider	Leendert Jan Zonneveld (DoubleSense)/ Vivian Hoeijmans
Specialist (ortho)	Joost van Linge
Teamleider OK	Marion Poot
OK-assistent (ortho)	Sandra Tas, Mieke Schildmeijer
Combister bedrijfsleider	John Vermeer
Combi-Ster teamleiders	Jos Mee, Marjolein van der Toorn
Planning (ortho)	Bianca van Nelfen

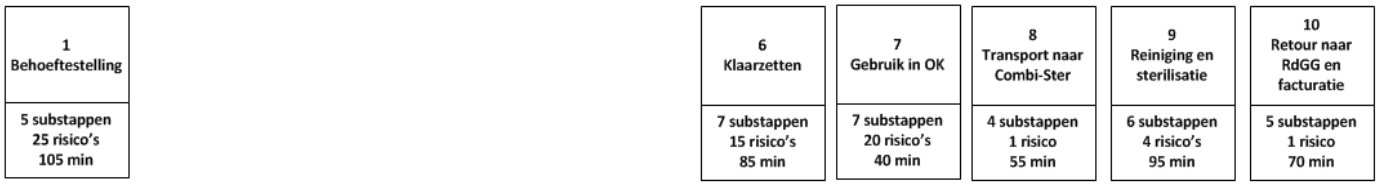
2- Aantallen 2014

Van 01-01-2014 t/m 30-09-2014 zijn er 1195 bruikleen netten gesteriliseerd (2 sterilisaties per bestelling). Als we deze getallen middelen voor een periode van een jaar, worden er **797 bruikleen netten gebruikt, verdeeld over 193 bruikleen aanvragen.**

3- Processtappen en risico analyse

Normale netten

Hoofdproces



Totaal aantal processtappen: **34**
Totaal aantal risico's: **68**
Totaal aantal hoog risico's: **31**
Totale tijd: **450 min**
Tijd per functie:

- Specialist: 30 min
- OK personeel: 180 min
- Combi-Ster: 175 min
- Anders: 65 min

Bruikleen netten

Hoofdproces

Totaal aantal processtappen: **71**
Totaal aantal risico's: **157**
Totaal aantal hoog risico's: **48**
Totale tijd: **715 min**
Tijd per functie:

- Specialist: 35 min
- OK personeel: 270 min
- Combi-Ster: 345 min
- Anders: 65 min

Het gedetailleerde proces is weergegeven in Appendix A.

Risico scores

Voor elk risico is een score bepaald door middel van indeling op frequentie en ernst. De scores zijn gebaseerd op een schaal van 1-5:

Score	Frequentie	Ernst
1	Nooit	Geen invloed
2	≤ 1 keer per kwartaal	OK gaat door met alternatieve werkwijze, geen gevolg voor patiënt.
3	> 1 keer per kwartaal	OK gaat door met alternatieve werkwijze, gevolg voor patiënt (bv OK is verlaat, maar nog steeds op zelfde dag)
4	> 1 keer per maand	OK kan niet door gaan, gevolg voor patiënt (bv OK wordt verzet naar andere dag)
5	> 1 keer per week	OK kan niet door gaan, ernstig gevolg voor patiënt (bv patiënt is al onder narcose)

Het totale risico score wordt berekend door de frequentie maal de ernst. Wanneer een risico een score heeft van 10 of hoger of de ernst een score heeft gekregen van 4 of hoger wordt dit risico tot de hoog scorende risico's gerekend.

Lijst van hoog scorende risico's

De risico's met de hoogste scores zijn te verdelen in de volgende categorieën:

- Gebrek aan systematiek in het doorgeven/vaststellen van de nodige (bruikleen) instrumentennetten
- Gebrek aan overzicht van de beschikbare netten en planning van andere specialismes
- Onduidelijkheid over de status van bestelling van bruikleen instrumentennetten voor de betrokkenen
- Afwezigheid van klaarzet lijsten voor bruikleen instrumentennetten.
- Onverwachte problemen met instrumenten tijdens OK of afwezigheid van de nodige aanvullende instrumenten tijdens OK

De tabel hieronder geeft een overzicht van de risico's met de hoogste scores. Indien een risico alleen voor normale of bruikleen netten geld is er een 'x' in de desbetreffende cel gezet.

H-FMEA (bruikleen) instrumentarium - Huidige processen								
Alleen normale	**Alleen bruikleen**	**Potentiële faalwijze**	**Potentiele oorzaak**	**Freq**	**Ernst**	**Risico score**	**Accepteren, beheersen, elimineren**	**Beschrijving actie**
		1. Behoeftestelling						
		1.1 Patiënt bij poli en patiënt en naam operatie plaatsen op wachtlijst (info over bijzonderheden operatie en bruikleen in vrije veld ChipSoft)						
		Incomplete informatie in vrije veld	Geen informatie geschreven over welke implantaat in patiënt zit (voor een revisie)	3	4	12	beheersen	OK assistent gaat erachteraan
			Geen informatie geschreven over welke instrumenten en implantaten nodig zijn	2	4	8	accepteren	
			Informatie ingevoerd door artsen in opleidingen die niet alles weten	4	4	16	accepteren	
		1.1' Spoed patiënten via SEH/IC. Aanmelden direct bij planner OK (spoed= 12-14 uur voor de operatie)						
		Nodige net niet aanwezig	Net nog bij Combi-Ster	3	4	12		
			Net in ander gebouw	3	4	12		
			Net in gebruik	2	4	8		
		1.3 Ortho overleg op donderdag. Check OK programma voor komende 2 weken en check (bruikleen) netten						
		Mist informatie	Niet/ onvolledig/ verkeerd informatie in vrije veld instrumentarium in ChipSoft	3	4	12	accepteren	
		Geen overzicht van de netten in roulatie	Operatie assistante niet op de hoogte	5	2	10	accepteren	
			Overzicht van netten in roulatie niet aanwezig	3	4	12	accepteren	
			Overzicht van wat trauma nodig heeft niet aanwezig	5	2	10	accepteren	
		Materialen niet op tijd besproken tussen planner ortho en terrein deskundigen	patiënt gepland en geopereerd tussen 2 overleggen (semi spoed)	4	3	12	accepteren	
			Meerdere aanspreekpunt bij terrein deskundige en niet bereikbaar tijdens OK	2	4	8	accepteren	
	x	**1.4 Schrijven in ortho agenda welke bruikleen set nodig is op de OK datum**						
		Niet gedaan	Vergeten/ te druk	2	4	8	accepteren	
		Verkeerde net opschrijven	Vergissing	2	4	8	accepteren	
			Onduidelijke informatie ingevoerd in vrije veld ChipSoft	2	4	8	accepteren	
	x	**1.5 Overleg met leverancier en bruikleen set reserveren**						
		Niet gedaan	Vergeten/ te druk	2	4	8	accepteren	

		Verkeerde net besteld	Vergissing/ verkeerd begrepen vanuit OK/ verkeerd begrepen vanuit firma	2	4	8	accepteren	
			Firma en OK gebruiken andere benaming voor de netten	2	4	8	accepteren	
		1.8 Operatie tijd doorgeven aan patiënt, 1 dag van te voren						
		Niet doorgeven	patiënt niet bereikbaar (dan wordt het aan verpleegafdeling doorgegeven)	2	4	8	beheersen	Doorgeven aan verpleegafdeling
		2. Bestelling						
	x	**2.1 Digitaal aanvraag bruikleen formulier invullen in Word, mailen naar teamleider OK, printen en brengen naar besteller**						
		Formulier niet ingevuld	Te druk/ vergeten	2	4	8	accepteren	
		Niet gemaild	Te druk/ vergeten	2	4	8	accepteren	
		Niet naar besteller gebracht	Te druk/ vergeten	2	4	8	accepteren	
	x	**2.3 Winkelwagen aanmaken bij Z-XL**						
		Geen winkelwagen aangemaakt	Te druk/ vergeten	2	4	8	accepteren	
		3. Levering bij Combi-Ster						
	x	**3.3 Check inhoud levering met pakbon leverancier, reinigings- en sterilisatie voorschriften, nieuwe dossier en nieuwe barcode aanmaken**						
		Mist/kapotte instrumenten	Verkeerde check bij leverancier	2	4	8	accepteren/ beheersen	Contact opnemen met firma
		Mist een net	Soms moeilijk om te weten, het niet altijd bekend hoeveel netten in een set moeten zijn	2	4	8	accepteren/ beheersen	Contact opnemen met firma
		Reinigings- en sterilisatie voorschriften niet te doen bij Combi-Ster		1	4	4	beheersen	Contact opnemen met firma
	x	**3.5 Wit label maken met: bruikleen, locatie, leverancier, sterilisatie dag en OK dag**						
		Verkeerde datum	Vergissing	2	4	8	accepteren	
		4. Reiniging en sterilisatie						
	x	**4.3 Netten samenstellen, check compleetheid en inpakken**						
		Verkeerde sterilisatie sticker geplakt	Vergissing	2	5	10	accepteren/ beheersen	Werkflow afspraken
	x	**4.4 Sterilisatieproces**						
		Deel niet gesteriliseerd (deel levering)	Vergissing	2	4	8	accepteren	
		5. Transport naar OK						
	x	**5.4 Netten uitruimen in steriele berging of direct in klaarzet kar plaatsen (als het met de ochtend levering aankomt)**						
		Netten verpakking beschadigd	Netten gestoten	5	3	15	accepteren	
		6. Klaarzetten						
		6.1 Netten klaarzetten per OK programma volgens klaarzetlijsten (1 dag voor de operatie) in de ochtend de dag voor OK						
		Klaarzetlijsten niet volledig	Onbekend uit hoeveel netten de bruikleen set bestaat	5	2	10	accepteren	
	x	**6.2 Op whiteboard en op de kar schrijven dat er bruikleen netten moeten aankomen (hoeveelheid netten onbekend)**						
		Niet duidelijk hoeveel netten er zijn	Samenstelling van sets veranderen vaak	5	2	10	accepteren	
		6.4 Klaarzet karren checken +/- 14:00						
		Klaarzetlijsten niet volledig	Onbekend uit hoeveel netten de bruikleen set bestaat	5	2	10	accepteren	
		6.6 Check de fax van Combi-Ster of leveringen nog op tijd komen +/-16:00						
		Fax komt te laat		5	2	10	accepteren	
		Informatie fax klopt niet	Spullen die op de fax zijn kunnen al geleverd zijn (door vakere leveringen)	5	3	15	accepteren	
		6.7 Missende netten op klaarzetkar zetten na de levering van 6:00						

		Netten verpakking beschadigd	Netten gestoten	5	4	20	accepteren	
		6.8 Klaarzet karren checken +/- 7:30						
		Netten afwezig	Gebruikt voor spoed patiënt	2	4	8	beheersen	Spoed levering
		7. Gebruik OK						
		7.1 Netten per operatie naar de OK brengen en laatste check						
		Netten afwezig	Gebruikt voor spoed patiënt	2	4	8	accepteren	
		7.2 Barcode van netten scannen in ChipSoft						
		Niet scannen	Te druk/ vergeten	5	2	10	accepteren	
			Barcode kwijt	5	2	10	accepteren	
		7.3 Netten openmaken en checken voor gaten en tellen adhv begeleidingslijsten						
		Netten worden afgekeurd	Gat in de verpakking	5	5	25	accepteren	
		Mist instrument (onverwacht)	Fout samengesteld door Combi-Ster	4	5	20	accepteren	
		Mist een (bruikleen) net	Onvolledige klaarzetlijsten	2	5	10	accepteren	
			Onvolledige levering van Combi-Ster	2	5	10	accepteren	
		Instrument niet goed gereinigd	Fout bij Combi-Ster	2	5	10	accepteren	
		7.4 Operatie						
		Belangrijk instrument is/gaat kapot/ onsteriel		2	5	10	accepteren	
		Mist een instrument		2	5	10	accepteren	
		Aanvullende spullen nodig tijdens operatie	Onverwacht verloop van operatie	5	2	10	accepteren	
		Aanvullende spullen niet beschikbaar	Nog bij Combi-Ster of bij andere gebouw	3	5	15	accepteren	
		Instrumenten niet goed gereinigd	Foute reiniging bij Combi-Ster	2	5	10	accepteren	
		9. Reiniging en sterilisatie						
		9.1 Scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)						
		Niet gescand	Scanner doet het niet	5	2	10	accepteren	
x		**9.3 Netten samenstellen, check compleetheid en verpakken**						
		Sterilisatie stickers op verkeerde net geplakt	Vergissing, niet volgens protocol van één net tegelijk	2	5	10	accepteren/ beheersen	Werkflow afspraken

De complete lijst van faalwijzen, oorzaken en risicoscores is weergegeven in Appendix B. Spoed wordt niet meegenomen in de aantallen gepresenteerd in dit verslag.

4- Voorstel herontwerp

14 van de 33 stappen voor de normale netten en 22 van de 71 stappen voor de bruikleen netten kosten onnodig veel tijd en brengen onnodig veel risico's met zich mee. Deze stappen zouden anders ingericht moeten worden. Een voorstel voor een herontwerp van de processen voor de JIT situatie in de nieuwbouw wordt binnenkort gepresenteerd.

Hieronder een overzicht van de keuze van de stappen die her-ontworpen moeten worden:

	Stappen	Risico's	Tijd
Normale netten			
Totaal aantal	34	68	450 min
Aantal die onnodig veel tijd kosten en anders ingericht moeten worden (grijs)	14	38	230 min
Bruikleen netten			
Totaal aantal	71	157	715 min
Aantal die onnodig veel tijd kosten en anders ingericht moeten worden (grijs)	22	77	250 min

6- Appendices

Appendix G: Proces
Appendix H: Lijst van faalwijzen, oorzaken en risicoscores

G. The current process flow

The main process shows in general how the process flow of the surgical instruments looks like. However, it does not show in detail which steps must be made to complete each step. Each step is subdivided into steps that must be done before the process is finished. For each step it is indicated who is responsible for that step, the numbers below the boxes indicates how many minutes the step takes. The time for the steps of Z-XL and the manufacturer are not taken into account, since this is out of scope. As said in Section 4.5 and Appendix F the times are divided per actor group. The time for the specialist are only the steps where the specialist is involved, except for the surgery since this is not specified in time. The OR staff includes the steps with the OR team leader, orderer, planner OR, field expert, OR assistant (including shift OR assistant), logistic employee OR, and cleaning staff OR. The process time of Combi-Ster includes all steps where Combi-Ster is involved. There is tried to assign the time for sub-step per surgery. An average time is taken per sub-step. For some steps like the ortho meeting, the whole time is taken into account since this is very difficult to divide this per surgery. An explanation of each sub-step is given after the total process. Finally a process flow diagram is given of both the normal trays and the loan trays. The grey steps are the ones that are changed compared to the designed future process flow. The legend of the process flow diagram is given in Figure G.1.

The loan trays have more processes steps that must be completed. When contacting a manufacturer for loan instruments, one orders a set of instruments. This can contain out of one or more instrument trays, depending on the requested set and type of surgery. When ordering at the manufacturer it is not always known how many trays the set contains.

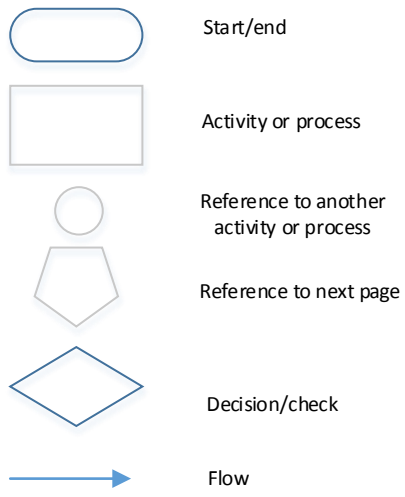
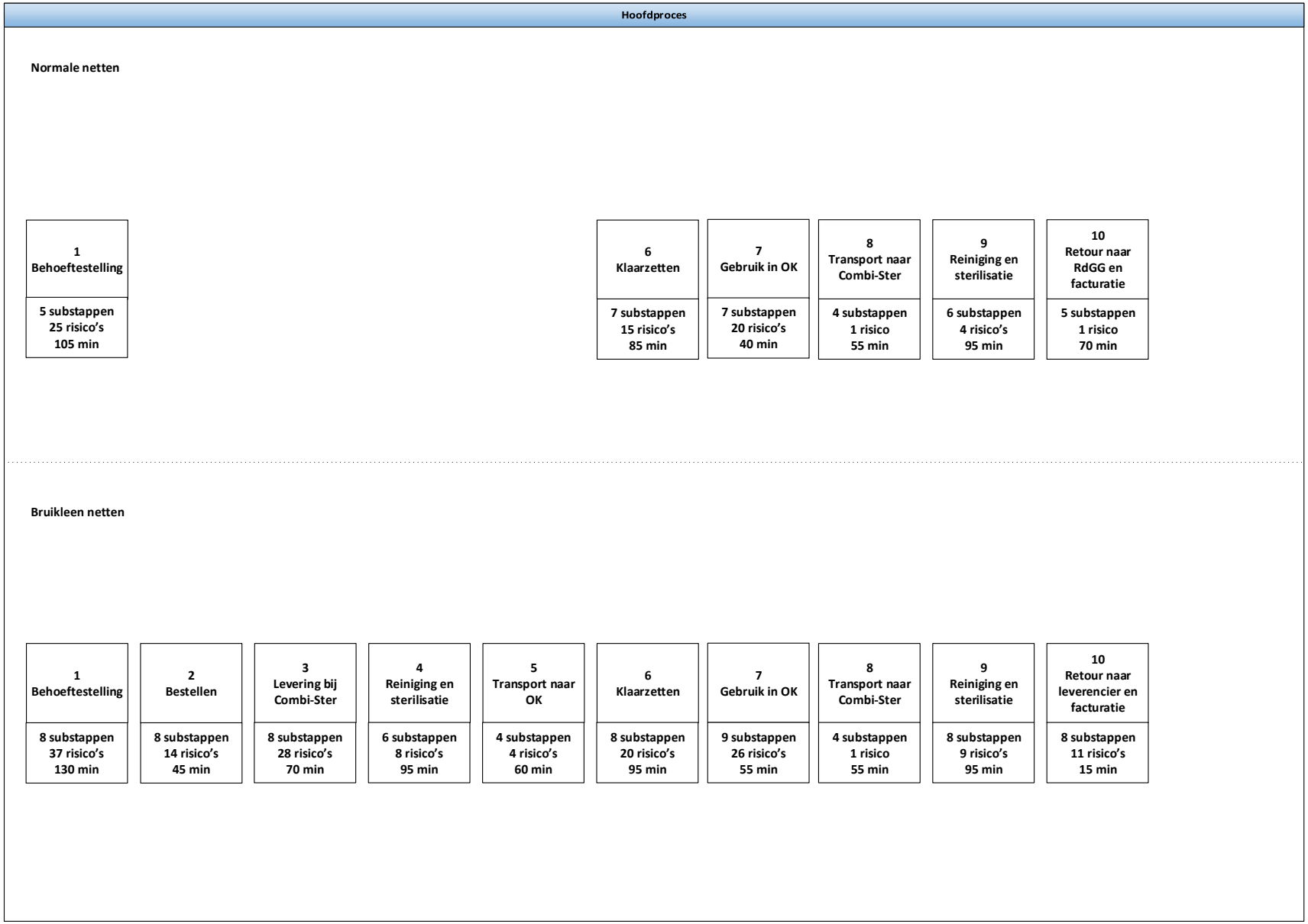
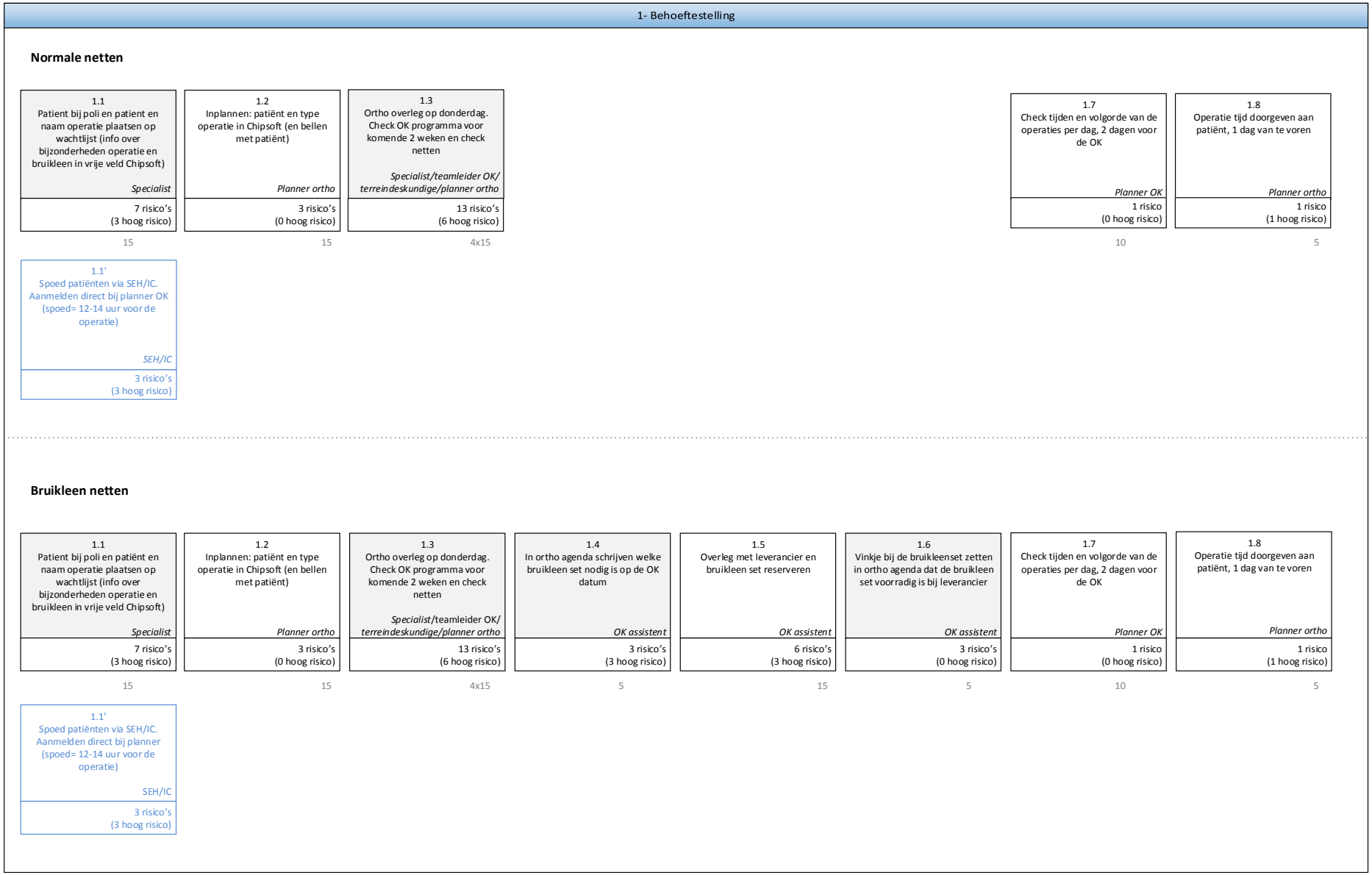


FIGURE G.1: LEGEND FOR PROCESS FLOW DIAGRAM


Hoofdproces
Normale netten
1 Behoeftestelling
5 substappen 25 risico's 105 min
6 Klaarzetten
7 substappen 15 risico's 85 min
7 Gebruik in OK
7 substappen 20 risico's 40 min
8 Transport naar Combi-Ster
4 substappen 1 risico 55 min
9 Reiniging en sterilisatie
6 substappen 4 risico's 95 min
10 Retour naar RdGG en facturatie
5 substappen 1 risico 70 min
Bruikleen netten
1 Behoeftestelling
8 substappen 37 risico's 130 min
2 Bestellen
8 substappen 14 risico's 45 min
3 Levering bij Combi-Ster
8 substappen 28 risico's 70 min
4 Reiniging en sterilisatie
6 substappen 8 risico's 95 min
5 Transport naar OK
4 substappen 4 risico's 60 min
6 Klaarzetten
8 substappen 20 risico's 95 min
7 Gebruik in OK
9 substappen 26 risico's 55 min
8 Transport naar Combi-Ster
4 substappen 1 risico 55 min
9 Reiniging en sterilisatie
8 substappen 9 risico's 95 min
10 Retour naar leverencier en facturatie
8 substappen 11 risico's 15 min


1- Behoeftestelling
Normale netten
1.1
Patient bij poli en patient en naam operatie plaatsen op wachtlijst (info over bijzonderheden operatie en bruikleen in vrije veld Chipsoft)
Specialist
7 risico's
(3 hoog risico)
15
1.2
Inplannen: patiënt en type operatie in Chipsoft (en bellen met patiënt)
Planner ortho
3 risico's
(0 hoog risico)
15
1.3
Ortho overleg op donderdag. Check OK programma voor komende 2 weken en check netten
Specialist/teamleider OK/ terreindeskundige/planner ortho
13 risico's
(6 hoog risico)
4x15
1.7
Check tijden en volgorde van de operaties per dag, 2 dagen voor de OK
Planner OK
1 risico
(0 hoog risico)
10
1.8
Operatie tijd doorgeven aan patiënt, 1 dag van te voren
Planner ortho
1 risico
(1 hoog risico)
5
1.1'
Spoed patiënten via SEH/IC. Aanmelden direct bij planner OK (spoed= 12-14 uur voor de operatie)
SEH/IC
3 risico's
(3 hoog risico)
Bruikleen netten
1.1
Patient bij poli en patiënt en naam operatie plaatsen op wachtlijst (info over bijzonderheden operatie en bruikleen in vrije veld Chipsoft)
Specialist
7 risico's
(3 hoog risico)
15
1.2
Inplannen: patiënt en type operatie in Chipsoft (en bellen met patiënt)
Planner ortho
3 risico's
(0 hoog risico)
15
1.3
Ortho overleg op donderdag. Check OK programma voor komende 2 weken en check netten
Specialist/teamleider OK/ terreindeskundige/planner ortho
13 risico's
(6 hoog risico)
4x15
1.4
In ortho agenda schrijven welke bruikleen set nodig is op de OK datum
OK assistent
3 risico's
(3 hoog risico)
5
1.5
Overleg met leverancier en bruikleen set reserveren
OK assistent
6 risico's
(3 hoog risico)
15
1.6
Vinkje bij de bruikleenset zetten in ortho agenda dat de bruikleen set voorradig is bij leverancier
OK assistent
3 risico's
(0 hoog risico)
5
1.7
Check tijden en volgorde van de operaties per dag, 2 dagen voor de OK
Planner OK
1 risico
(0 hoog risico)
10
1.8
Operatie tijd doorgeven aan patiënt, 1 dag van te voren
Planner ortho
1 risico
(1 hoog risico)
5
1.1'
Spoed patiënten via SEH/IC. Aanmelden direct bij planner (spoed= 12-14 uur voor de operatie)
SEH/IC
3 risico's
(3 hoog risico)

2- Bestelling

Normale netten

Bruikleen netten

2.1 Digitaal aanvraag bruikleen formulier invullen in Word, mailen naar teamleider OK, printen en brengen naar besteller *OK assistent*	2.2 Akkoord op aanvraag bruikleen formulier en mail naar Combi-Ster, met cc naar groep OK assistenten *Teamleider OK*	2.3 Besteller of teamleider OK maakt een winkelwagen aan bij Z-XL *Besteller/Teamleider OK*	2.4 Goedkeuren winkelwagen *Teamleider OK/OK manager*	2.5 Winkelwagen uitprinten en met aanvraag bruikleen formulier in bruikleen map zetten van de besteller *Besteller*	2.6 Reserveringsnummer (47 nummer) maken en mailen aan leverancier *Z-XL*	2.7 In agenda schrijven in instrumenten magazijn op dag van levering (2 dagen voor OK) en op dag van sterilisatie (1 dag voor OK) *Combi-Ster*	2.8 Aanvraag bruikleen formulier uitprinten en in map van Combi-Ster stoppen *Combi-Ster*
5 risico's (3 hoog risico)	1 risico's (0 hoog risico)	2 risico's (1 hoog risico)	2 risico's (0 hoog risico)	3 risico's (0 hoog risico)	1 risico (0 hoog risico)	0 risico's (0 hoog risico)	0 risico's (0 hoog risico)
10	5	10	5	5	-	5	5

3- Levering bij Combi-Ster

Normale netten

Bruikleen netten

3.1 Levering bij Combi-Ster 2 werkdagen voor de OK voor een bekende bruikleen set (3 werkdagen voor nieuwe set)	3.2 Afvinken levering bruikleen in agenda	3.3 Check inhoud levering met pakbon leverancier, reinigings- en sterilisatie voorschriften, nieuw dossier en nieuwe barcode aanmaken	3.4 Checken foto's uit database. Foto's van inhoud maken als er iets veranderd is en dossier updaten	3.5 Wit label maken met: bruikleen, locatie, leverancier, sterilisatie dag en OK dag	3.6 Barcode zoeken in bak en plaatsen op bruikleen netten.	3.7 Dossier van Combi-Ster doorgeven aan teamleider Combi-Ster in schone ruimte (tegelijk met de netten naar de reinigingsruimte)	3.8 Decontaminatie verklaring naar autoclaaf dienst, die geven het mee in de buitenkar naar de OK
Leverancier	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*
6 risico's (0 hoog risico)	3 risico's (0 hoog risico)	7 risico's (3 hoog risico)	5 risico's (0 hoog risico)	1 risico (1 hoog risico)	1 risico (0 hoog risico)	2 risico's (0 hoog risico)	3 risico's (0 hoog risico)
5	5	30	10	5	5	5	5

4- Reiniging en sterilisatie

Normale netten

Bruikleen netten

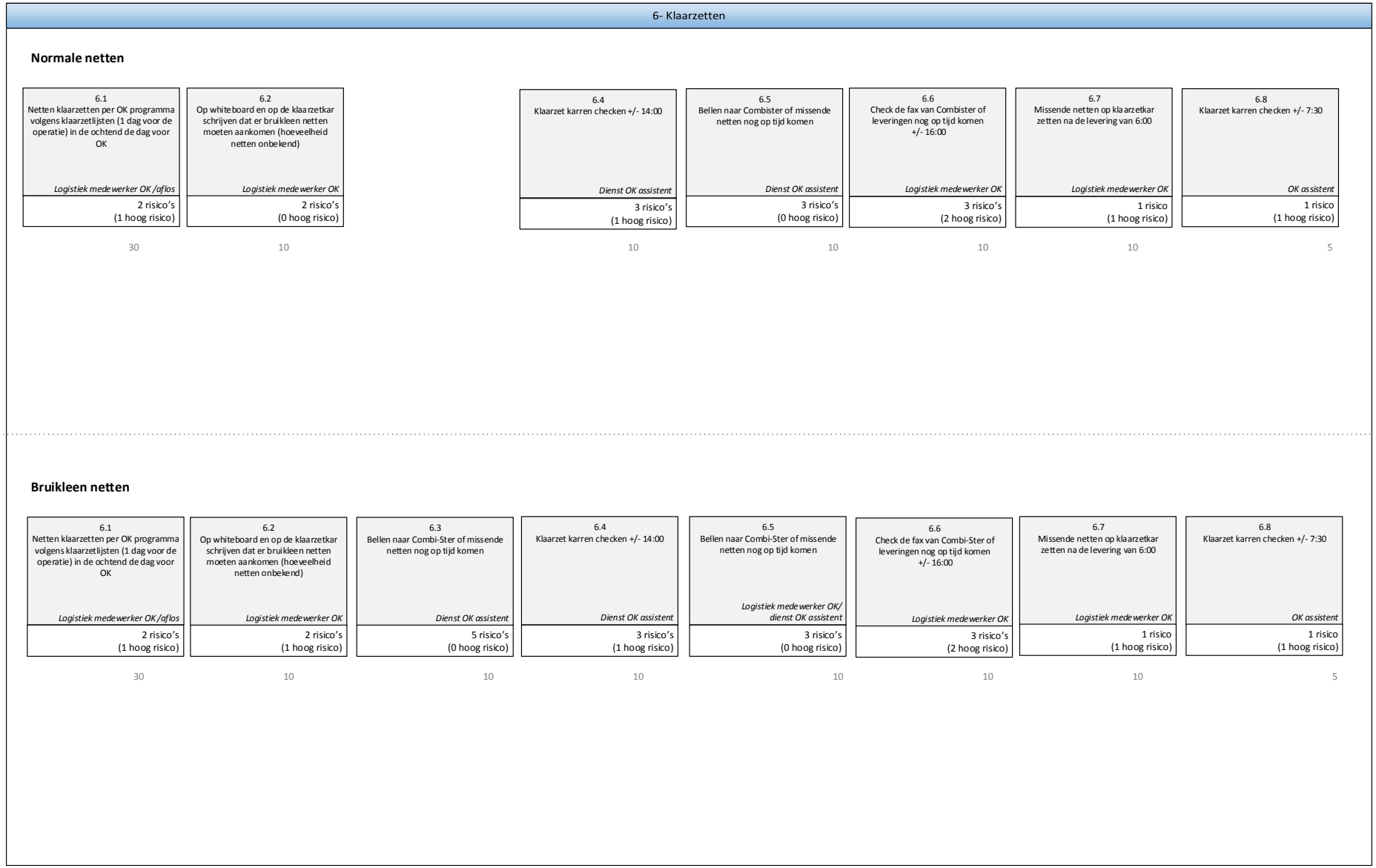
4.1 Netten scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)	4.2 Reinigingsproces	4.3 Netten samenstellen, check compleetheid en verpakken	4.4 Sterilisatieproces	4.5 Goedkeuren sterilisatieproces en scan barcode van sterilisatie sticker	4.6 Met reguliere netten naar de chauffeur
Combi-Ster	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*
2 risico's (0 hoog risico)	0 risico's (0 hoog risico)	3 risico's (1 hoog risico)	2 risico's (1 hoog risico)	0 risico's (0 hoog risico)	1 risico (0 hoog risico)
5	30	30	20	5	5

5- Transport naar OK

Normale netten

Bruikleen netten

5.1 Transport naar centraal magazijn RdGG in buitenkar met de gewone netten, meestal met de levering van 6:00	5.2 Transport naar ingang OK-complex	5.3 Binnenkar uit buitenkar halen en brengen naar steriele berging OK	5.4 Netten uitruimen in steriele berging of direct in klaarzet kar plaatsen (als het met de ochtend levering aankomt)
Combi-Ster	*Intern transport*	*Logistiek medewerker OK*	*Logistiek medewerker OK*
1 risico (0 hoog risico)	1 risico (0 hoog risico)	1 risico (0 hoog risico)	1 risico (1 hoog risico)
30	15	5	10


6- Klaarzetten
Normale netten
6.1
Netten klaarzetten per OK programma volgens klaarzetlijsten (1 dag voor de operatie) in de ochtend de dag voor OK
Logistiek medewerker OK /aflos
2 risico's
(1 hoog risico)
30
6.2
Op whiteboard en op de klaarzetkar schrijven dat er bruikleen netten moeten aankomen (hoeveelheid netten onbekend)
Logistiek medewerker OK
2 risico's
(0 hoog risico)
10
6.4
Klaarzet karren checken +/- 14:00
Dienst OK assistent
3 risico's
(1 hoog risico)
10
6.5
Bellen naar Combister of missende netten nog op tijd komen
Dienst OK assistent
3 risico's
(0 hoog risico)
10
6.6
Check de fax van Combister of leveringen nog op tijd komen +/- 16:00
Logistiek medewerker OK
3 risico's
(2 hoog risico)
10
6.7
Missende netten op klaarzetkar zetten na de levering van 6:00
Logistiek medewerker OK
1 risico
(1 hoog risico)
10
6.8
Klaarzet karren checken +/- 7:30
OK assistent
1 risico
(1 hoog risico)
5
Bruikleen netten
6.1
Netten klaarzetten per OK programma volgens klaarzetlijsten (1 dag voor de operatie) in de ochtend de dag voor OK
Logistiek medewerker OK /aflos
2 risico's
(1 hoog risico)
30
6.2
Op whiteboard en op de klaarzetkar schrijven dat er bruikleen netten moeten aankomen (hoeveelheid netten onbekend)
Logistiek medewerker OK
2 risico's
(1 hoog risico)
10
6.3
Bellen naar Combi-Ster of missende netten nog op tijd komen
Dienst OK assistent
5 risico's
(0 hoog risico)
10
6.4
Klaarzet karren checken +/- 14:00
Dienst OK assistent
3 risico's
(1 hoog risico)
10
6.5
Bellen naar Combi-Ster of missende netten nog op tijd komen
Logistiek medewerker OK/ dienst OK assistent
3 risico's
(0 hoog risico)
10
6.6
Check de fax van Combi-Ster of leveringen nog op tijd komen +/- 16:00
Logistiek medewerker OK
3 risico's
(2 hoog risico)
10
6.7
Missende netten op klaarzetkar zetten na de levering van 6:00
Logistiek medewerker OK
1 risico
(1 hoog risico)
10
6.8
Klaarzet karren checken +/- 7:30
OK assistent
1 risico
(1 hoog risico)
5

7- Gebruik in OK

Normale netten

7.1 Netten per operatie naar de OK brengen en laatste check	7.2 Barcode van netten scannen in Chipsoft	7.3 Netten openmaken en checken voor gaten en tellen adhv begeleidingslijsten	7.4 Operatie	7.6 Instrumenten terug op de netten leggen en check compleetheid, verpakken en op tafel op de gang	7.8 Schone netten weer terug in schone gang en terug zetten in steriele berging	7.9 Vuile netten in vuile kar bij balie OK-complex
OK assistent	*OK assistent*	*OK assistent*	*OK team*	*OK assistent*	*Logistiek medewerker OK*	*Schoonmaak OK*
1 risico (1 hoog risico)	3 risico's (2 hoog risico)	5 risico's (5 hoog risico)	6 risico's (5 hoog risico)	4 risico's (0 hoog risico)	1 risico (0 hoog risico)	0 risico's (0 hoog risico)
5	5	10	?	10	5	5

Bruikleen netten

7.1 Netten per operatie naar de OK brengen en laatste check	7.2 Barcode van netten scannen in Chipsoft	7.3 Netten openmaken en checken voor gaten en tellen adhv begeleidingslijsten	7.4 Operatie	7.5 Decontaminatie verklaring invullen	7.6 Instrumenten terug op de netten leggen en check compleetheid, verpakken en op tafel op de gang	7.7 Artikel nummers verzamelen en opschrijven in map besteller wat verbruikt is (implantaten)	7.8' Schone netten in plastic tas in de vuile kar	7.9 Vuile netten in vuile kar bij balie OK-complex
OK assistent	*OK assistent*	*OK assistent*	*OK team*	*Specialist*	*OK assistent*	*OK assistent*	*Logistiek medewerker OK*	*Schoonmaak OK*
1 risico (1 hoog risico)	3 risico's (2 hoog risico)	5 risico's (5 hoog risico)	6 risico's (5 hoog risico)	3 risico's (0 hoog risico)	4 risico's (0 hoog risico)	3 risico's (0 hoog risico)	1 risico (0 hoog risico)	0 risico's (0 hoog risico)
5	5	10	?	5	10	10	5	5

8- Transport naar Combi-Ster

Normale netten

8.1 Transport naar centraal magazijn RdGG (3-4 x/dag)	8.2 Lege karren neerzetten (voor volgende operaties)	8.3 Vuile/schone karren in wagen laden (6x/dag)	8.4 Transport naar vuile ruimte Combi-Ster (6x/dag)
Intern transport	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*
0 risico's (0 hoog risico)	0 risico's (0 hoog risico)	0 risico's (0 hoog risico)	1 risico (0 hoog risico)
15	5	5	30

Bruikleen netten

8.1 Transport naar centraal magazijn RdGG (3-4 x/dag)	8.2 Lege karren neerzetten (voor volgende operaties)	8.3 Vuile/schone karren in wagen laden (6x/dag)	8.4 Transport naar vuile ruimte Combi-Ster (6x/dag)
Intern transport	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*
0 risico's (0 hoog risico)	0 risico's (0 hoog risico)	0 risico's (0 hoog risico)	1 risico (0 hoog risico)
15	5	5	30

9- Reiniging en sterilisatie

Normale netten

9.1 Scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)	9.2 Reinigingsproces	9.3 Netten samenstellen, check compleetheid en verpakken	9.4 Sterilisatieproces	9.5 Goedkeuren sterilisatieproces en scan barcode van sterilisatie sticker	9.6 Dispatch (sorteren op klant en plaatsen in buitenkar)
Combi-Ster	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*
1 risico (1 hoog risico)	0 risico's (0 hoog risico)	2 risico's (1 hoog risico)	0 risico's (0 hoog risico)	0 risico's (0 hoog risico)	1 risico (0 hoog risico)
5	30	30	20	5	5

Bruikleen netten

9.1 Scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)	9.2 Reinigingsproces	9.3' Netten samenstellen en check compleetheid	9.4' Netten terug naar instrumenten magazijn en check compleetheid van aantal netten	9.5' Decontaminatie verklaring en andere documenten van de leverancier klaar maken voor retour	9.6' Netten terug zetten in dozen van leverancier
Combi-Ster	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*
1 risico (1 hoog risico)	0 risico's (0 hoog risico)	1 risico (0 hoog risico)	3 risico's (0 hoog risico)	1 risico (0 hoog risico)	0 risico's (0 hoog risico)
5	30	30	20	5	5

9.1' Voor schone netten in vuile kar: zak eraf en naar instrumenten magazijn	9.2' Schone netten openmaken, label en barcode eraf halen
Combi-Ster	*Combi-Ster*
2 risico's (0 hoog risico)	1 risico (0 hoog risico)
5	5

10- Retour en facturatie

Normale netten

10.1 Transport naar centraal magazijn RdGG in buitenkar, 2x/dag	10.2 Transport naar ingang OK-complex (op de gang)	10.3 Binnenkar halen uit buitenkar en brengen naar steriele berging OK	10.4 Netten uitruimen in steriele berging	10.5 Maandelijkse factuur naar OK
Combi-Ster	*Intern transport*	*Logistiek medewerker OK*	*Logistiek medewerker OK*	*Combi-Ster*
1 risico (0 hoog risico)	0 risico's (0 hoog risico)	0 risico's (0 hoog risico)	0 risico's (0 hoog risico)	0 risico's (0 hoog risico)
30	15	5	10	10

Bruikleen netten

10.1' 1 dag na OK, bellen naar Combi-Sster of de netten opgehaald kunnen worden	10.2' Netten ophalen bij Combi-Ster	10.3' Check instrumentarium op verbruik en staat (bot of kapot)	10.4' Factuur sturen aan Z-XL	10.5' Goedkeuring vragen aan besteller	10.6' Vergelijk factuur met winkelwagen, aanvraag bruikleen formulier, verbruikt materiaal en factuur goedkeuren	10.7' Vergelijken met factuur en goedkeuren	10.8' Omzetten in order nummer (45 nummer) en koppelen aan 47-nummer en factureren op kostenplaats ortho
Leverancier	*Leverancier*	*Leverancier*	*Leverancier*	*Z-XL*	*Besteller*	*Z-XL*	*Z-XL*
1 risico (0 hoog risico)	3 risico's (0 hoog risico)	2 risico's (0 hoog risico)	0 risico's (0 hoog risico)	1 risico (0 hoog risico)	4 risico's (0 hoog risico)	0 risico's (0 hoog risico)	0 risico's (0 hoog risico)
5	-	-	-	-	10	-	-

Step 1 - Needs statement

1.1 The process begins when the patient enters the hospital at the policlinic. Here the specialist decides what kind of treatment is needed and if surgery must take place. When surgery is necessary the patient will be placed on a waiting list, here the name of the patient and kind of surgery are noted. Additional information about specific information concerning the surgery and the need of a loan set will be noted in ChipSoft; in a free space.

Another possibility for patients to enter the process is via the emergency room or intensive care. These patients need care in short-term, it is called emergency when the surgery must take place within 12-14 hours. If the surgery must take place within 12 hours it is seen as trauma, but this will not be taken into account.

1.2 Based on the waiting list the planner of orthopaedics will make a schedule with the surgeries that will take place at each day. The patient and kind or surgery will be planned in ChipSoft on the right day. The ortho planner calls the patient to confirm the day of surgery.

1.3 Every Thursday there is a meeting between the specialist, team leader of the OR, field expert, planner ortho. During this meeting they will go through the planning of the coming two weeks. There will be discussed if loan sets and or special instruments are needed and who is responsible for ordering.

If the number of available trays is not sufficient for the planned surgeries, the planning can be adapted and the surgery will be moved to another day. The ortho planner contacts the patient to reschedule the surgery. Tight schedules will be recognised during the ortho meeting. To deal with this emergency sterilization can be assigned to trays. The OR assistants know by head if this is the case but sometimes this is also noted in the agenda.

The OR assistants must know which trays are not available due to e.g. maintenance. Combi-Ster contacts the OR-complex if they find out instruments are missing from trays or are broken. The OR-complex decides if trays are taken out of circulation or not. Combi-Ster sends an email to the field experts and OR assistants with an overview of the trays that are taken out or in of circulation. However, this overview is not available at the ortho meeting, it is expected that the OR assistant knows this by head.

1.4 Directly after the ortho meeting the OR assistant writes in the ortho agenda which loan set is needed. This will be noted at the day when the surgery takes place.

1.5 Directly after the ortho meeting and make a note in the agenda that a loan set is needed, the OR assistant contacts the manufacturer to check if the set is available and reserves the set. When the set is not available at the manufacturer on the requested date the OR assistant calls the ortho planner, mostly the OR assistant already has another date when the set will be available. The ortho planner contacts the patient to make a new appointment for the surgery.

1.6 When the set is booked at the manufacturer the OR assistant will make a note in the agenda (checkmark). This indicates that the set is available at the manufacturer and is booked.

1.7 Two days in advance the surgeries will be planned based on time/order of the day. The OR planner checks what is the most convenient order to plan the surgeries. However, during the day it even might happen that the order of surgeries changes, due to emergency surgeries.

1.8 A day before the planned surgery the ortho planner calls the patient to inform at which time the surgery will take place.

Step 2 – Ordering (loan trays)

2.1 Before an order can be placed at the manufacturer for the loan set, the OR assistant has to fill in a request form in Word Microsoft. This form will be emailed to the OR team leader, and printed for the orderer.

2.2 The OR team leader checks and approves the form. This is more a formality than a hard check. The OR teal leader forwards the request form to Combi-Ster by email, the cc includes the group of OR assistants.

2.3 The orderer or OR team leader creates a shopping card for the requested loan set at Z-XL.

2.4 Depending on the person who has created the shopping card in step 2.3 the OR team or OR manager approves the shopping card (OR team leader when orderer has made shopping card and OR manager if OR team leader has made shopping cart). The approval must be done by the one that hierarchically seen has a higher function. Due to the work load of the OR manager, this normally is done by the OR team leader.

2.5 When the shopping cart is approved the orderer will print this document and place this together with the request form for loan trays in the folder for loan trays of the OR assistant that requested the order.

2.6 Z-XL makes a reservation number for the requested order, this is called a 47-number. This reservation is send to the manufacturer that will deliver the set.

2.7 Combi-Ster will make a note in the agenda at the instrument storage when the loan set will arrive, two days before scheduled surgery and three days for unknown sets. Another note will be made in the agenda on the day that the set must be sterilized; this is one day before surgery.

2.8 Combi-Ster will print the request loan form and put it in a folder.

Step 3 – Delivery at Combi-Ster (loan trays)

3.1 Normally the ordered loan set will be arrive two days prior to the planned surgery at Combi-Ster. When a new set is requested the manufacturer must deliver the set three days in advance. Also when the OR assistant does not known if the ordered set is new for Combi-Ster there will be delivered three days in advance. The OR assistant at the hospital discusses the delivery date with the manufacturer when reserving the set (step 1.5). Since Combi-Ster is involved in this step by receiving the set, the time is set on five minutes for Combi-Ster.

3.2 When the loan set is delivered at Combi-Ster a checkmark will be noted in the agenda as indication that the set is delivered.

3.3 Combi-Ster checks the content of the delivery by the delivery note of the manufacturer and the request form. The cleaning and sterilization regulations are checked to see if Combi-Ster can meet these regulations. In case of an unknown set a new dossier and barcode will be created. For known sets this already exists.

3.4 The content of the trays of the set are checked with the pictures from the database. If something has changed, e.g. a different instrument or changes in the order of the instruments on the tray, new pictures will be made to update the dossier. For unknown sets pictures always will be made.

3.5 When the file in the system is updated a white label will be made. Here information as the name of the set, location where it must go to, manufacturer, sterilization day and surgery day is indicated. This will be connected to the tray before packing and sterilizing.

3.6 Combi-Ster has a box where all barcodes are placed. The right barcode will be attached at the tray before cleaning and sterilization.

3.7 When the trays of the loan set are going to the disinfection machine the dossier will be handed over to the team leader of in clean area.

3.8 A decontamination declaration is a form that must be provided to the manufacturer after using the instruments for surgery. This declaration must be signed by the surgeon to declare right use of the instruments (e.g. not used on animals). This form will be handed over to the autoclave service that has to add the form in the outer cart that includes the loan set.

Step 4 – Cleaning and sterilization (loan trays)

4.1 The trays will be scanned in the soiled area to identify the tray and the cleaning and sterilization instructions from the internal digital system of Combi-Ster.

4.2 After the identification the instruments go through the cleaning process.

4.3 The trays will enter the clean area when the cleaning process is finished. Here the trays will be assembled and packed in a special packaging. This packaging is resistant for the autoclave processes that sterilizes the instruments. The instruments will be placed on an inner cart. To recognize the trays a sticker including the name of the tray, expiration date, and barcode is placed on the packing, called the sterilization sticker. If instruments are missing an additional sticker will be add with the names of the missing instrument(s).

4.4 Based on a schedule the inner carts with the trays will be placed in the autoclave. The schedule is made based on customer and tuned with the transport times. The instruments will be sterilized in the autoclave.

4.5 The sterilization process will be checked based on temperature, pressure and time. This is done based on a report produced by the autoclave. When approved, the barcode from the sterilization stickers will be scanned so the system knows which trays are going on transport.

4.6 The trays on the inner carts will be placed in an outer cart, to ensure the sterility. The loan trays are placed on the same inner cart as the normal trays and will be transported to the customer (OR-H or OR-B).

Step 5 – Transport to the OR-complex

5.1 The carts will arrive at the central storage at the RdGG. The delivery of loan sets is mostly done with the delivery of 6:00 o'clock. Exceptions can be made, e.g. if the set is not sterilized yet.

5.2 From the central storage the outer carts are transported to the entrance of the OR-complex. This will be done by an employee of the internal transport.

5.3 The inner cart must be taken out of the outer cart, since the outer cart is not sterile and thus is not allowed to enter the OR-complex. The inner cart is taken to the sterile storage at the OR-complex.

5.4 At the sterile storage the (loan) trays are unloaded or directly placed on a procedure based trolley (PBT), if the set is needed the same or next day. In the sterile storage are five shelves for loan trays.

Step 6 – Preparation at the OR-complex

6.1 Based on protocols the trays are prepared per OR-program on PBT in the morning one day before surgery. The protocols indicate which trays are needed for which surgery and additions per specialist/surgeon are noted. The field expert maintains the protocols. A checklist is attached to the PBT for the knee and hip surgeries.

6.2 Missing (loan) trays during the preparation of the PBT will be written down on the whiteboard at the corridor and on the PBT cart itself.

6.3 In case of missing loan trays, Combi-Ster will be called to check if the trays are still on time for surgery.

6.4 At 14:00 o'clock the PBT for the next day are checked by the shift OR assistant.

6.5 When after the check at 14:00 still trays are missing the OR-assistant calls Combi-Ster to check if the trays will be on time for surgery.

6.6 Around 16:00 o'clock a fax will arrive from Combi-Ster. This fax indicates the trays that will be delivered. If trays are missing on the fax the logistic employee OR informs the shift OR assistant. The OR assistant will call Combi-Ster to inform about the missing trays.

The loan trays are not always indicated at the fax. The normal trays are added to the fax by use of selecting the customer number, but to add the loan trays a different number must be selected by hand that is not always done.

6.7 After the delivery of 6:00 o'clock the next day the missing trays will be added to the PBT.

6.8 Around 7:30 o'clock a final check will be done check if the PBTs are complete for the program of the same day.

Step 7 – Use in OR

7.1 When bringing the trays into the OR a last check will be done based on the names of the trays (from the sterilization sticker).

7.2 The sterilization sticker will be scanned in ChipSoft.

7.3 Before the surgery starts the trays are opened and the packing is checked for damages. In case of a torn packing the tray is not sterile anymore and thus cannot be used during surgery.

In practice it can be that the patient is put in sleep at the same time of opening and checking the trays. But most of the times the patient is not yet in sleep when opening and checking the trays.

7.4 During surgery the instruments will be used.

7.5 The specialist must fill in the decontamination declaration. This is mostly done during or right after the surgery.

7.6 After surgery the OR assistant put the instruments as neat as possible back in the trays and checks if the trays are complete. The trays will be packed in the same packing when they arrived and placed on a table at the corridor.

7.7 The loan trays are provided with stickers to help tracking which instruments are used during surgery. After surgery the stickers are brought to the office of the orderer, and the OR assistant notes down on the right request form which instruments are used.

7.8 Clean normal trays are placed at the clean corridor. Over here the logistic employee OR brings the trays back to the sterile storage. These trays do not have to be sterilized again and are directly available for usage.

7.8' Clean loan trays must go back to Combi-Ster. The trays are put in a plastic bag and placed in the cart with the used soil instruments.

7.9 The soil trays will be placed in soil carts at the desk of the OR-complex. Clean loan trays are placed in a plastic bag and put in the same cart as the soil trays.

Step 8 – Transport to Combi-Ster

8.1 The carts are transported to the central storage. This is done 3 or 4 times a day.

8.2 Combi-Ster places empty soil carts for the next surgeries at the RdGG.

8.3 The soiled carts are loaded into the truck to get on transport to Combi-Ster.

8.4 Combi-Ster drives six times a day from the RdGG to Combi-Ster with goods.

Step 9 – Cleaning and sterilization

9.1 When the carts arrive at Combi-Ster they are scanned in the soiled area to identify the tray and the cleaning and sterilization instructions from the internal digital system of Combi-Ster.

9.1' Clean loan trays are taken out of the soiled cart. The plastic bag will be removed and the trays will be brought to the instrumental storage.

9.2 After scanning the instruments the cleaning process will be started. Special conditions and/or requirements concerning cleaning and sterilization are retrieved from the system when scanning the trays.

9.2' The clean loan trays are opened and the label and barcode, which were attached in step 3.5 and 3.6, will be removed.

9.3 The trays will enter the clean area when the cleaning process is finished. Here the trays will be assembled and packed in a special packaging. This packaging is resistant for the autoclave processes that sterilizes the instruments. The instruments will be placed on an inner cart. To recognize the trays a sticker including the name of the tray, expiration date, and barcode pasted on the packing, called the sterilization sticker. If instruments are missing an additional sticker will be pasted with the names of the missing instrument(s).

9.3' The cleaned loan trays are checked on completeness and compiled. Loan trays do not need to be sterilized before they will be transported back to the manufacturer.

9.4 The normal trays will be sterilized in the autoclave.

9.4' If the loan trays are complete, they will be placed in the instrumental storage.

9.5 The sterilization process will be checked based on temperature, pressure and time. This is done based on a report produced by the autoclave. When approved, the barcode from the sterilization stickers will be scanned so the system knows which trays are going on transport.

9.5' The decontamination declaration together with the other documents of the manufacturer (e.g. requirements/instructions for usage and cleaning and sterilization process) must be prepared before returning the sets back to the manufacturer. The decontamination declaration returns from the OR-complex in the clean carts.

9.6 The inner carts must be sorted on customer and be placed in the outer cart, to ensure the sterility. The customer is e.g. the OR-complex at the B- or H-building, it is thus very clear to which OR-complex the carts must go to.

9.6' The trays and documents from step 9.5' are put back in the boxes of the manufacturer.

Step 10 – Return to RdGG and invoicing

10.1 After cleaning and sterilizing the instrument trays they will be transported back to the RdGG. This is done twice a day, at 6:00 and at 13:00 o'clock. The outer carts (including the inner carts with the trays) are transported to the central storage of the RdGG.

10.1' One day after the surgery the manufacturer calls Combi-Ster to verify if the set can be collected.

10.2 Arrived at the central storage in the RdGG, the carts will be transported to the corridor in front of the OR-complex.

10.2' The trays will be picked up at Combi-Ster and transported to the manufacturer.

10.3 The inner cart will be taken to sterile storage of the OR-complex. The outer cart will stay at the corridor.

10.3' The manufacturer checks the instruments on usage and condition. When lending the instruments to another hospital the instruments need to be in good condition.

10.4 The inner carts are unloaded and the trays are placed in the sterile storage.

10.4' Based on the check done in 10.3' the manufacturer send an invoice to Z-XL.

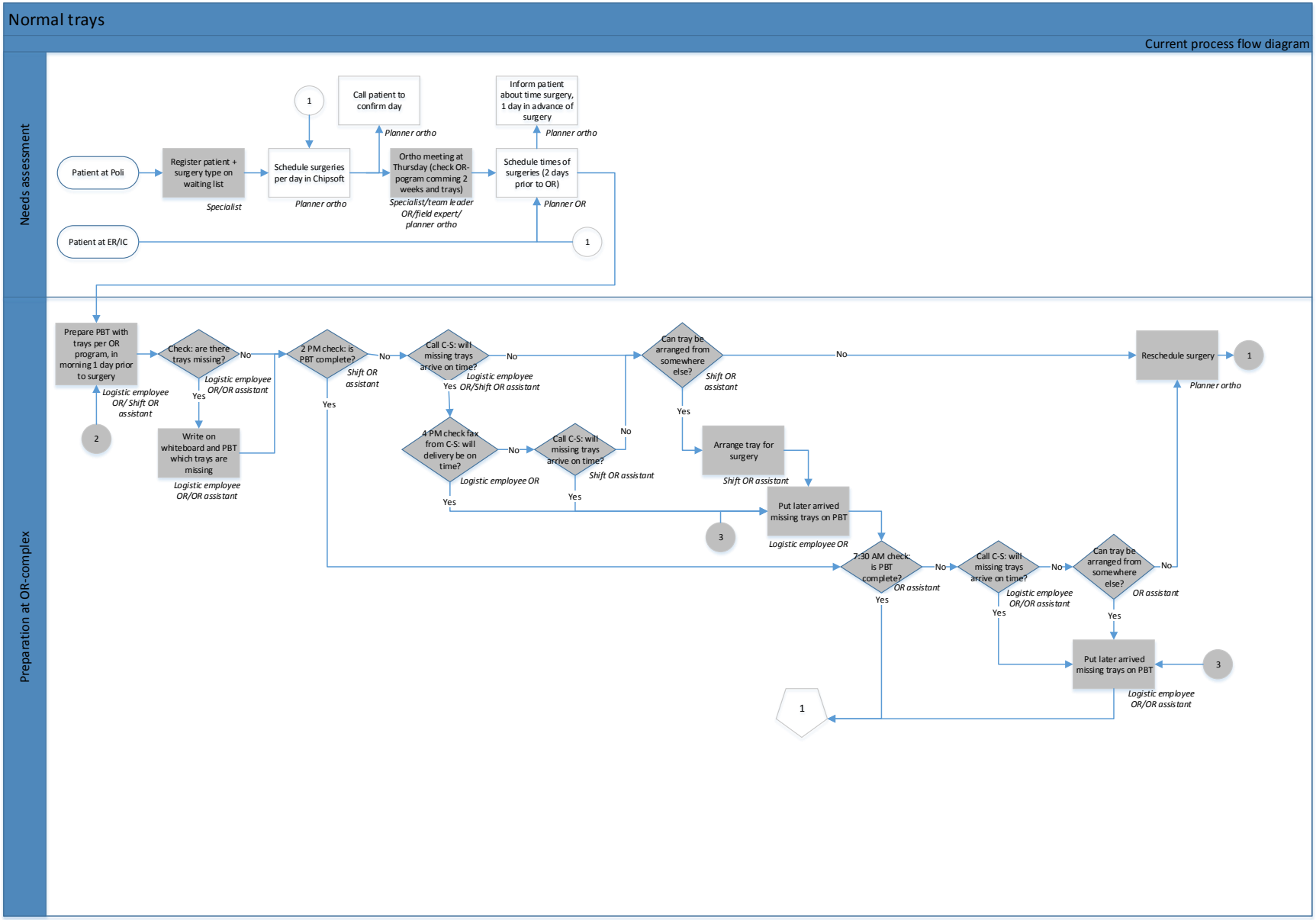
10.5 Every month Combi-Ster sends an invoice to the OR-complex based on the cleaned and sterilized trays of last month. Every tray has its own cleaning and sterilization price. For emergency sterilization Combi-Ster asks double the price of the normal sterilization price of the tray.

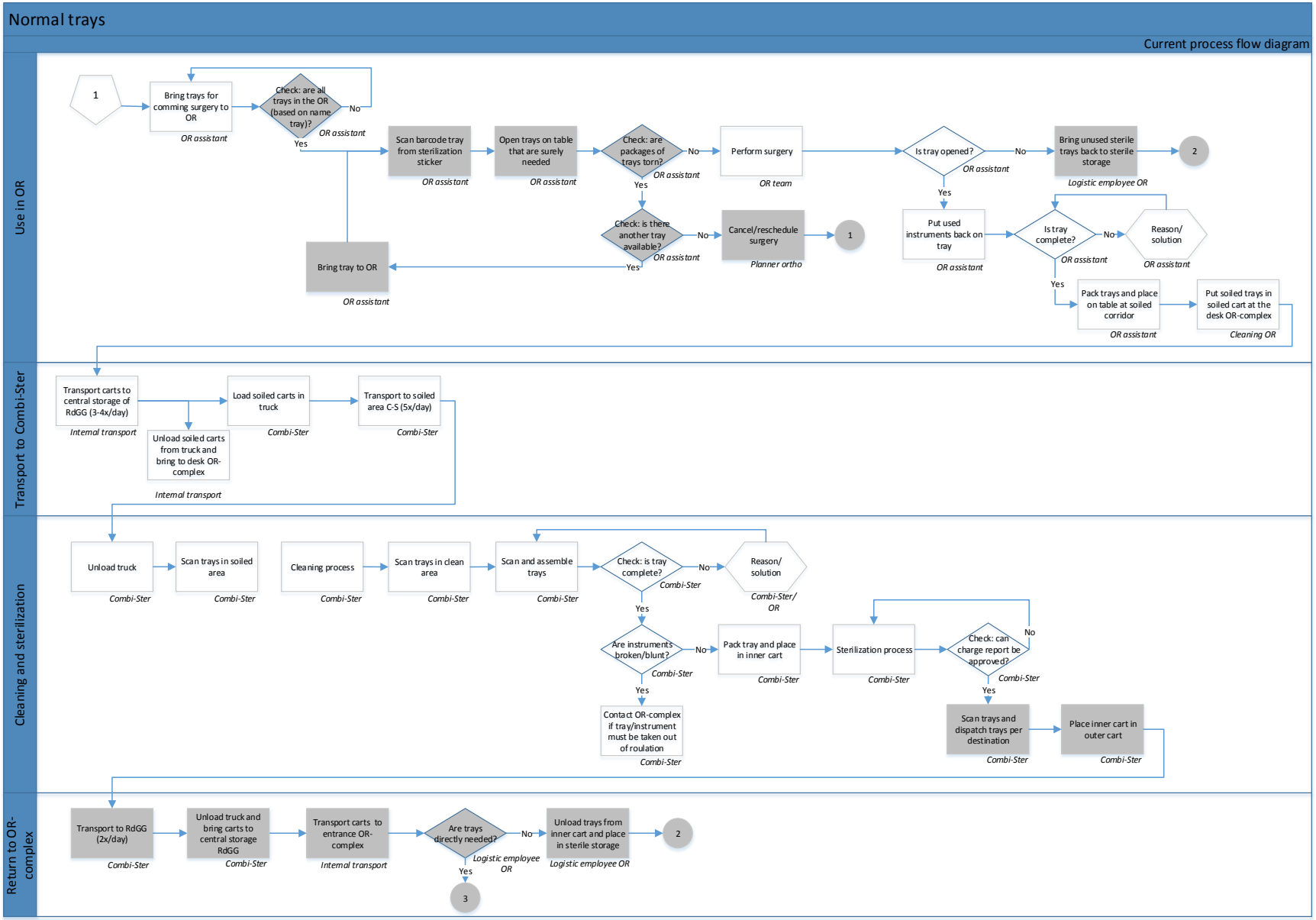
10.5' Z-XL receives the invoice and asks the orderer to confirm the invoice.

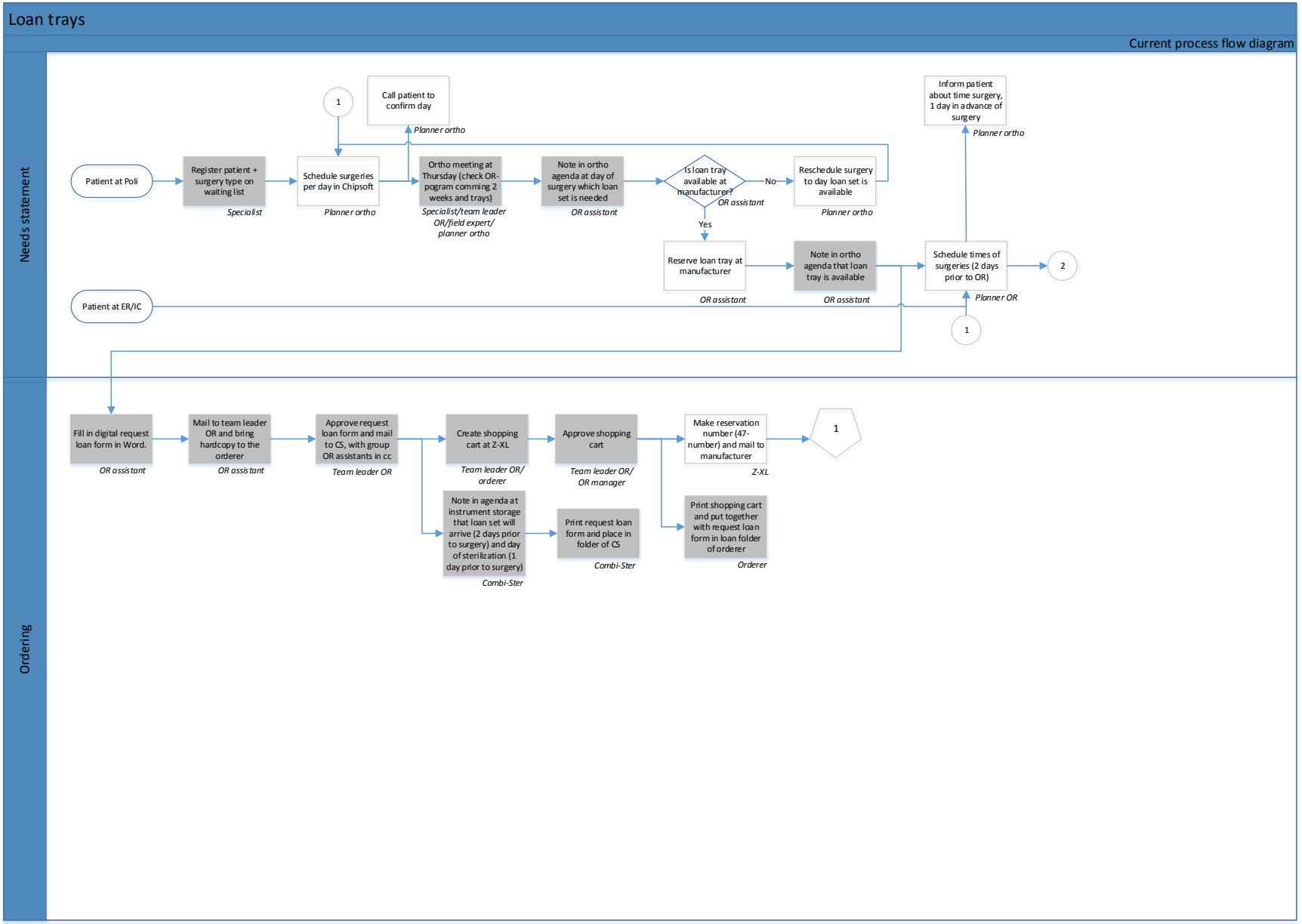
10.6' Before confirming the invoice the orderer checks the invoice with the request loan form (step 2.1), the shopping card (made in step 2.3), and the used material (step 7.7). When this all is correct the invoice will be confirmed.

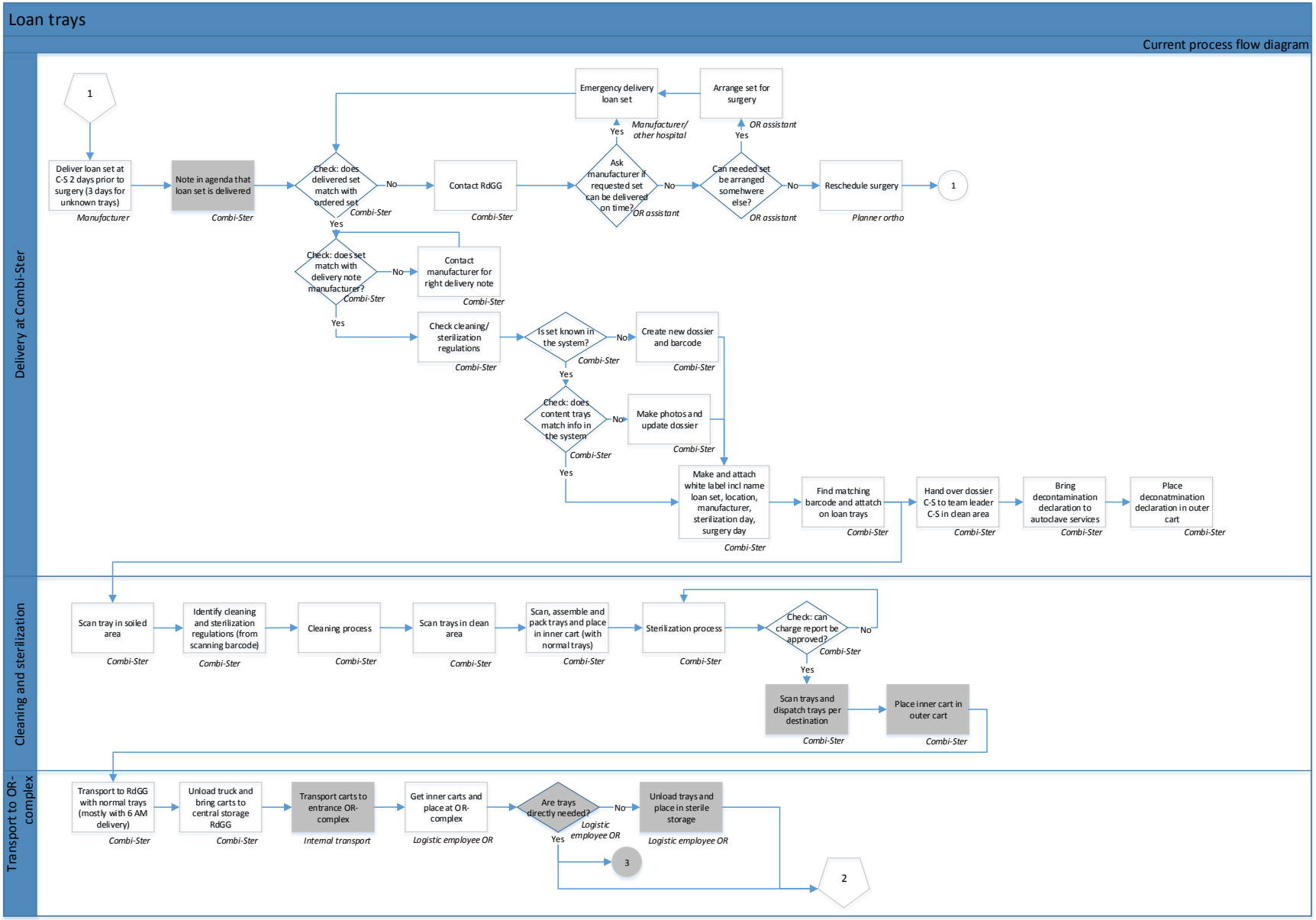
10.7' Z-XL checks the information from the orderer with the invoice and approves when they are similar.

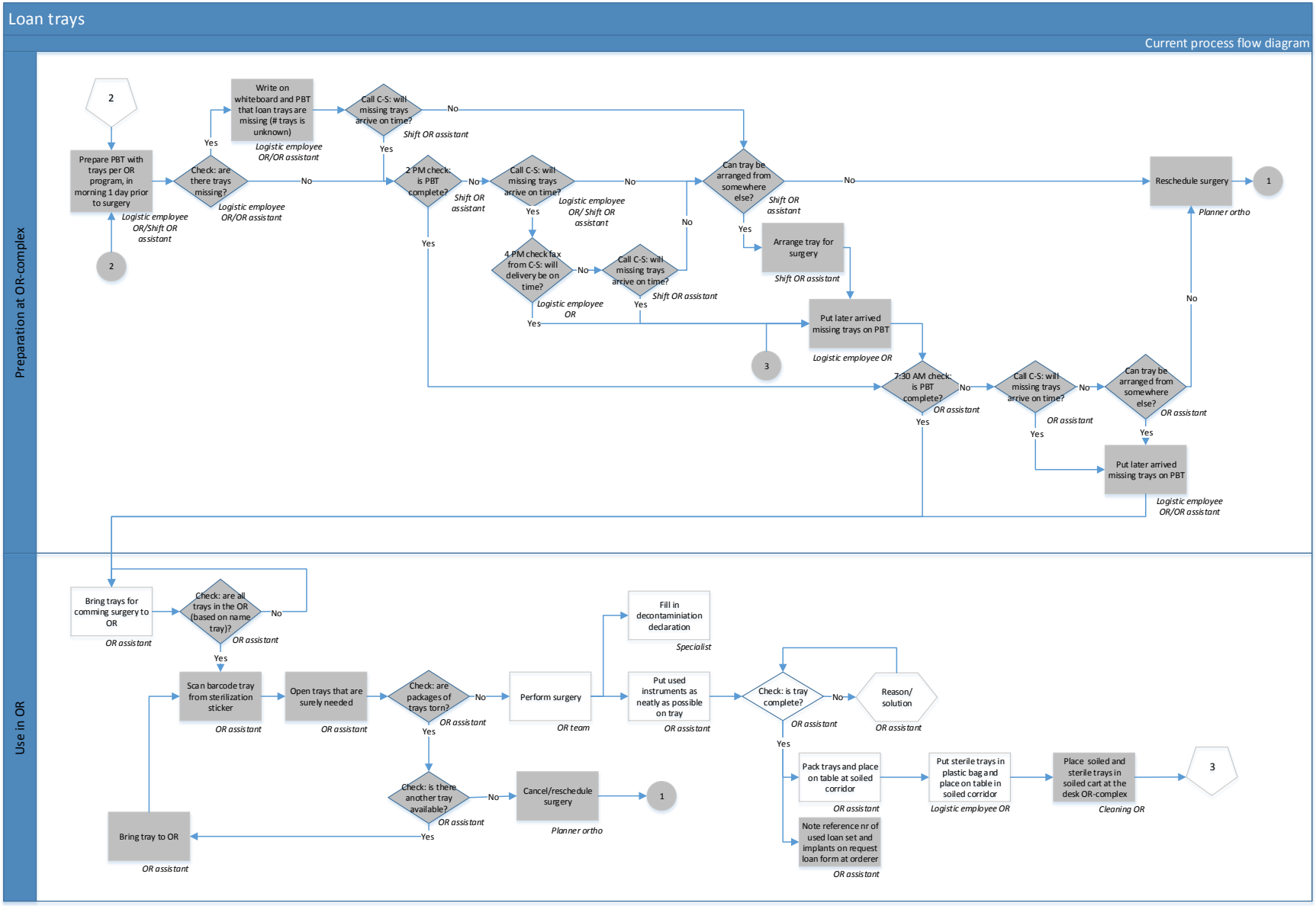
10.8' The reservation number (47-number) from step 2.6 will be changed in an order number (45-number) and linked to the 47-number. The invoice will be at the costs centre of orthopaedic.

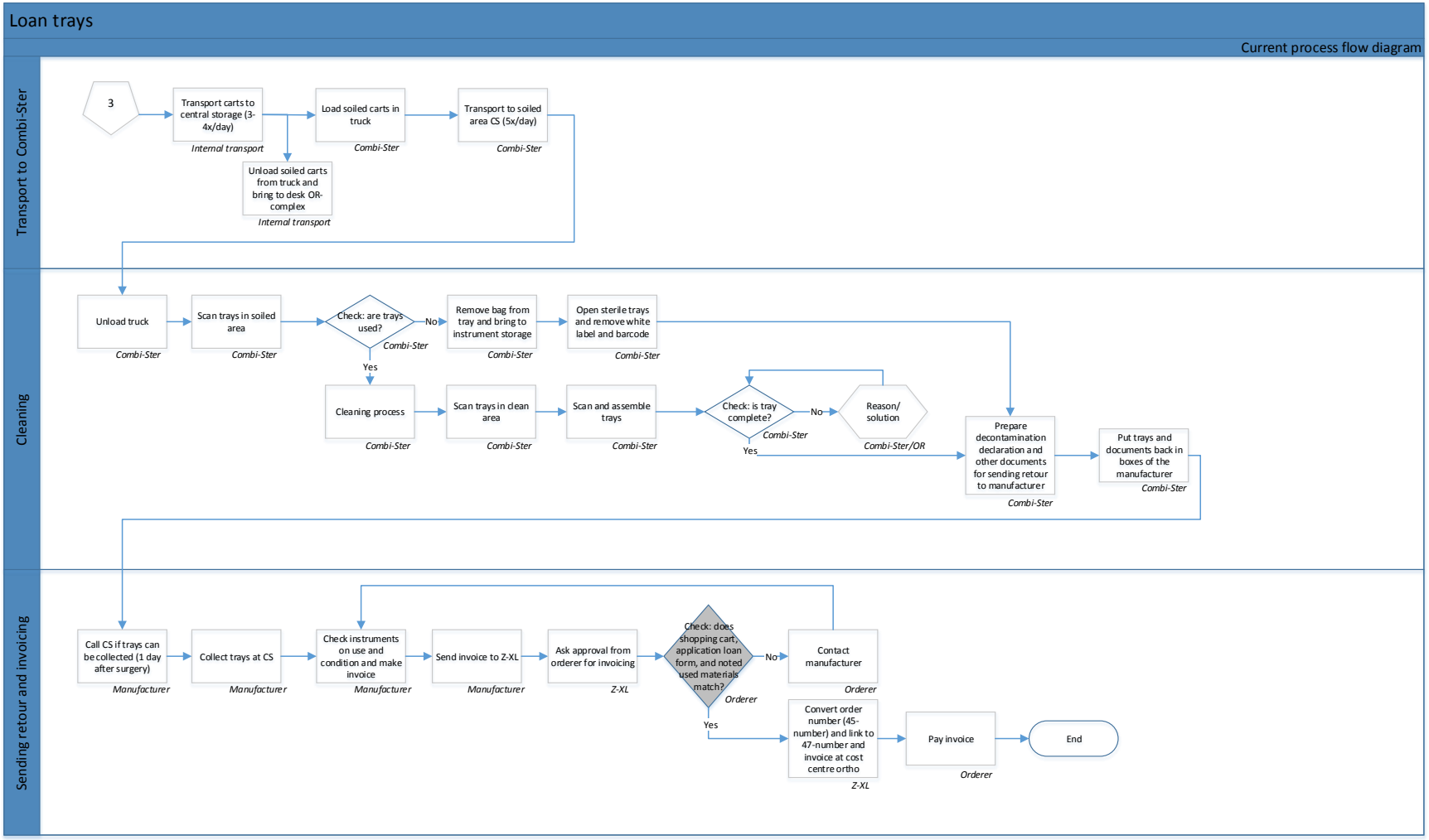

Normal trays
Current process flow diagram
Needs assessment
Preparation at OR-complex
Patient at Poli
Register patient + surgery type on waiting list
Specialist
Schedule surgeries per day in Chipsoft
Planner ortho
Call patient to confirm day
Planner ortho
Ortho meeting at Thursday (check OR-pogram comming 2 weeks and trays)
Specialist/team leader OR/field expert/ planner ortho
Schedule times of surgeries (2 days prior to OR)
Planner OR
Inform patient about time surgery, 1 day in advance of surgery
Planner ortho
Patient at ER/IC
1
Prepare PBT with trays per OR program, in morning 1 day prior to surgery
Logistic employee OR/ Shift OR assistant
2
Check: are there trays missing?
No
Yes
Logistic employee OR/OR assistant
Write on whiteboard and PBT which trays are missing
Logistic employee OR/OR assistant
2 PM check: is PBT complete?
No
Yes
Shift OR assistant
Call C-S: will missing trays arrive on time?
No
Yes
Logistic employee OR/Shift OR assistant
4 PM check fax from C-S: will delivery be on time?
No
Yes
Logistic employee OR
Call C-S: will missing trays arrive on time?
No
Yes
Shift OR assistant
Can tray be arranged from somewhere else?
No
Yes
Shift OR assistant
Reschedule surgery
1
Planner ortho
Arrange tray for surgery
Shift OR assistant
Put later arrived missing trays on PBT
Logistic employee OR
3
7:30 AM check: is PBT complete?
No
Yes
OR assistant
Call C-S: will missing trays arrive on time?
No
Yes
Logistic employee OR/OR assistant
Can tray be arranged from somewhere else?
No
Yes
OR assistant
Put later arrived missing trays on PBT
3
Logistic employee OR/OR assistant
1


Normal trays
Current process flow diagram
Use in OR
Transport to Combi-Ster
Cleaning and sterilization
Return to OR-complex
1
Bring trays for comming surgery to OR
OR assistant
Check: are all trays in the OR (based on name tray)?
OR assistant
No
Yes
Scan barcode tray from sterilization sticker
OR assistant
Open trays on table that are surely needed
OR assistant
Check: are packages of trays torn?
OR assistant
No
Yes
Perform surgery
OR team
Is tray opened?
OR assistant
No
Yes
Bring unused sterile trays back to sterile storage
Logistic employee OR
2
Put used instruments back on tray
OR assistant
Is tray complete?
OR assistant
No
Reason/ solution
OR assistant
Yes
Pack trays and place on table at soiled corridor
OR assistant
Put soiled trays in soiled cart at the desk OR-complex
Cleaning OR
Check: is there another tray available?
OR assistant
No
Yes
Cancel/reschedule surgery
Planner ortho
1
Bring tray to OR
OR assistant
Transport carts to central storage of RdGG (3-4x/day)
Internal transport
Unload soiled carts from truck and bring to desk OR-complex
Internal transport
Load soiled carts in truck
Combi-Ster
Transport to soiled area C-S (5x/day)
Combi-Ster
Unload truck
Combi-Ster
Scan trays in soiled area
Combi-Ster
Cleaning process
Combi-Ster
Scan trays in clean area
Combi-Ster
Scan and assemble trays
Combi-Ster
Check: is tray complete?
Combi-Ster
No
Reason/ solution
Combi-Ster/ OR
Yes
Are instruments broken/blunt?
Combi-Ster
No
Pack tray and place in inner cart
Combi-Ster
Sterilization process
Combi-Ster
Check: can charge report be approved?
Combi-Ster
No
Yes
Scan trays and dispatch trays per destination
Combi-Ster
Place inner cart in outer cart
Combi-Ster
Yes
Contact OR-complex if tray/instrument must be taken out of roulation
Combi-Ster
Transport to RdGG (2x/day)
Combi-Ster
Unload truck and bring carts to central storage RdGG
Combi-Ster
Transport carts to entrance OR-complex
Internal transport
Are trays directly needed?
Logistic employee OR
No
Yes
Unload trays from inner cart and place in sterile storage
Logistic employee OR
2
3


Loan trays
Current process flow diagram
Needs statement
Ordering
Patient at Poli
Register patient + surgery type on waiting list
Specialist
Schedule surgeries per day in Chipsoft
Planner ortho
1
Call patient to confirm day
Planner ortho
Ortho meeting at Thursday (check OR-pogram comming 2 weeks and trays)
Specialist/team leader OR/field expert/ planner ortho
Note in ortho agenda at day of surgery which loan set is needed
OR assistant
Is loan tray available at manufacturer?
OR assistant
No
Reschedule surgery to day loan set is available
Planner ortho
Yes
Reserve loan tray at manufacturer
OR assistant
Note in ortho agenda that loan tray is available
OR assistant
Schedule times of surgeries (2 days prior to OR)
Planner OR
Inform patient about time surgery, 1 day in advance of surgery
Planner ortho
2
Patient at ER/IC
1
Fill in digital request loan form in Word.
OR assistant
Mail to team leader OR and bring hardcopy to the orderer
OR assistant
Approve request loan form and mail to CS, with group OR assistants in cc
Team leader OR
Create shopping cart at Z-XL
Team leader OR/ orderer
Approve shopping cart
Team leader OR/ OR manager
Make reservation number (47-number) and mail to manufacturer
Z-XL
1
Note in agenda at instrument storage that loan set will arrive (2 days prior to surgery) and day of sterilization (1 day prior to surgery)
Combi-Ster
Print request loan form and place in folder of CS
Combi-Ster
Print shopping cart and put together with request loan form in loan folder of orderer
Orderer


Loan trays
Current process flow diagram
Delivery at Combi-Ster
Cleaning and sterilization
Transport to OR-complex
1
Deliver loan set at C-S 2 days prior to surgery (3 days for unknown trays)
Manufacturer
Note in agenda that loan set is delivered
Combi-Ster
Check: does delivered set match with ordered set
Combi-Ster
No
Yes
Contact RdGG
Combi-Ster
Emergency delivery loan set
Yes
Manufacturer/ other hospital
Ask manufacturer if requested set can be delivered on time?
OR assistant
No
Arrange set for surgery
Yes
OR assistant
Can needed set be arranged somehwere else?
OR assistant
No
Reschedule surgery
Planner ortho
1
Check: does set match with delivery note manufacturer?
Combi-Ster
No
Contact manufacturer for right delivery note
Combi-Ster
Yes
Check cleaning/ sterilization regulations
Combi-Ster
Is set known in the system?
Combi-Ster
No
Create new dossier and barcode
Combi-Ster
Yes
Check: does content trays match info in the system
Combi-Ster
No
Make photos and update dossier
Combi-Ster
Yes
Make and attach white label incl name loan set, location, manufacturer, sterilization day, surgery day
Combi-Ster
Find matching barcode and attatch on loan trays
Combi-Ster
Hand over dossier C-S to team leader C-S in clean area
Combi-Ster
Bring decontamination declaration to autoclave services
Combi-Ster
Place deconatmination declaration in outer cart
Combi-Ster
Scan tray in soiled area
Combi-Ster
Identify cleaning and sterilization regulations (from scanning barcode)
Combi-Ster
Cleaning process
Combi-Ster
Scan trays in clean area
Combi-Ster
Scan, assemble and pack trays and place in inner cart (with normal trays)
Combi-Ster
Sterilization process
Combi-Ster
Check: can charge report be approved?
Combi-Ster
No
Yes
Scan trays and dispatch trays per destination
Combi-Ster
Place inner cart in outer cart
Combi-Ster
Transport to RdGG with normal trays (mostly with 6 AM delivery)
Combi-Ster
Unload truck and bring carts to central storage RdGG
Combi-Ster
Transport carts to entrance OR-complex
Internal transport
Get inner carts and place at OR-complex
Logistic employee OR
Are trays directly needed?
Logistic employee OR
No
Yes
Unload trays and place in sterile storage
Logistic employee OR
3
2


Loan trays
Current process flow diagram
Preparation at OR-complex
Use in OR
2
Prepare PBT with trays per OR program, in morning 1 day prior to surgery
Logistic employee OR/Shift OR assistant
Check: are there trays missing?
Logistic employee OR/OR assistant
Yes
No
Write on whiteboard and PBT that loan trays are missing (# trays is unknown)
Logistic employee OR/OR assistant
Call C-S: will missing trays arrive on time?
Shift OR assistant
No
Yes
2 PM check: is PBT complete?
Shift OR assistant
No
Yes
Call C-S: will missing trays arrive on time?
Logistic employee OR/ Shift OR assistant
No
Yes
4 PM check fax from C-S: will delivery be on time?
Logistic employee OR
No
Yes
Call C-S: will missing trays arrive on time?
Shift OR assistant
No
Yes
Can tray be arranged from somewhere else?
Shift OR assistant
No
Yes
Arrange tray for surgery
Shift OR assistant
Reschedule surgery
Planner ortho
1
2
3
Put later arrived missing trays on PBT
Logistic employee OR
7:30 AM check: is PBT complete?
OR assistant
No
Yes
Call C-S: will missing trays arrive on time?
OR assistant
No
Yes
Can tray be arranged from somewhere else?
OR assistant
No
Yes
Put later arrived missing trays on PBT
Logistic employee OR/OR assistant
Bring trays for comming surgery to OR
OR assistant
Check: are all trays in the OR (based on name tray)?
OR assistant
No
Yes
Scan barcode tray from sterilization sticker
OR assistant
Open trays that are surely needed
OR assistant
Check: are packages of trays torn?
OR assistant
No
Yes
Perform surgery
OR team
Fill in decontaminiation declaration
Specialist
Put used instruments as neatly as possible on tray
OR assistant
Check: is tray complete?
OR assistant
No
Yes
Reason/ solution
OR assistant
Pack trays and place on table at soiled corridor
OR assistant
Put sterile trays in plastic bag and place on table in soiled corridor
Logistic employee OR
Place soiled and sterile trays in soiled cart at the desk OR-complex
Cleaning OR
3
Note reference nr of used loan set and implants on request loan form at orderer
OR assistant
Check: is there another tray available?
OR assistant
No
Yes
Cancel/reschedule surgery
Planner ortho
1
Bring tray to OR
OR assistant


Loan trays
Current process flow diagram
Transport to Combi-Ster
Cleaning
Sending retour and invoicing
3
Transport carts to central storage (3-4x/day)
Internal transport
Load soiled carts in truck
Combi-Ster
Transport to soiled area CS (5x/day)
Combi-Ster
Unload soiled carts from truck and bring to desk OR-complex
Internal transport
Unload truck
Combi-Ster
Scan trays in soiled area
Combi-Ster
Check: are trays used?
Combi-Ster
No
Yes
Remove bag from tray and bring to instrument storage
Combi-Ster
Open sterile trays and remove white label and barcode
Combi-Ster
Cleaning process
Combi-Ster
Scan trays in clean area
Combi-Ster
Scan and assemble trays
Combi-Ster
Check: is tray complete?
Combi-Ster
No
Yes
Reason/ solution
Combi-Ster/OR
Prepare decontamination declaration and other documents for sending retour to manufacturer
Combi-Ster
Put trays and documents back in boxes of the manufacturer
Combi-Ster
Call CS if trays can be collected (1 day after surgery)
Manufacturer
Collect trays at CS
Manufacturer
Check instruments on use and condition and make invoice
Manufacturer
Send invoice to Z-XL
Manufacturer
Ask approval from orderer for invoicing
Z-XL
Check: does shopping cart, application loan form, and noted used materials match?
Orderer
No
Yes
Contact manufacturer
Orderer
Convert order number (45-number) and link to 47-number and invoice at cost centre ortho
Z-XL
Pay invoice
Orderer
End

H. List of failure modes of current process

H-FMEA (bruikleen) instrumentarium - Huidige processen								
Alleen normale	**Alleen bruikleen**	**Potentiële faalwijze**	**Potentiele oorzaak**	**Freq**	**Ernst**	**Risico score**	**Accepteren, beheersen, elimineren**	**Beschrijving actie**
		1. Behoeftestelling						
		1.1 Patiënt bij poli en patiënt en naam operatie plaatsen op wachtlijst (info over bijzonderheden operatie en bruikleen in vrije veld ChipSoft)						
		Incomplete informatie in vrije veld	Geen informatie geschreven over welke implantaat in patiënt zit (voor een revisie)	3	4	12	beheersen	OK assistent gaat achteraan
			Geen informatie geschreven over welke instrumenten en implantaten nodig zijn	2	4	8	accepteren	
			Informatie ingevoerd door artsen in opleidingen die niet alles weten	4	4	16	accepteren	
			Info veld in ChipSoft is niet meer te wijzigen (door specialist, planner ortho kan het wel)	3	2	6	accepteren	
			Informatie over patiënt pas later bekend	2	2	4	accepteren	
		Verandering van de wensen voor de operatie	Andere operateur	2	2	4	accepteren	
			Informatie over patiënt pas later bekend	2	2	4	accepteren	
		1.1' Spoed patiënten via SEH/IC. Aanmelden direct bij planner OK (spoed= 12-14 uur voor de operatie)						
		Nodige net niet aanwezig	Net nog bij Combi-Ster	3	4	12		
			Net in ander gebouw	3	4	12		
			Net in gebruik	2	4	8		
		1.2 Inplannen: patiënt en type operatie in ChipSoft (en bellen met patiënt)						
		patiënt niet inplannen	patiënt niet aangemeld in ChipSoft	3	2	6	accepteren	
			patiënt niet op inplanlijst (bv. Niet bij anesthesie geweest, geen POS akkoord)	4	2	8	accepteren	
			Planner ortho niet aanwezig	2	3	6	accepteren	
		1.3 Ortho overleg op donderdag. Check OK programma voor komende 2 weken en check (bruikleen) netten						
		Overleg gaat niet door		3	2	6	accepteren	
		Mist informatie	Niet/ onvolledig/ verkeerd informatie in vrije veld instrumentarium in ChipSoft	3	4	12	accepteren	
			Operateur niet aanwezig of niet bereikbaar bij overleg	4	2	8	accepteren	
			Terrein deskundige niet aanwezig	3	2	6	accepteren	
			Otho consulante niet aanwezig	2	1	2	accepteren	
		Overleg is te kort om alle materialen door te nemen	Overleg niet bedoeld alleen voor materialen doornemen, niet voor iedereen van belang	4	2	8	accepteren	
		Geen overzicht van de netten in roulatie	Operatie assistante niet op de hoogte	5	2	10	accepteren	
			Overzicht van netten in roulatie niet aanwezig	3	4	12	accepteren	
			Overzicht van wat trauma nodig heeft niet aanwezig	5	2	10	accepteren	
			Overzicht van nodige materialen (uit ChipSoft) niet aanwezig	3	3	9	accepteren	
		Materialen niet op tijd besproken tussen planner ortho en terrein deskundigen	patiënt gepland en geopereerd tussen 2 overleggen (semi spoed)	4	3	12	accepteren	
			Meerdere aanspreekpunt bij terrein deskundige en niet bereikbaar tijdens OK	2	4	8	accepteren	
			OK assistenten te druk/vergeten actie te ondernemen aan het einde van de dag	4	2	8	accepteren	

	x	**1.4 Schrijven in ortho agenda welke bruikleen set nodig is op de OK datum**						
		Niet gedaan	Vergeten/ te druk	2	4	8	accepteren	
		Verkeerde net opschrijven	Vergissing	2	4	8	accepteren	
			Onduidelijke informatie ingevoerd in vrije veld ChipSoft	2	4	8	accepteren	
	x	**1.5 Overleg met leverancier en bruikleen set reserveren**						
		Niet gedaan	Vergeten/ te druk	2	4	8	accepteren	
		Niet mogelijk op OK datum	Net niet beschikbaar op OK datum	2	2	4	accepteren	
			Te laat actie ondernomen (sommige netten moet je ver van te voren boeken)	2	3	6	accepteren	
			patiënt te laat ingepland	2	3	6	accepteren	
		Verkeerde net besteld	Vergissing/ verkeerd begrepen vanuit OK/ verkeerd begrepen vanuit leverancier	2	4	8	accepteren	
			leverancier en OK gebruiken andere benaming voor de netten	2	4	8	accepteren	
	x	**1.6 Vinkje bij de bruikleen set zetten in ortho agenda dat de bruikleen set voorradig is bij leverancier**						
		Niet gedaan	Vergeten/ te druk	2	2	4	accepteren	
		Vinkje bij verkeerde patiënt in agenda	Vergissing	3	2	6	accepteren	
			Onduidelijk vinkje/ niet duidelijk opgeschreven	3	2	6	accepteren	
		1.7 Check tijden en volgorde van de operaties per dag, 2 dagen voor de OK						
		Niet naar de opmerkingen van terrein deskundige kijken	(bv. Operatie liefst in de middag i.v.m. aanleveringen van Combi-Ster)	3	3	9	accepteren	
		1.8 Operatie tijd doorgeven aan patiënt, 1 dag van te voren						
		Niet doorgeven	patiënt niet bereikbaar (dan wordt het aan verpleegafdeling doorgegeven)	2	4	8	beheersen	Doorgeven aan verpleegafdeling
		2. Bestelling						
	x	**2.1 Digitaal aanvraag bruikleen formulier invullen in Word, mailen naar teamleider OK, printen en brengen naar besteller**						
		Formulier niet ingevuld	Te druk/ vergeten	2	4	8	accepteren	
		Niet gemaild	Te druk/ vergeten	2	4	8	accepteren	
		Niet geprint	Te druk/ vergeten	4	2	8	accepteren	
		Niet naar besteller gebracht	Te druk/ vergeten	2	4	8	accepteren	
		Formulier verkeerd ingevuld	Vergissing	3	2	6	accepteren	
	x	**2.2 Akkoord op aanvraag bruikleen formulier en mail naar Combi-Ster, met cc naar groep OK assistenten**						
		Geen mail doorgestuurd	Te druk/ vergeten	4	2	8	accepteren	
	x	**2.3 Winkelwagen aanmaken bij Z-XL**						
		Geen winkelwagen aangemaakt	Te druk/ vergeten	2	4	8	accepteren	
		Verkeerd ingevuld	Vergissing	2	3	6	accepteren	
	x	**2.4 Goedkeuren winkelwagen**						
		Winkelwagen niet goedgekeurd	Manager OK niet aanwezig (als teamleider de aanvraag heeft gemaakt)	3	2	6	accepteren	
			Teamleider niet aanwezig	2	2	4	accepteren	
	x	**2.5 Winkelwagen uitprinten en met aanvraag bruikleen formulier in bruikleen map zetten van de besteller**						
		Niet uitgeprint	Luiheid, te druk/ vergeten	2	2	4	accepteren	

		Verkeerde map	Vergissing	2	2	4	accepteren	
		2 formulieren (bruikleen aanvraag formulier en winkelwagen) niet bij elkaar	Vergissing, te druk/ vergeten	2	2	4	accepteren	
	x	**2.6 Reserveringsnummer (47 nummer) maken en mailen aan leverancier**						
		Order nummer 'verdwaald' in het systeem	ICT problemen	2	2	4	accepteren	
	x	**2.7 In agenda schrijven in instrumenten magazijn op dag van levering (2 dagen voor OK) en op dag van sterilisatie (1 dag voor OK)**						
		-						
	x	**2.8 Aanvraag bruikleen formulier uitprinten en in map van Combi-Ster stoppen**						
		-						
		3. Levering bij Combi-Ster						
	x	**3.1 Levering bij Combi-Ster 2 werkdagen voor de OK voor een bekende bruikleen set (3 werkdagen voor nieuwe set)**						
		Niet geleverd	Direct op OK geleverd	2	2	4	accepteren	
			Incorrecte bestelling	1	3	3	accepteren	
			Vergissing leverancier	1	3	3	beheersen	
		Te laat geleverd	Uitgeleend bij andere ziekenhuis en te laat bij de leverancier terug	2	3	6	accepteren	
			Onbekend dat een nieuwe set 3 dagen voor de OK aanwezig moet zijn	2	2	4	accepteren	
			Vergissing leverancier	1	3	3	accepteren	
	x	**3.2 Afvinken levering bruikleen in agenda**						
		Niet gedaan	Vergeten/ te druk	2	2	4	accepteren	
			Bruikleen was niet agenda geschreven want de aanvraag formulier was niet geprint (omdat de mail al geopend is)	2	2	4	accepteren	
		Levering onbekend bij Combi-Ster	Bruikleen aanvraag formulier niet naar Combi-Ster gemaild (dus onbekend voor wie en wanneer het bedoeld is)	4	2	8	accepteren	
	x	**3.3 Check inhoud levering met pakbon leverancier, reinigings- en sterilisatie voorschriften, nieuwe dossier en nieuwe barcode aanmaken**						
		Mist/kapotte instrumenten	Verkeerde check bij leverancier	2	4	8	accepteren/ beheersen	contact opnemen met leverancier
		Mist een net	Soms moeilijk om te weten, het niet altijd bekend hoeveel netten in een set moeten zijn	2	4	8	accepteren/ beheersen	contact opnemen met leverancier
		Reinigings- en sterilisatie voorschriften niet geleverd/ niet compleet	Vergeten bij leverancier	2	2	4	accepteren	
		Reinigings- en sterilisatie voorschriften niet te doen bij Combi-Ster		1	4	4	accepteren	
		Geen nieuwe dossier aangemaakt	ICT problemen	1	2	2	accepteren	
			Niet genoeg tijd (spoed)	2	2	4	accepteren	
			Voorschriften niet aanwezig	2	2	4	accepteren	
	x	**3.4 Checken foto's uit database. Foto's van inhoud maken als er iets veranderd is en dossier updaten**						
		Niet gecheckt	Vergeten/ te druk/ spoed	3	2	6	accepteren	
		Geen update	Vergeten/ te druk /spoed	3	2	6	accepteren	

			ICT problemen	2	2	4	accepteren	
			Camera kapot	1	2	2	accepteren	
		Fout gecheckt	Vergissing	2	2	4	accepteren	
	x	**3.5 Wit label maken met: bruikleen, locatie, leverancier, sterilisatie dag en OK dag**						
		Verkeerde datum	Vergissing	2	4	8	accepteren	
	x	**3.6 Barcode zoeken in bak en plaatsen op bruikleen netten**						
		Verkeerde barcode	Vergissing	2	3	6	accepteren	
	x	**3.7 Dossier van Combi-Ster doorgeven aan teamleider Combi-Ster in schone ruimte (tegelijker tijd met de netten naar de reinigingsruimte)**						
		Dossier niet doorgegeven	Vergeten/ te druk/ spoed	2	2	4	accepteren	
			Bruikleen verantwoordelijke niet aanwezig	2	2	4	accepteren	
	x	**3.8 Decontaminatie verklaring naar autoclaaf dienst (na de autoclaaf), die geven het mee in de buitenkar naar de OK**						
		Niet doorgegeven	Vergeten/ te druk/ spoed	2	1	2	accepteren	
		Niet in de kar gezet	Vergeten door autoclaaf dienst	2	1	2	accepteren	
			In verkeerde kar gezet door autoclaaf dienst	2	1	2	accepteren	
		4. Reiniging en sterilisatie						
	x	**4.1 Netten scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)**						
		Verkeerde barcode	Vergissing	2	2	4	accepteren	
		ICT problemen		2	2	4	accepteren	
	x	**4.2 Reinigingsproces**						
		-						
	x	**4.3 Netten samenstellen, check compleetheid en inpakken**						
		Map met overzicht van inhoud net is niet doorgegeven aan de teamleider	Vergeten/ te druk/ slechte communicatie tussen teamleiders	2	2	4	accepteren	
		Foto verkeerd gekoppeld	Vergissing	2	2	4	accepteren	
		Verkeerde sterilisatie sticker geplakt	Vergissing	2	5	10	accepteren/ beheersen	werkflow afspraken
	x	**4.4 Sterilisatieproces**						
		Deel niet gesteriliseerd (deel levering)	Vergissing	2	4	8	accepteren	
			Problemen met verpakking/ net nat geworden	2	2	4	accepteren	
	x	**4.5 Goedkeuren sterilisatieproces en scan barcode van sterilisatie sticker**						
		-						
	x	**4.6 Met reguliere netten naar de chauffeur**						
		In verkeerde kar (klant) geplaatst	Vergissing	2	3	6	accepteren	
		5. Transport naar OK						
	x	**5.1 Transport naar centraal magazijn RdGG in buitenkar met de gewone netten, meestal met de levering van 6:00**						
		Probleem met transport		1	2	2	accepteren	
	x	**5.2 Transport naar ingang OK-complex**						
		Verkeerde afdeling gebracht	Vergissing	2	3	6	accepteren	
	x	**5.3 Binnenkar halen uit buitenkar en brengen naar steriele berging OK**						

		Kar kan niet geopend worden	Oude karren	1	2	2	accepteren	
	x	**5.4 Netten uitruimen in steriele berging of direct in klaarzet kar plaatsen (als het met de ochtend levering aankomt)**						
		Netten verpakking beschadigd	Netten gestoten	5	3	15	accepteren	
		6. Klaarzetten						
		6.1 Netten klaarzetten per OK programma volgens klaarzetlijsten (1 dag voor de operatie) in de ochtend de dag voor OK						
		Klaarzetlijsten niet volledig	Onbekend uit hoeveel netten de bruikleen set bestaat	5	2	10	accepteren	
			Verandering in klaarzetlijsten (nieuwe artsen, nieuwe spullen)	2	2	4	accepteren	
		6.2 Op whiteboard en op de kar schrijven dat er bruikleen netten moeten aankomen (hoeveelheid netten onbekend)						
		Niet opgeschreven	Te druk/ vergeten	4	2	8	accepteren	
		Niet duidelijk hoeveel netten er zijn	Samenstelling van sets veranderen vaak	5	2	10	accepteren	
	x	**6.3 Bellen naar Combi-Ster of missende netten nog op tijd komen**						
		Niet bellen	Vergeten/ te druk	4	2	8	accepteren	
			Wordt niet opgenomen	1	2	2	accepteren	
		Geen informatie over de missende netten	Taal probleem	3	2	6	accepteren	
			Bruikleen verantwoordelijke van Combi-Ster niet aanwezig	1	2	2	accepteren	
		Bruikleen set niet (volledig) geleverd bij Combi-Ster	Verkeerde aanvraag/ levering	2	2	4	accepteren	
		6.4 Klaarzet karren checken +/- 14:00						
		Niet gecheckt	Te druk/ vergeten	2	3	6	accepteren	
		Klaarzetlijsten niet volledig	Onbekend uit hoeveel netten de bruikleen set bestaat	5	2	10	accepteren	
			Verandering in klaarzetlijsten (nieuwe artsen, nieuwe spullen)	2	2	4	accepteren	
		6.5 Bellen naar Combi-Ster of missende netten nog op tijd komen						
		Niet bellen	Vergeten/ te druk	2	3	6	accepteren	
			Wordt niet opgenomen	1	2	2	accepteren	
		Geen informatie over de missende netten	Taal probleem	3	3	9	accepteren	
		6.6 Check de fax van Combi-Ster of leveringen nog op tijd komen +/-16:00						
		Bruikleen niet op de fax	Andere klant nummer voor bruikleen (moet met de hand selecteren)					
		Fax komt te laat		5	2	10	accepteren	
		Informatie fax klopt niet	Spullen die op de fax zijn kunnen al geleverd zijn (door vakere leveringen)	5	3	15	accepteren	
		6.7 Missende netten op klaarzetkar zetten na de levering van 6:00						
		Netten verpakking beschadigd	Netten gestoten	5	4	20	accepteren	
		6.8 Klaarzet karren checken +/- 7:30						
		Netten afwezig	Gebruikt voor spoed patiënt	2	4	8	beheersen	spoed levering
		7. Gebruik OK						
		7.1 Netten per operatie naar de OK brengen en laatste check						
		Netten afwezig	Gebruikt voor spoed patiënt	2	4	8	accepteren	
		7.2 Barcode van netten scannen in ChipSoft						

		Niet scannen	Te druk/ vergeten	5	2	10	accepteren	
			Barcode kwijt	5	2	10	accepteren	
			ICT problemen	2	2	4	accepteren	
		7.3 Netten openmaken en checken voor gaten en tellen a.d.h.v. begeleidingslijsten						
		Netten worden afgekeurd	Gat in de verpakking	5	5	25	accepteren	
		Mist instrument (onverwacht)	Fout samengesteld door Combi-Ster	4	5	20	accepteren	
		Mist een (bruikleen) net	Onvolledige klaarzetlijsten	2	5	10	accepteren	
			Onvolledige levering van Combi-Ster	2	5	10	accepteren	
		Instrument niet goed gereinigd	Fout bij Combi-Ster	2	5	10	accepteren	
		7.4 Operatie						
		Instrument is/gaat kapot/onsteriel		4	2	8	accepteren	
		Belangrijk instrument is/gaat kapot/ onsteriel		2	5	10	accepteren	
		Mist een instrument		2	5	10	accepteren	
		Aanvullende spullen nodig tijdens operatie	Onverwacht verloop van operatie	5	2	10	accepteren	
		Aanvullende spullen niet beschikbaar	Nog bij Combi-Ster of bij andere gebouw	3	5	15	accepteren	
		Instrumenten niet goed gereinigd	Foute reiniging bij Combi-Ster	2	5	10	accepteren	
		7.5 Decontaminatie verklaring invullen						
		Verklaring niet ingevuld	Vergeten/ te druk	4	1	4	accepteren	
			Verklaring kwijt	4	1	4	accepteren	
			verklaring in verkeerde kar gezet	4	1	4	accepteren	
		7.6 Instrumenten terug op de netten leggen en check compleetheid, verpakken en op tafel op de gang						
		Gebruikte implantaten (schroeven en platen) niet aangevuld	Vergeten/ te druk/ geen overzicht	2	2	4	accepteren	
		Verkeerd aangevuld	Vergissing	2	3	6	accepteren	
		Instrument kwijt	Per ongeluk weggegooid	2	2	4	accepteren	
		Niet geregistreerd dat instrument defect of kwijt is	Vergeten/ te druk	2	2	4	beheersen	Check bij Combi-Ster tijdens stap 9.3
	x	**7.7 Artikel nummers verzamelen en opschrijven in map besteller wat verbruikt is (implantaten)**						
		Geen artikel nummers/ onleesbaar		2	2	4	accepteren	
		Nummers niet opgeschreven	Vergeten/ te druk	2	2	4	accepteren	
		Verkeerd nummer opgeschreven	Vergissing	2	2	4	accepteren	
x		**7.8 Schone netten weer terug in schone gang en terug zetten in steriele berging**						
		Niet op de juiste plek terug zetten	Vergissing	4	2	8	accepteren	
	x	**7.8' Schone netten in plastic tas in de vuile kar**						

		Niet gebeurt, terug in de steriele voorraad	Vergissing	4	2	8	accepteren	
		7.9 Vuile netten in vuile kar bij balie OK-complex						
		-						
		8. Transport naar Combi-Ster						
		8.1 Transport naar centraal magazijn (3-4 x/dag)						
		-						
		8.2 Lege karren neerzetten (voor volgende operaties)						
		-						
		8.3 Vuile karren in wagen laden (6x per dag)						
		-						
		8.4 Transport naar vuile ruimte Combi-Ster (chauffeur rijdt 6x/dag)						
		Transport problemen		1	2	2	accepteren	
		9. Reiniging en sterilisatie						
		9.1 Scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)						
		Niet gescand	Scanner doet het niet	5	2	10	accepteren	
	x	**9.1' Voor schone netten in vuile kar: zak eraf en naar instrumenten magazijn**						
		Net niet herkend als bruikleen en toch mee in roulatie	OK vergeet een zak omheen te doen	2	2	4	accepteren	
			Combi-Ster heeft niet OK gebeld om aan te herinneren (meestal gebeurt dat niet door de OK zelf, het is omdat CS belt naar de OK om te vragen dat de netten terug moeten)	4	2	8	accepteren	
		9.2 Reinigingsproces						
		-						
	x	**9.2' Schone netten openmaken, label en barcode eraf halen**						
		Label en barcode vergeten af te halen	Vergeten/ te druk	2	2	4	accepteren	
x		**9.3 Netten samenstellen, check compleetheid en verpakken**						
		Net niet compleet of instrument kapot	Iets mis gegaan in OK of in wasmachine	3	2	6	accepteren	
		Sterilisatie stickers op verkeerde net geplakt	Vergissing, niet volgens protocol van één net tegelijk	2	5	10	accepteren/ beheersen	werkflow afspraken
	x	**9.3' Netten samenstellen en check compleetheid**						
		Net niet compleet of instrument kapot	Iets mis gegaan in OK of in wasmachine	3	2	6	accepteren	
x		**9.4 Sterilisatieproces**						
		-						
	x	**9.4' Netten terug naar instrumenten magazijn en check compleetheid van aantal netten**						
		Netten door gegaan naar de sterilisatie i.p.v. naar de instrumenten magazijn	Cover label niet gelezen	3	2	6	accepteren	
		Net niet compleet of instrument kapot	Iets mis gegaan in OK of in wasmachine	3	2	6	accepteren	
		Mist een net	Net achter gebleven in OK	2	2	4	beheersen	
x		**9.5 Goedkeuren sterilisatieproces en scan barcode van sterilisatie sticker**						

		-						
	x	**9.5' Decontaminatie verklaring en andere documenten van de leverancier klaar maken voor retour**						
		Verklaring mist	In de OK gebleven of kwijt	4	2	8	beheersen	bellen
x		**9.6 Dispatch (sorteren op klant en plaatsen in buitenkar)**						
		Net in verkeerde kar (klant) geplaatst	Vergissing	2	3	6	accepteren	bellen
	x	**9.6' Netten terug zetten in dozen van leverancier**						
		-						
		10. Retour en facturatie						
x		**10.1 Transport naar centraal magazijn RdGG in buitenkar, 2x/dag**						
		Probleem met transport		1	2	2	accepteren	
	x	**10.1' 1 dag na OK, bellen naar Combi-Ster of de netten opgehaald kunnen worden**						
		Niet gebeld	Vergeten/ te druk	2	2	4	accepteren	
x		**10.2 Transport naar ingang OK-complex (op de gang)**						
	x	**10.2' Netten ophalen bij Combi-Ster**						
		Net niet klaar om op te halen	Geen tijd afgesproken tussen leverancier en Combi-Ster	3	2	6	accepteren	
			Netten zijn nog op OK/ in schoonmaak proces	3	2	6	accepteren	
		Leverancier niet gekomen	Vergeten	1	2	2	accepteren	
x		**10.3 Binnenkar halen uit buitenkar en brengen naar steriele berging OK**						
		-						
	x	**10.3' Check instrumentarium op verbruik en staat (bot of kapot)**						
		Net niet compleet of instrument kapot	Iets mis gegaan in OK of wasmachine en was niet ontdekt door instrumenten magazijn	2	1	2	accepteren	
		Instrumenten niet schoon	Was procedure niet goed gecontroleerd	2	1	2	accepteren	
x		**10.4 Netten uitruimen in steriele berging**						
		-						
	x	**10.4' Factuur sturen aan Z-XL**						
		-						
	x	**10.5' Goedkeuring vragen aan besteller**						
		Niet gedaan	Vergeten/ te druk	2	2	4	accepteren	
	x	**10.6' Vergelijken met winkelwagen, aanvraag bruikleen formulier, verbruikt materiaal en factuur goedkeuren**						
		Verkeerde aanvraag bij factuur	Vergissing	3	2	6	accepteren	
		Aanvraag en factuur komen niet overeen	Vergissing	3	2	6	accepteren	
		Verbruik niet ingevuld	Vergeten/ te druk	3	2	6	accepteren	
			Aanvraag kwijt	3	2	6	accepteren	
	x	**10.7' Vergelijken met factuur en goedkeuren**						
		-						
	x	**10.8' Omzetten in order nummer (45 nummer) en koppelen aan 47-nummer en factureren op kostenplaats ortho**						
		-						

I. HFMEA report of designed future situation

HFMEA levering en gebruik van instrumentennetten

Fase 2: JIT proces in nieuwbouw

Reinier de Graaf Groep

Januari 2015

Annetje Guédon, Thekla Rakers

Samenvatting

Doel
Een risicoanalyse is uitgevoerd over het JIT proces in de nieuwbouw vanaf het inplannen van een orthopedische ingreep t/m het retourneren van de benodigde (bruikleen) instrumentennetten via Combi-Ster aan de OK of de leverancier.

Resultaat
Een overzicht van het proces rondom normale en bruikleen instrumentennetten en een complete lijst en classificatie van de risico's per processtap zijn weergegeven in Appendix A en B. De belangrijkste resultaten van dit onderzoek zijn:

- Voor de normale netten laat het JIT proces een kleine verhoging van de aantal stappen, risico's en tijd zien vergeleken met de huidige situatie. Voor de bruikleen netten worden die aantallen juist lager.
- In de JIT situatie worden meer risico's beheerst in het proces vergeleken met de huidige situatie en de totale hoog scorende risico's gaan naar beneden. Dit wijst naar een veiliger proces.
- De categorieën van risico's verschuiven tussen de huidige en JIT situatie. Er zijn bijna geen risico's meer wat betreft een gebrek aan systematiek en overzicht. Wel zijn er meer onopzettelijke menselijke fouten mogelijk, maar een groter aantal wordt beheerst in latere processtappen.

Requirements
Het voorgestelde JIT proces en de bijbehorende risico analyse is alleen geldig mits er aan de vooropgestelde voorwaarden wordt voldaan. De voorwaarden betreffen het IT-systeem (van de OK en Combi-Ster) en de werkwijze van de medewerkers.

3- Focus, methode en team

Focus
Het proces vanaf het inplannen van een orthopedische ingreep t/m het retourneren van de benodigde (bruikleen) instrumentennetten via Combi-Ster aan de OK of leverancier, voor de JIT situatie in de nieuwbouw.

Methode
Een risicoanalyse is uitgevoerd door een multidisciplinair team volgens de Healthcare Failure Mode and Effects Analysis (HFMEA) methode (VMS praktijkgids Prospectieve Risico Inventarisatie; maart 2012). Het stappenplan van een HFMEA ziet er als volgt uit:
1. Specificeer onderwerp
2. Stel een team samen
3. Analyseer het huidige proces d.m.v. opdeling in deelprocessen
4. Bepaal risico's van het proces (incl. oorzaken en effecten)
5. Bepaal prioritering van risico's en geef mogelijke oplossingen om risico's te beperken
Het gehele traject zal omvat twee sessies van twee uur verspreid over een maand.

Team
Een team van tien mensen vanuit verschillende functies die te maken hebben met het proces rondom de (bruikleen) instrumentennetten en implantaten.

Procesbegeleider	Annetje Guédon
Secretaris	Thekla Rakers
JIT projectleider	Vivian Hoeijmans
Specialist (ortho)	Joost van Linge
Teamleider OK	Marion Poot
OK-assistent (ortho)	Sandra Tas, Mieke Schildmeijer
Combi- Ster bedrijfsleider	John Vermeer
Combi-Ster teamleiders	Hans Klinkenberg
Planning (ortho)	Bianca van Nelfen

4- Aantallen 2014

Van 01-01-2014 t/m 30-09-2014 zijn er 1195 bruikleen netten gesteriliseerd (2 sterilisaties per bestelling). Als we deze getallen middelen voor een periode van een jaar, worden er **797 bruikleen netten gebruikt, verdeeld over 193 bruikleen aanvragen.**

3- Processtappen en risico analyse

Normale netten

Hoofdproces

	Huidige proces	JIT proces nieuwbouw
Totaal aantal processtappen	34	37
Totaal aantal risico's	68	74
Totaal aantal hoog risico's	31	34
Totale tijd:	450 min	445 min
- Specialist	30 min	30 min
- OK personeel	180 min	135 min
- Combi-Ster personeel	175 min	215 min
- Anderen	65 min	65 min

Bruikleen netten

Hoofdproces

	Huidige proces	JIT proces nieuwbouw
Totaal aantal processtappen	71	67
Totaal aantal risico's	157	131
Totaal aantal hoog risico's	48	37
Totale tijd:	715 min	660 min
- Specialist	35 min	35 min
- OK personeel	270 min	185 min
- Combi-Ster personeel	345 min	370 min
- Anderen	65 min	65 min

Het gedetailleerde proces is weergegeven in Appendix A.

Risico scores

Voor elk risico is een score bepaald door middel van indeling op frequentie en ernst. De scores zijn gebaseerd op een schaal van 1-5.

Score	Frequentie	Ernst
1	Nooit	Geen invloed
2	≤ 1 keer per kwartaal	OK gaat door met alternatieve werkwijze, geen gevolg voor patiënt.
3	> 1 keer per kwartaal	OK gaat door met alternatieve werkwijze, gevolg voor patiënt (bv OK is verlaat, maar nog steeds op zelfde dag)
4	> 1 keer per maand	OK kan niet door gaan, gevolg voor patiënt (bv OK wordt verzet naar andere dag)
5	> 1 keer per week	OK kan niet door gaan, ernstig gevolg voor patiënt (bv patiënt is al onder narcose)

Het totale risico score wordt berekend door de frequentie maal de ernst. Wanneer een risico een score heeft van 10 of hoger of de ernst een score heeft gekregen van 4 of hoger wordt dit risico tot de hoog scorende risico's gerekend.
De totale score voor de hoog scorende risico's is hieronder weergegeven.

	Huidige proces	JIT proces nieuwbouw
Totale hoog risico score	510	414

Risico's accepteren of beheren

Voor elk risico is er ook bepaald of die wordt geaccepteerd of beheert (en wat de beheersmaatregelen zijn). De gedetailleerde lijst is weergegeven in Appendix B.

	Huidige proces	JIT proces nieuwbouw
Alle risico's	162	137
Accepteren	151	87
Beheersen	7	46
Accepteren/ beheersen	4	4
Alleen hoog risico	49	42
Accepteren	41	25
Beheersen	4	15
Accepteren/ beheersen	4	2

Aantal hoog risico's per categorie

De risico's met de hoogste scores zijn te verdelen in de volgende categorieën:

	Huidige proces	JIT proces nieuwbouw
Gebrek aan systematiek in het doorgeven/vast stellen van de nodige (bruikleen) instrumentarium	9	0
Gebrek aan overzicht van de beschikbare netten en planning van andere specialismes	7	1
Klaarzetlijsten (of reinigingsvoorschriften) niet up-to-date	7	5
Onverwacht verloop van OK	3	3
Onopzettelijke fout, menselijke fout	23	29
Limiet door aantal netten	0	4*
Totaal	**49**	**42**

**De risico's gerelateerd aan de aantal netten komen naar boven bij de JIT situatie. Maar wij denken dat het in de huidige situatie ook was, alleen was de groep daar niet zo veel mee bezig dus het viel niet op in de risico analyse.*

De tabel hieronder geeft een overzicht van de hoog scorende risico's. Indien een risico alleen voor normale of bruikleen netten geld is er een 'x' in de desbetreffende cel gezet.

H-FMEA (bruikleen) instrumentarium - JIT processen in de nieuwbouw								
Alleen normale	**Alleen bruikleen**	**Potentiële faalwijze**	**Potentiele oorzaak**	**Freq**	**Ernst**	**Risico score**	**Accepteren, beheersen, elimineren**	**Beschrijving actie**
		1. Behoeftestelling						
		1.1 Patiënt bij poli en plaatsen op wachtlijst. Systematisch informatie invullen in ChipSoft (Behandelcode kiezen, keuze voor bruikleen, extra benodigdheden, nodige assistentie bij OK, check of informatie compleet is). Goedkeuren als alle info compleet is.						
		Informatie in ChipSoft verkeerd ingevuld	Verkeerde behandelcode ingevuld	2	4	8	accepteren	
		Verkeerd gedaan/onterecht goedgekeurd	Vergissing	2	4	8	accepteren	
x		**1.6 Digitaal klaarzetten voor de operaties zonder behandelcode/winkelmandje (schatting: 10% van de operaties)**						
		Verkeerd gedaan	Vergissing	2	4	8	beheersen	Hier kom je pas vlak voor de OK achter. Beheersen door grijpvoorraad en spoed levering vanuit Combi-Ster
		1.6' SPOED: Digitaal klaarzetten voor de spoed operaties zonder behandelcode/winkelmandje (schatting: 10% van de operaties)						
		Nodige net niet aanwezig	Net nog in proces (OK of Combi-Ster)	2	4	8	accepteren/ beheersen	
		1.7 Check tijden en volgorde van de operaties per dag + check operaties die geen netten toegekend hebben, 2 dagen voor operatie						
		Geen check van de operaties die geen netten toegekend hebben	Vergeten/ te druk	2	4	8	beheersen	Herkenning (bv verschillende kleuren) in ChipSoft zodat het heel duidelijk is voor de planner OK dat er voor die operatie nog iets mist.
		1.8 Operatie tijd doorgeven aan patiënt, 1 dag van tevoren						
		Niet doorgeven	Patiënt niet bereikbaar (dan wordt het aan verpleegafdeling doorgegeven)	2	4	8	beheersen	Verpleegafdeling neemt contact op met patiënt? Patiënt belt zelf?
		1.9 Om 16:00 uur planning definitief af hebben, systeem ondersteunt maken planning door automatische check of het lukt met de netten.						
		Spoed sterilisatie nodig en niet doorgegeven	Vergeten/ te druk	3	4	12	beheersen	Prioriteiten lijst automatisch aangemaakt door ChipSoft. Bellen

								voor spoed voor de zekerheid, ook is het in het systeem.
		2. Bestelling						
	x	**2.1 Aanmaken winkelwagen bij Z-XL (info over bruikleen via filter/zoekactie in ChipSoft)**						
		Geen winkelwagen aangemaakt	Te druk/ vergeten	2	4	8	accepteren	
		3. Levering bij Combi-Ster						
	x	**3.2 Check inhoud levering met pakbon leverancier, reinigings- en sterilisatie voorschriften, nieuw dossier en nieuwe barcode aanmaken**						
		Mist/kapotte instrumenten	Verkeerde check bij leverancier	2	4	8	accepteren	
		Mist een net	Soms moeilijk om te weten, het niet altijd bekend hoeveel netten in een set moeten zijn	2	4	8	beheersen	De besteller kan ik ChipSoft invoeren hoeveel netten de bestelling heeft.
		Reinigings- en sterilisatie voorschriften niet te doen bij Combi-Ster		1	4	4	accepteren	
	x	**3.4 Wit label maken met: bruikleen, locatie, leverancier, sterilisatie dag en datum operatie**						
		Verkeerde datum	Vergissing	2	4	8	beheersen	Bruikleen komt op klaarzetlijst te staan
		4. Reiniging en sterilisatie						
	x	**4.3 Netten samenstellen, check compleetheid en verpakken**						
		Verkeerde sterilisatie sticker geplakt	Vergissing	2	5	10	accepteren/ beheersen	Werkflow afspraken
	x	**4.4 Sterilisatieproces**						
		Deel niet gesteriliseerd (deel levering)	Vergissing	2	4	8	accepteren	
	x	**4.6 Plaats netten in klaarzetkar of in steriele voorraad**						
		Net wordt onsteriel	Stoten van het net, waardoor er een gat in de verpakking komt	4	3	12	accepteren	
		5. Klaarzetten bij Combi-Ster						
		5.1 Print klaarzetlijst gebaseerd op OK programma en grijpvoorraad om 16:00 1 dag voor operaties						
		Lijst niet compleet	Digitaal klaarzetten niet gedaan wanneer nodig	2	4	8	beheersen	Planner OK kan het doen, als verantwoordelijke voor de planning, indien nodig vragen aan OK assistenten wat er nodig is. Eis = operatie behandelcode is makkelijk zichtbaar voor planner OK.
		5.2 Verzamelen van de netten in de klaarzetkar uiterlijk om 4:30 uur						
		Netten niet aanwezig	In het proces	3	4	12	accepteren	Bellen, planning aanpassen
		Verkeerd klaarzetten	Vergissing	2	4	8	beheersen	Scannen van netten per operatie. 'Systeem' geeft een melding als het niet klopt.
		5.3 Klaarzetkar en netten scannen per operatie en plaatsen in buitenkar uiterlijk om 5:00 uur						
		Vergissing	Fout gescand	2	4	8	accepteren	Scannen na het klaarzetten = automatische check van het systeem
		5.2' SPOED: Verzamelen van de netten in de klaarzetkar						
		Netten niet aanwezig	In het proces	3	4	12	accepteren	Bellen, planning aanpassen
		Verkeerd klaarzetten	Vergissing	2	4	8	beheersen	Scannen van netten per operatie. 'Systeem' geeft een melding als het niet klopt.
		5.3' SPOED: Klaarzetkar en netten scannen per operatie en plaatsen in buitenkar						
		Vergissing	Fout gescand	2	4	8	accepteren	Scannen na het klaarzetten = automatische check van het systeem

		7. Klaarzetten bij OK						
		7.2 Vul klaarzetkarren aan met grijpvoorraad netten indien nodig en deze netten scannen						
		Grijpvoorraad netten niet aanwezig	In het proces	2	4	8	accepteren	
			Fout gescand op eerder moment, waardoor informatie in systeem niet klopt	2	4	8	beheersen	Duidelijke werkafspraken maken wat betreft het scannen.
		7.3 Karren verder aanvullen met laminaat, disposables etc. + brengen naar opdekruimte (voor eerste operatie)						
		Grijpvoorraad netten niet aanwezig	In het proces	2	4	8	accepteren	
			Fout gescand op eerder moment	2	4	8	beheersen	Duidelijke werkafspraken maken wat betreft het scannen.
		7.4 Check compleetheid netten en andere benodigdheden voor eerste operatie						
		Nodige net afwezig	Fout aangevraagd in ChipSoft	3	4	12	accepteren	Operatie wordt gecanceld/verplaatst naar later op de dag
			Protocollen/ klaarzetlijsten niet up-to-date	2	4	8	beheersen	Wie gaat de digitale klaarzetlijsten beheren? OK assistenten geven het door aan ' iemand' in de OK die de ChipSoft beheerder wordt
			Net voor andere operatie gebruikt in de tussentijd	2	4	8	beheersen	OK assistent belt voor spoed aanvraag
		7.5 Netten opdekken voor eerste operatie						
		Mist instrument (onverwacht)	Fout samengesteld door Combi-Ster	4	5	20	accepteren	Op dit moment accepteren. Misschien een apart project/onderzoek naar verbetering hiervoor. Bv RFID toepassing?
		Mist een (bruikleen) net	Onvolledige klaarzetlijsten	2	5	10	beheersen	Wie gaat de digitale klaarzetlijsten beheren? OK assistenten geven het door aan ' iemand' in de OK die de ChipSoft beheerder wordt
			Onvolledige levering van Combi-Ster	2	5	10	accepteren	
		Instrument niet goed gereinigd	Fout bij Combi-Ster	2	5	10	accepteren	
		7.6 Check voor gaten in verpakking van netten						
		Netten worden afgekeurd/niet meer steriel	Gat in de verpakking	5	5	25	accepteren	Apart onderzoek opzetten waardoor dit echt komt en hoe dit te beheersen/elimineren. En achter te halen eerder in het proces?
		7.7 Netten scannen in ChipSoft						
		Niet scannen	Te druk/ vergeten	5	2	10	beheersen	Duidelijke werkafspraken. Kan desnoods na de operatie?
			Sticker met barcode kwijt	5	2	10	accepteren	
		8. Gebruik in OK						
		8.1 Breng opdektafels naar de OK						
		Net/instrument wordt onsteriel	Net/instrument valt op de grond of komt in aanraking met niet steriel product	2	5	10	accepteren	
		8.2 Operatie						
		Belangrijk instrument is/gaat kapot/ onsteriel		2	5	10	accepteren	
		Mist een instrument (onverwacht)	Fout samengesteld door Combi-Ster	2	5	10	accepteren	Op dit moment accepteren. Misschien een apart project/onderzoek naar verbetering hiervoor. Bv RFID toepassing?
		Aanvullende spullen nodig tijdens operatie	Onverwacht verloop van operatie	5	2	10	accepteren	
		Aanvullende spullen niet beschikbaar	Nog in het proces	3	5	15	accepteren	

		Instrumenten niet goed gereinigd	Foute reiniging bij Combi-Ster	2	5	10	accepteren	
		10. Reiniging en sterilisatie						
		10.1 Netten scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)						
		Niet gescand	Scanner doet het niet	5	2	10	beheersen	Extra handscanner als reserve hebben
x		**10.3 Netten samenstellen, check compleetheid en verpakken**						
		Verkeerde sterilisatie sticker geplakt	Vergissing	2	5	10	accepteren/ beheersen	Werkflow afspraken
X		**10.4 Sterilisatieproces**						
		Deel niet gesteriliseerd (deel levering)	Vergissing	2	4	8	accepteren	
X		**10.6 Plaats netten in steriele voorraad of in klaarzetkar**						
		Net wordt onsteriel	Stoten van het net, waardoor er een gat in de verpakking komt	4	3	12	accepteren	

De complete lijst van faalwijzen, oorzaken en risicoscores is weergegeven in Appendix B. Spoed patiënten worden niet meegenomen in de aantallen van dit verslag.

4- Requirements

System requirements

RdGG and Combi-Ster system requirements

- The data in the systems of Combi-Ster and RdGG must be unambiguous (e.g. use same tray names).
- Changes in the system of Combi-Ster or RdGG should be real-time visible for other users (e.g. OR planning, priority, content trays, status trays)
- The following must be available in the database of both systems:
    - Digital pick list based on planning (incl. loan trays)
    - Priority status of the trays (e.g. emergency levels, storage)
    - Digital information of the (loan) trays (e.g. content, weight, pictures, missing instruments)
    - Status of the trays (track & trace)
    - Availability of the trays (out of use, processing time, track & trace)
- It should be possible to skip scanning points during the process.

Combi-Ster system requirements

Planning

- The system must be able to deal with two inventory locations
- The trays must be processed and assigned according to the following priority:
    1. Emergency surgeries (three classifications: directly needed, within 6 hours, within 24 hours)
    2. Planned surgeries
    3. Emergency storage at RdGG (determine minimum emergency storage for week and weekend)
    4. Storage at Combi-Ster
- Changes in the picking list after 4pm must be visible for Combi-Ster (e.g. by an email and a high priority status)

Enter and retrieve information

- Digital information about (loan) trays (e.g. content, pictures, missing instruments, cleaning and sterilization requirements) must be possible to change, add and retrieve.

- System must keep track of the expiration dates and indicate if trays are (close to) expire (e.g. by email to team leader Combi-Ster)

RdGG system requirements

Planning

- The system must notice conflicts within the planning (e.g. pop-up) (based on planned surgeries and available trays)
- The date of surgery is preliminary (information can still be changed or added) until the final check done by the specialist

Enter and retrieve information

- The system must support the users to systematically enter information
    - Record surgeries with and without treatment code.
    - Include a special assigned box for loan trays
    - Include order status of loan trays
    - Enter used loan trays/implants to the surgery (after surgery)
    - Indicate that information is missing
    - Include additional information (e.g. needed OR assistance)
    - Indicate the priority level for emergency
- Trays must be assigned to surgeries (recalls)
- The system must support searching/filtering on:
    - Surgeries with no treatment code
    - Surgeries with missing information
    - Surgeries not approved by specialist
    - Surgeries with loan set
    - Order status of loan set
    - Surgeries with extra supplies
    - Digital information about trays based on a (part of a) word
    - Status of the trays (track and trace)

Staff's Work flow requirements

General

- Service Level Agreements must be made between Combi-Ster and RdGG (e.g. latest time of delivery before OR, time when planning OR will be ready)
- RdGG and Combi-Ster must trust each other (supported by extra checks of the systems)

Combi-Ster

Process

- The trays for each surgery must be placed together in a PBT and be clearly recognisable.
- Taking the trays from the storage should be according to the expiration date.
- An employee of Combi-Ster must be working at RdGG (front office employee). The tasks of this new function will be:
    - Scanning incoming and outgoing trays
    - Collect soil trays after surgery
    - Weighing outgoing trays
- Scan moments are needed at the following places:
    - Entering the soil area at Combi-Ster
    - Cleaning the trays
    - Going into the dishwasher
    - Entering the clean area (after dishwasher)
    - Checking, compiling and packing the trays
    - Entering the autoclave

    - Entering the sterile area (after autoclave)
    - Entering the storage
    - Placing in the PBT
    - Placing in an outer cart
    - Entering the OR department, scanning the cart only (front office employee)
    - Leaving the OR department (front office employee)

IT tasks

- Combi-Ster must be able to retrieve the pick list (at 4 PM the day before the surgeries).
- Combi-Ster must be able to retrieve when loan trays will arrive (instead of email with request loan form).

Work times

- An employee of Combi-Ster must work during the late afternoon/evening to pick the trays for the PBTs (4 PM – 10PM).
- An employee of Combi-Ster is responsible for placing the missing trays processed during the night in the PBT's before 4:30 AM.
- Combi-Ster must deliver at 5 AM (an hour earlier compared to now)
- The front office employee of Combi-Ster must start working at 6 AM when the carts arrive.

<u>RdGG</u>

Process

- Ortho meeting needs to change; only discuss surgeries without treatment code and with loan trays, based on real time overview on computer.
- Taking the trays from the emergency storage should be according to the expiration date.
- Field expert
    - Digitally prepare the trays needed for surgeries without a treatment code (estimated on 10% of all surgeries) at a fixed time.
- Logistic employee OR
    - Put the unused 'back up' trays (e.g. for open surgery instead of laparoscopic) back in the emergency storage.
    - Scan trays entering the OR-complex
    - Scan trays ingoing and outgoing from the emergency storage
- OR assistant
    - Scan when taking trays from the emergency storage
    - Scan trays just before/ during surgery
- Front office employee of Combi-Ster
    - Scanning incoming and outgoing trays
    - Collect soil trays after surgery
    - Weighing outgoing trays

IT tasks

- Specialist
    - Enter information systematically when register new surgeries on the waiting list, supported by the system (no approval when: info is missing, a surgery is on the 'algemene lijst' and the sets can differ according to the surgeon who will get the surgery assigned, surgeons in training are filling in the information but it needs to be checked).
    - Give approval on surgery when it is not done directly when entering the information (because info was missing e.g.)
    - Give approval on surgery during the weekly ortho meeting when it is not done yet.
- Orderer
    - Directly order loan sets at Z-XL based on search/filter in system (no request loan form anymore).

    - Approve the shopping cart at Z-XL (this can also be done by the team leader, not the OR manager any more).
    - Update order status of loan set.
- Team leader OR
    - Approval the shopping cart at Z-XL (this can also be done by the orderer, not the OR manager any more).
    - Update order status of loan set.
- OR assistant
    - Retrieve from system which loan sets must be ordered (not based on ortho meeting any more, no agenda any more).
    - Update order status of loan set (add extra info if needed).
    - Digitally prepare loan set for the pick list.
    - Enter used loan trays/implants in the system after the surgery.
- Planner OR
    - Check for the coming two days if there are surgeries without any assigned trays (through search/filter in system), if so report to field expert.
    - Finish planning for next day before 4 PM, supported by the system.
    - Indicate priority level of emergency surgeries in the system and call Combi-Ster

Work times

- The logistic employee OR must start working at 6 AM, to gather the trays, laminate, disposables for the check of OR assistants at 7:30 AM
- OR assistant must check PBT's at 7:30 AM (surgeries start at 8 AM)

n.b.
Standardize the content and the names of trays between RdGG and DHV to be able to use them at both locations. The planning should take both locations into account.

5- Implementatie

Voorstel voor tussen fase nieuwbouw

6- Appendices

Appendix J: Proces
Appendix K: Lijst van faalwijzen, oorzaken en risicoscores

J. The designed future process flow

The main process shows in general how the process flow of the surgical instruments looks like. However, it does not show in detail which steps must be made to complete each step. Each step is subdivided into steps that must be done before the process is finished. For each step it is indicated who is responsible for that step, the number below the box indicates how many minutes the step takes. As said in Section 5.4.2 and Appendix I the times are divided per actor group. The time for the specialist are only the steps where the specialist is involved, except for the surgery since this is not specified in time. The OR staff includes the steps with the OR team leader, orderer, planner OR, field expert, OR assistant (including shift OR assistant), and logistic employee OR. The process time of Combi-Ster includes all steps where Combi-Ster is involved, including the front office employee. There is tried to assign the time for sub-step per surgery. An average time is taken per sub-step. For some steps like the ortho meeting, the whole time is taken into account since this is very difficult to divide this per surgery. However, this is both done during the current process and the designed future process, thus the times can still be compared. Below the process steps are shown followed by an explanation of each sub-step. Finally a process flow diagram is given of both the normal trays and the loan trays. The grey steps are the ones that differ compared to the current process flow. The legend of the process flow diagram is given in Figure J.1.

The loan trays have more processes steps that must be completed. When contacting a manufacturer for loan instruments, one orders a set of instruments. This can contain out of one or more instrument trays, depending on the requested set and type of surgery. When ordering at the manufacturer it is not always known how many trays the set contains.

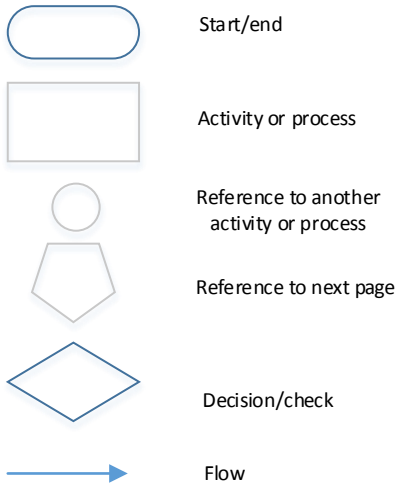
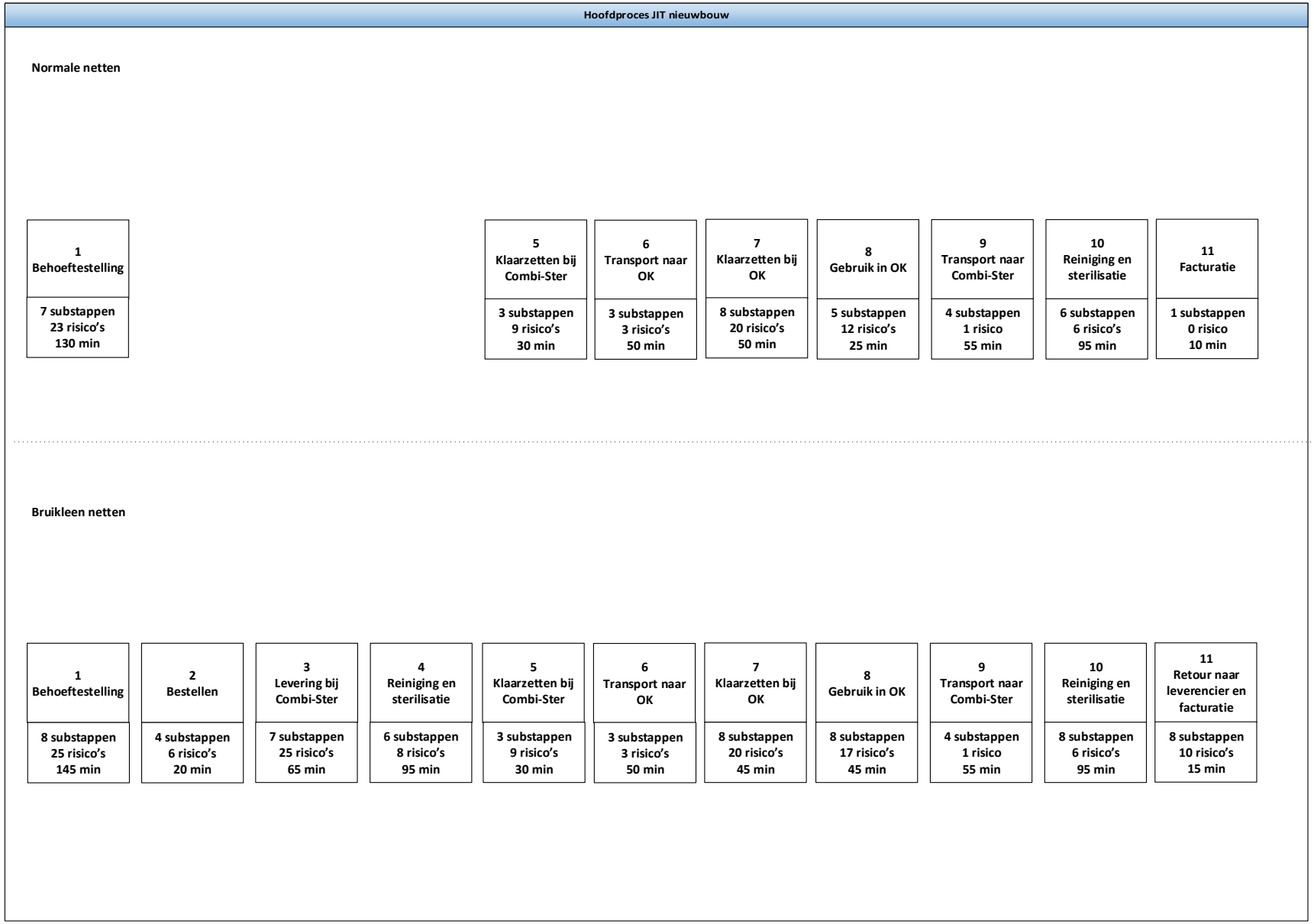
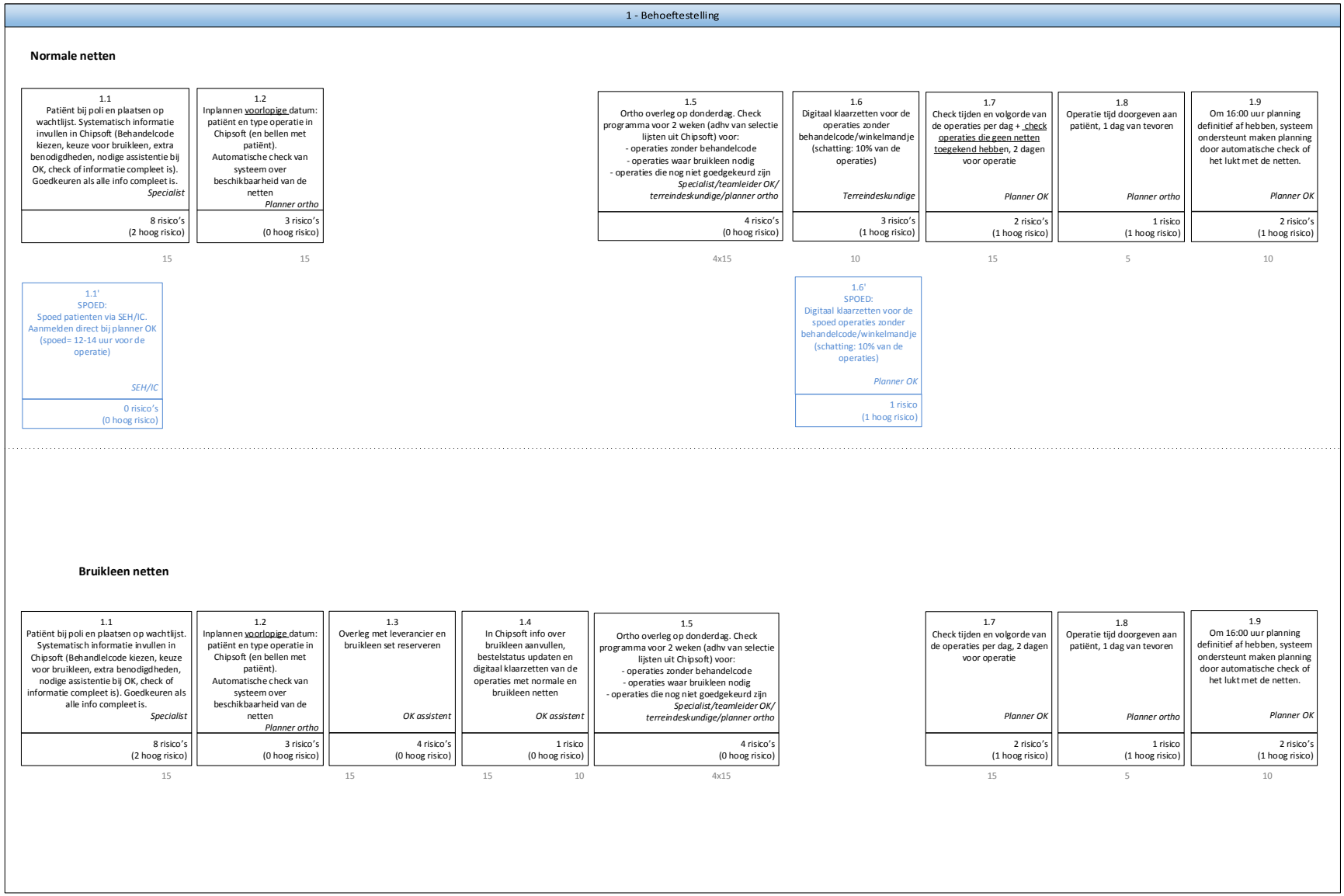


FIGURE J.1: LEGEND FOR PROCESS FLOW DIAGRAM


Hoofdproces JIT nieuwbouw
Normale netten
1
Behoeftestelling
7 substappen
23 risico's
130 min
5
Klaarzetten bij Combi-Ster
3 substappen
9 risico's
30 min
6
Transport naar OK
3 substappen
3 risico's
50 min
7
Klaarzetten bij OK
8 substappen
20 risico's
50 min
8
Gebruik in OK
5 substappen
12 risico's
25 min
9
Transport naar Combi-Ster
4 substappen
1 risico
55 min
10
Reiniging en sterilisatie
6 substappen
6 risico's
95 min
11
Facturatie
1 substappen
0 risico
10 min
Bruikleen netten
1
Behoeftestelling
8 substappen
25 risico's
145 min
2
Bestellen
4 substappen
6 risico's
20 min
3
Levering bij Combi-Ster
7 substappen
25 risico's
65 min
4
Reiniging en sterilisatie
6 substappen
8 risico's
95 min
5
Klaarzetten bij Combi-Ster
3 substappen
9 risico's
30 min
6
Transport naar OK
3 substappen
3 risico's
50 min
7
Klaarzetten bij OK
8 substappen
20 risico's
45 min
8
Gebruik in OK
8 substappen
17 risico's
45 min
9
Transport naar Combi-Ster
4 substappen
1 risico
55 min
10
Reiniging en sterilisatie
8 substappen
6 risico's
95 min
11
Retour naar leverencier en facturatie
8 substappen
10 risico's
15 min


1 - Behoeftestelling
Normale netten
1.1
Patiënt bij poli en plaatsen op wachtlijst. Systematisch informatie invullen in Chipsoft (Behandelcode kiezen, keuze voor bruikleen, extra benodigdheden, nodige assistentie bij OK, check of informatie compleet is). Goedkeuren als alle info compleet is.
Specialist
8 risico's
(2 hoog risico)
15
1.2
Inplannen voorlopige datum: patiënt en type operatie in Chipsoft (en bellen met patiënt). Automatische check van systeem over beschikbaarheid van de netten
Planner ortho
3 risico's
(0 hoog risico)
15
1.5
Ortho overleg op donderdag. Check programma voor 2 weken (adhv van selectie lijsten uit Chipsoft) voor:
- operaties zonder behandelcode
- operaties waar bruikleen nodig
- operaties die nog niet goedgekeurd zijn
Specialist/teamleider OK/ terreindeskundige/planner ortho
4 risico's
(0 hoog risico)
4x15
1.6
Digitaal klaarzetten voor de operaties zonder behandelcode/winkelmandje (schatting: 10% van de operaties)
Terreindeskundige
3 risico's
(1 hoog risico)
10
1.7
Check tijden en volgorde van de operaties per dag + check operaties die geen netten toegekend hebben, 2 dagen voor operatie
Planner OK
2 risico's
(1 hoog risico)
15
1.8
Operatie tijd doorgeven aan patiënt, 1 dag van tevoren
Planner ortho
1 risico
(1 hoog risico)
5
1.9
Om 16:00 uur planning definitief af hebben, systeem ondersteunt maken planning door automatische check of het lukt met de netten.
Planner OK
2 risico's
(1 hoog risico)
10
1.1'
SPOED:
Spoed patienten via SEH/IC. Aanmelden direct bij planner OK (spoed= 12-14 uur voor de operatie)
SEH/IC
0 risico's
(0 hoog risico)
1.6'
SPOED:
Digitaal klaarzetten voor de spoed operaties zonder behandelcode/winkelmandje (schatting: 10% van de operaties)
Planner OK
1 risico
(1 hoog risico)
Bruikleen netten
1.1
Patiënt bij poli en plaatsen op wachtlijst. Systematisch informatie invullen in Chipsoft (Behandelcode kiezen, keuze voor bruikleen, extra benodigdheden, nodige assistentie bij OK, check of informatie compleet is). Goedkeuren als alle info compleet is.
Specialist
8 risico's
(2 hoog risico)
15
1.2
Inplannen voorlopige datum: patiënt en type operatie in Chipsoft (en bellen met patiënt). Automatische check van systeem over beschikbaarheid van de netten
Planner ortho
3 risico's
(0 hoog risico)
15
1.3
Overleg met leverancier en bruikleen set reserveren
OK assistent
4 risico's
(0 hoog risico)
15
1.4
In Chipsoft info over bruikleen aanvullen, bestelstatus updaten en digitaal klaarzetten van de operaties met normale en bruikleen netten
OK assistent
1 risico
(0 hoog risico)
10
1.5
Ortho overleg op donderdag. Check programma voor 2 weken (adhv van selectie lijsten uit Chipsoft) voor:
- operaties zonder behandelcode
- operaties waar bruikleen nodig
- operaties die nog niet goedgekeurd zijn
Specialist/teamleider OK/ terreindeskundige/planner ortho
4 risico's
(0 hoog risico)
4x15
1.7
Check tijden en volgorde van de operaties per dag, 2 dagen voor operatie
Planner OK
2 risico's
(1 hoog risico)
15
1.8
Operatie tijd doorgeven aan patiënt, 1 dag van tevoren
Planner ortho
1 risico
(1 hoog risico)
5
1.9
Om 16:00 uur planning definitief af hebben, systeem ondersteunt maken planning door automatische check of het lukt met de netten.
Planner OK
2 risico's
(1 hoog risico)
10

2- Bestelling

Normale netten

Bruikleen netten

2.1	2.2	2.3	2.4
Aanmaken winkelwagen bij Z-XL (info over bruikleen via filter/ zoekactie in Chipsoft)	Winkelwagen goedkeuren en bestelstatus in Chipsoft updaten.	Reserveringsnummer (47-nummer) maken en mailen aan leverancier	Print uitdraaien uit Chipsoft of in agenda schrijven in instrumenten magazijn op dag van levering (2 dagen voor OK) en op sterilisatie dag (1 dag voor OK)
Besteller	*Teamleider OK/ besteller*	*Z-XL*	*Combi-Ster*
2 risico's (1 hoog risico)	3 risico's (0 hoog risico)	0 risico's (0 hoog risico)	1 risico (0 hoog risico)
10	5	-	5

3- Levering bij Combi-Ster

Normale netten

Bruikleen netten

3.1	3.2	3.3	3.4	3.5	3.6	3.7
Levering bij Combi-Ster 2 werkdagen voor de operatie voor de bekende bruikleen set (3 werkdagen voor nieuwe set)	Check inhoud levering met pakbon leverancier, reinigings- en sterilisatie voorschriften, nieuw dossier en nieuwe barcode aanmaken	Checken foto's uit database. Foto's van inhoud maken als er iets veranderd is en dossier updaten	Wit label maken met: bruikleen, locatie, leverancier, sterilisatie dag en datum operatie	Barcode zoeken en plaatsen op bruikleen netten en scannen	Dossier van Combi-Ster doorgeven aan teamleider Combi-Ster in schone ruimte (tegelijk met de netten naar de reinigingsruimte)	Decontaminatie verklaring naar autoclaaf dienst, die geven het mee in de buitenkar naar de OK
Leverancier	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*
6 risico's (0 hoog risico)	7 risico's (3 hoog risico)	5 risico's (0 hoog risico)	1 risico (1 hoog risico)	1 risico (0 hoog risico)	2 risico's (0 hoog risico)	3 risico's (0 hoog risico)
5	30	10	5	5	5	5

4- Reiniging en sterilisatie

Normale netten

Bruikleen netten

4.1 Netten scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)	4.2 Reinigingsproces	4.3 Netten samenstellen, check compleetheid en verpakken	4.4 Sterilisatieproces	4.5 Goedkeuren sterilisatieproces en scan barcode van sterilisatie sticker	4.6 Plaats netten in steriele voorraad of in klaarzetkar
Combi-Ster	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*
2 risico's (0 hoog risico)	0 risico's (0 hoog risico)	3 risico's (1 hoog risico)	2 risico's (1 hoog risico)	0 risico's (0 hoog risico)	1 risico (1 hoog risico)
5	30	30	20	5	5

5- Klaarzetten bij Combi-Ster

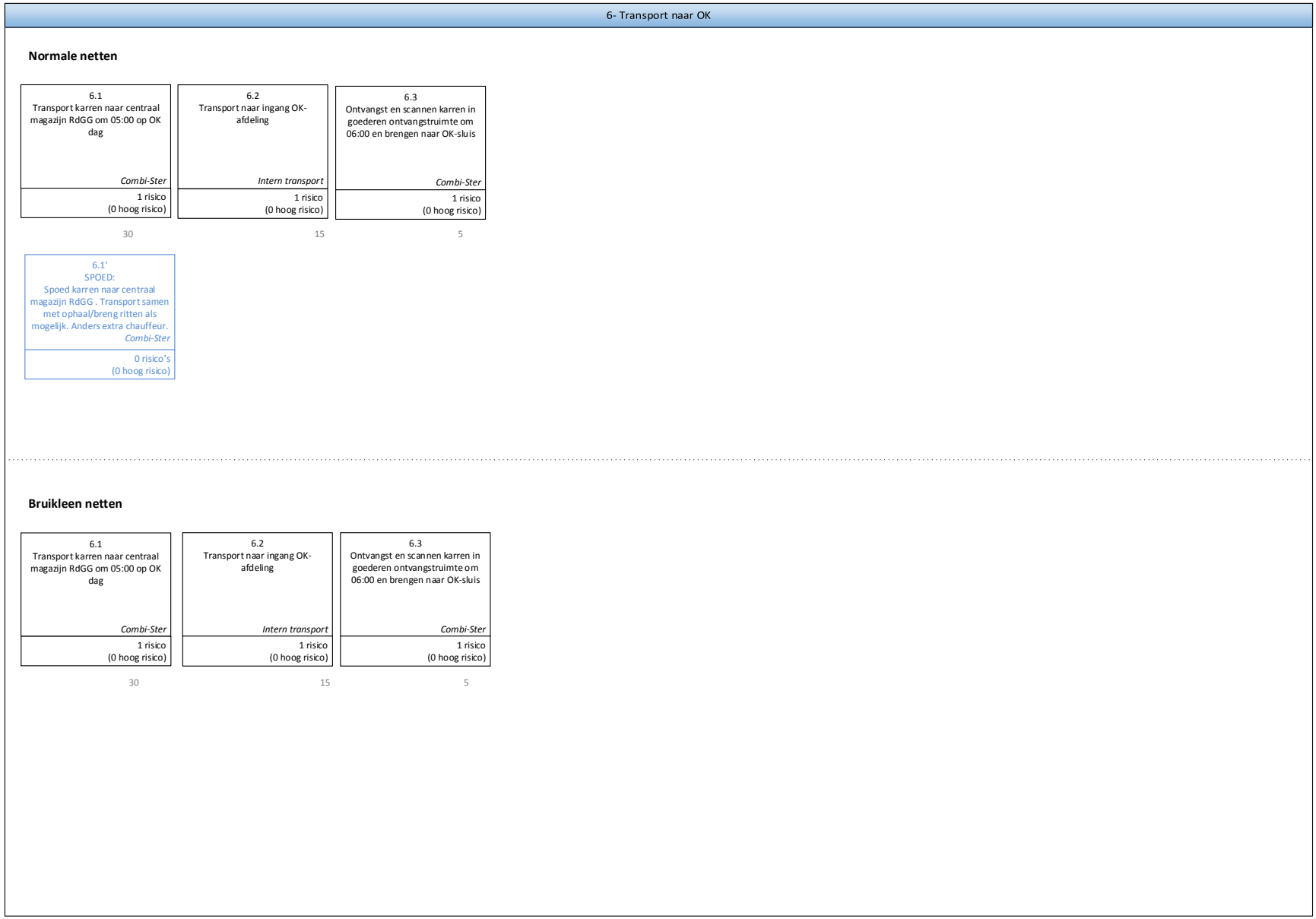
Normale netten

5.1	5.2	5.3
Print klaarzetlijst gebaseerd op OK programma en grijpvoorraad om 16:00 1 dag voor operaties	Verzamelen van de netten in de klaarzetkar tot uiterlijk 4:30 uur	Klaarzetkar en netten scannen per operatie en plaatsen in buitenkar tot uiterlijk 5:00 uur
Combi-Ster	*Combi-Ster*	*Combi-Ster*
4 risico's (1 hoog risico)	4 risico's (2 hoog risico)	1 risico (1 hoog risico)
5	15	10

5.1'	5.2'	5.3'
SPOED: Spoed klaarzetlijst printen	SPOED: Verzamelen van de netten in de klaarzetkar	SPOED: Klaarzetkar en netten scannen per operatie en plaatsen in buitenkar
Combi-Ster	*Combi-Ster*	*Combi-Ster*
2 risico's (0 hoog risico)	4 risico's (2 hoog risico)	1 risico (1 hoog risico)

Bruikleen netten

5.1	5.2	5.3
Print klaarzetlijst gebaseerd op OK programma en grijpvoorraad om 16:00 1 dag voor operaties	Verzamelen van de netten in de klaarzetkar tot uiterlijk 4:30 uur	Klaarzetkar en netten scannen per operatie en plaatsen in buitenkar tot uiterlijk 5:00 uur
Combi-Ster	*Combi-Ster*	*Combi-Ster*
4 risico's (1 hoog risico)	4 risico's (2 hoog risico)	1 risico (1 hoog risico)
5	15	10


6- Transport naar OK
Normale netten
6.1
Transport karren naar centraal magazijn RdGG om 05:00 op OK dag
Combi-Ster
1 risico
(0 hoog risico)
30
6.2
Transport naar ingang OK-afdeling
Intern transport
1 risico
(0 hoog risico)
15
6.3
Ontvangst en scannen karren in goederen ontvangstruimte om 06:00 en brengen naar OK-sluis
Combi-Ster
1 risico
(0 hoog risico)
5
6.1'
SPOED:
Spoed karren naar centraal magazijn RdGG . Transport samen met ophaal/breng ritten als mogelijk. Anders extra chauffeur.
Combi-Ster
0 risico's
(0 hoog risico)
Bruikleen netten
6.1
Transport karren naar centraal magazijn RdGG om 05:00 op OK dag
Combi-Ster
1 risico
(0 hoog risico)
30
6.2
Transport naar ingang OK-afdeling
Intern transport
1 risico
(0 hoog risico)
15
6.3
Ontvangst en scannen karren in goederen ontvangstruimte om 06:00 en brengen naar OK-sluis
Combi-Ster
1 risico
(0 hoog risico)
5

7- Klaarzetten bij OK

Normale netten

7.1 Ontvangst van karren bij OK sluis. Grijpvoorraad netten naar grijpvoorraad brengen en scannen	7.2 Vul klaarzetkarren aan met grijpvoorraad netten indien nodig en deze netten scannen	7.3 Karren verder aanvullen met laminaat, disposables etc. + brengen naar opdekruimte (voor eerste operatie)	7.4 Check compleetheid netten en andere benodigdheden voor operatie	7.5 Netten opdekken voor eerste operatie	7.6 Check voor gaten in verpakking van netten	7.7 Netten scannen in Chipsoft	7.8 Herhaal vanaf stap 7.5 voor alle volgende operaties dezelfde dag
Logistiek medewerker OK	*Logistiek medewerker OK*	*Logistiek medewerker OK*	*OK assistent*	*OK assistent*	*OK assistent*	*OK assistent*	*OK assistent*
2 risico's (0 hoog risico)	3 risico's (2 hoog risico)	4 risico's (2 hoog risico)	3 risico's (3 hoog risico)	4 risico's (4 hoog risico)	1 risico (1 hoog risico)	3 risico's (2 hoog risico)	0 risico's (0 hoog risico)
10	5	10	5	10	5	5	-

Bruikleen netten

7.1 Ontvangst van karren bij OK sluis.	7.2 Vul klaarzetkarren aan met grijpvoorraad netten indien nodig en deze netten scannen	7.3 Karren verder aanvullen met laminaat, disposables etc. + brengen naar opdekruimte (voor eerste operatie)	7.4 Check compleetheid netten en andere benodigdheden voor operatie	7.5 Netten opdekken voor eerste operatie	7.6 Check voor gaten in verpakking van netten	7.7 Netten scannen in Chipsoft	7.8 Herhaal vanaf stap 7.5 voor alle volgende operaties met bruikleen dezelfde dag
Logistiek medewerker OK	*Logistiek medewerker OK*	*Logistiek medewerker OK*	*OK assistent*	*OK assistent*	*OK assistent*	*OK assistent*	*OK assistent*
2 risico's (0 hoog risico)	3 risico's (2 hoog risico)	4 risico's (2 hoog risico)	3 risico's (3 hoog risico)	4 risico's (4 hoog risico)	1 risico (1 hoog risico)	3 risico's (2 hoog risico)	0 risico's (0 hoog risico)
5	5	10	5	10	5	5	-

8- Gebruik in OK

Normale netten

8.1 Breng opdektafels naar de OK	8.2 Operatie	8.4 Instrumenten terug op de netten leggen en check compleetheid, verpakken en in de kar op de vuile gang neerzetten	8.7 Breng vuile netten naar de afval uitgaande ruimte	8.8 Netten wegen, scannen en in kar terugzetten
OK assistent	*OK team*	*OK assistent*	*Combi-Ster*	*Combi-Ster*
1 risico (1 hoog risico)	6 risico's (5 hoog risico)	3 risico's (0 hoog risico)	0 risico's (0 hoog risico)	2 risico's (0 hoog risico)
5	?	10	5	5

Bruikleen netten

8.1 Breng opdektafels naar de OK	8.2 Operatie	8.3 Decontaminatie verklaring invullen	8.4 Instrumenten terug op de netten leggen en check compleetheid, verpakken en in de kar op de vuile gang neerzetten	8.5 Direct na operatie in Chipsoft zetten welke bruikleennetten en implantaten gebruikt zijn	8.6 Schone netten in plastic tas in de vuile kar	8.7 Breng vuile netten naar de afval uitgaande ruimte	8.8 Netten wegen, scannen en in kar terugzetten
OK assistent	*OK team*	*Specialist*	*OK assistent*	*OK assistent*	*Logistiek medewerker OK*	*Combi-Ster*	*Combi-Ster*
1 risico (1 hoog risico)	6 risico's (5 hoog risico)	3 risico's (0 hoog risico)	3 risico's (0 hoog risico)	1 risico (0 hoog risico)	1 risico (0 hoog risico)	0 risico's (0 hoog risico)	2 risico's (0 hoog risico)
5	?	5	10	10	5	5	5

9- Transport naar Combi-Ster

Normale netten

9.1 Transport naar centraal magazijn RdGG (3-4x/dag) *Intern transport*	9.2 Lege vuile karren neerzetten voor volgende operaties *Logistiek medewerker OK*	9.3 Vuile/schone karren in vrachtwagen laden *Combi-Ster*	9.4 Transport naar vuile ruimte Combi-Ster (6x/dag) *Combi-Ster*
0 risico's (0 hoog risico)	0 risico's (0 hoog risico)	0 risico's (0 hoog risico)	1 risico (0 hoog risico)
15	5	5	30

Bruikleen netten

9.1 Transport naar centraal magazijn RdGG (3-4x/dag) *Intern transport*	9.2 Lege vuile karren neerzetten voor volgende operaties *Logistiek mededewerker OK*	9.3 Vuile/schone karren in vrachtwagen laden *Combi-Ster*	9.4 Transport naar vuile ruimte Combi-Ster (6x/dag) *Combi-Ster*
0 risico's (0 hoog risico)	0 risico's (0 hoog risico)	0 risico's (0 hoog risico)	1 risico (0 hoog risico)
15	5	5	30

10- Reiniging en sterilisatie

Normale netten

10.1 Netten scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode) *Combi-Ster*	10.2 Reinigingsproces *Combi-Ster*	10.3 Netten samenstellen, check compleetheid en verpakken *Combi-Ster*	10.4 Sterilisatieproces *Combi-Ster*	10.5 Goedkeuren sterilisatieproces en scan barcode van sterilisatie sticker *Combi-Ster*	10.6 Plaats netten in steriele voorraad of in klaarzetkar *Combi-Ster*
1 risico (1 hoog risico)	0 risico's (0 hoog risico)	2 risico's (1 hoog risico)	2 risico's (1 hoog risico)	0 risico's (0 hoog risico)	1 risico (1 hoog risico)
5	30	30	20	5	5

Bruikleen netten

10.1 Netten scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode) *Combi-Ster*	10.2 Reinigingsproces *Combi-Ster*	10.3 Netten samenstellen en check compleetheid *Combi-Ster*	10.4' Netten terug naar instrumenten magazijn en check compleetheid van aantal netten *Combi-Ster*	10.5' Decontaminatie verklaring en andere documenten van de leverancier klaarmaken voor retour *Combi-Ster*	10.6' Netten terug zetten in dozen van leverancier *Combi-Ster*
1 risico (1 hoog risico)	0 risico's (0 hoog risico)	1 risico's (0 hoog risico)	3 risico's (0 hoog risico)	1 risico (0 hoog risico)	0 risico's (0 hoog risico)
5	30	30	20	5	5

10.1' Voor schone netten in vuile kar: zak eraf en naar instrumenten magazijn *Combi-ster*	10.2' Schone netten openmaken, label en barcode eraf halen *Combi-ster*
0 risico's (0 hoog risico)	0 risico's (0 hoog risico)
5	5

11- Factureren (en retour leverancier)

Normale netten

11.1 Maandelijkse factuur naar OK *Combi-Ster*
0 risico's (0 hoog risico)
10

Bruikleen netten

11.1 1 dag na OK bellen naar Combi-Ster of de netten opgehaald kunnen worden *Leverancier*	11.2 Netten ophalen bij Combi-Ster *Leverancier*	11.3 Check instrumentarium op verbruik en staat (bot of kapot) *Leverancier*	11.4 Factuur sturen aan Z-XL *Leverancier*	11.5 Goedkeuring vragen aan besteller *Z-XL*	11.6 Vergelijken factuur met winkelwagen en verbruikt materiaal en goedkeuren *Besteller*	11.7 Vergelijken met factuur en goedkeuren *Z-XL*	11.8 Omzetten in ordernummer (45 nummer) en koppelen aan 47-nummer en factureren op kostenplaats ortho *Z-XL*
1 risico (0 hoog risico)	3 risico's (0 hoog risico)	2 risico's (0 hoog risico)	0 risico's (0 hoog risico)	1 risico (0 hoog risico)	3 risico's (0 hoog risico)	0 risico's (0 hoog risico)	0 risico's (0 hoog risico)
5	-	-	-	-	10	-	-

Step 1 – Needs statement

1.1 The process begins when the patient enters the hospital at the policlinic. Here the specialist decides what kind of treatment is needed and if surgery must take place. When surgery is necessary the patient will be placed on a waiting list, here the name of the patient and kind of surgery are systematically noted in the system of RdGG (ChipSoft). Different fields are available to enter the treatment code, needed loan set, extra supplies, needed assistance during OR. The surgery must be approved when all information is complete.

Another possibility for patients to enter the process is via the emergency room or intensive care. These patients need care in short-term, it is called emergency when the surgery must take place within 12-14 hours. If the surgery must take place within 12 hours it is seen as trauma, but this will not be taken into account.

1.2 Based on the waiting list the planner of orthopaedics will make a schedule with the surgeries that will take place at each day. The patient and kind or surgery will be preliminary planned in ChipSoft on the right day, so that adjustments and/or additions can still be made. The ortho planner calls the patient to confirm the day of surgery.

1.3 Based on filtering the surgeries with requested loan sets, the OR assistant knows which sets needs to be ordered. When the set is not available at the manufacturer on the requested date the OR assistant calls the ortho planner, mostly the OR assistant already has another date when the set will be available. The ortho planner contacts the patient to make a new appointment for the surgery.

1.4 After ordering the loan set, the OR assistant update the information concerning the loan set, update the order status, and digitally prepare the surgery with the normal and loan trays.

1.5 The ortho meetings will still be done ever Thursday with the specialist, team leader of the OR, field expert, planner ortho. However, the structure of the meeting will be changed. The planned surgeries of the coming two weeks without a treatment code, needing a loan set, and that are not yet approved by the specialist or field expert will be discussed. A laptop or computer is needed to filter the surgeries.

1.6 Not all surgeries will have a treatment code, expected is that this will be in case of 10% of the surgeries for orthopaedics, probably less for most other specialists. The field expert will filter on these surgeries and digitally prepare the trays needed for the surgery.

The OR planner will digitally prepare the emergency surgeries without a treatment code. When he is not sure which trays are needed he will contact an OR assistant for help.

1.7 Two days in advance the surgeries will be planned based on time/order of the day. The OR planner checks what is the most convenient order to plan the surgeries. He or she will also check if all surgeries have trays assigned. If this is not the case he will assign the trays, with help of the OR assistant. However, during the day it even might happen that the order of surgeries changes, due to emergency surgeries. The system will help the OR planner with the planning by checking the availability of the needed trays.

1.8 A day before the planned surgery the ortho planner calls the patient to inform at which time the surgery will take place.

1.9 Before 4 PM the OR planner must finalize the planning for the next day, supported by the system that automatically check if the planning is feasible with the available trays. Ideally the planning will be saved in

the system and Combi-Ster can retrieve the planning from the system. If this is not possible the planning must be send to Combi-Ster.

Step 2 – Ordering (loan trays)

2.1 With the use of filtering the surgeries that require loan sets in ChipSoft, the orderer will create a shopping card at Z-XL.

2.2 The team leader of the OR or orderer will approve the shopping cart and update the order status of the loan set in ChipSoft.

2.3 Z-XL makes a reservation number for the requested order, this is called a 47-number. This reservation is send to the manufacturer that will deliver the set.

2.4 Combi-Ster will print the list with the requested loan trays and make a note in the agenda at the instrument storage when the loan set will arrive, two days before scheduled surgery and three days for unknown sets. Another note will be made in the agenda on the day that the set must be sterilized; this is one day before surgery.

Step 3 – Delivery at Combi-Ster (loan trays)

3.1 Normally the ordered loan set will be arrive two days prior to the planned surgery at Combi-Ster. When a new set is requested the manufacturer must deliver the set three days in advance. Also when the OR assistant does not known if the ordered set is new for Combi-Ster there will be delivered three days in advance. The OR assistant at the hospital discusses the delivery date with the manufacturer when reserving the set (step 1.5). Since Combi-Ster is involved in this step by receiving the set, the time is set on five minutes for Combi-Ster.

3.2 Combi-Ster checks the content of the delivery by the delivery note of the manufacturer and the request form. The cleaning and sterilization regulations are checked to see if Combi-Ster can meet these regulations. In case of an unknown set a new dossier and barcode will be created. For known sets this already exists.

3.3 The content of the trays of the set are checked with the pictures from the database. If something has changed, e.g. a different instrument or changes in the order of the instruments on the tray, new pictures will be made to update the dossier. For unknown sets pictures always will be made.

3.4 When the file in the system is updated a white label will be made. Here information as the name of the set, location where it must go to, manufacturer, sterilization day and surgery day is indicated. This will be connected to the tray before packing and sterilizing.

3.5 Combi-Ster has a box where all barcodes are placed. The right barcode will be attached at the tray before cleaning and sterilization.

3.6 When the trays of the loan set are going to the disinfection machine the dossier will be handed over to the team leader of in clean area.

3.7 A decontamination declaration is a form that must be provided to the manufacturer after using the instruments for surgery. This declaration must be signed by the surgeon to declare right use of the instruments (e.g. not used on animals). This form will be handed over to the autoclave service that has to add the form in the outer cart that includes the loan set.

Step 4 – Cleaning and sterilization (loan trays)

4.1 The trays will be scanned in the soiled area to identify the tray and the cleaning and sterilization instructions from the internal digital system of Combi-Ster.

4.2 After the identification the instruments go through the cleaning process.

4.3 The trays will enter the clean area when the cleaning process is finished. Here the trays will be assembled and packed in a special packaging. This packaging is resistant for the autoclave processes that sterilizes the instruments. The instruments will be placed on an inner cart. To recognize the trays a sticker including the name of the tray, expiration date, and barcode is placed on the packing, called the sterilization sticker. If instruments are missing an additional sticker will be add with the names of the missing instrument(s).

4.4 The instruments will be sterilized in the autoclave.

4.5 The sterilization process will be checked based on temperature, pressure and time. This is done based on a report produced by the autoclave. When approved, the barcode from the sterilization stickers will be scanned to update the track and trace information.

4.6 The trays will be placed in the sterile storage or in a PBT.

Step 5 – Preparation at Combi-Ster

5.1 Combi-Ster will retrieve the order list for the OR programme the next day at 4 PM from the system or from a message from the OR planner (Step 1.9). The order list contains the trays needed for the OR programme the next day and the trays to replenish the emergency storage at RdGG.

For emergency orders the times can be different, depending on the urgency and time of request.

5.2 The picking of the trays must be finished at 4:30 AM the day of the surgeries. Thus between 4 PM and 4:30 AM the next day the trays must be picked. It can be done by starting with picking the trays at 4 PM. Trays that are not finished the cleaning and sterilization process yet can be added later. During the night shift the missing trays can still be processed and add to the PBT.

5.3 No later than 5 AM the trays must be scanned and assigned to the PBT and outer cart.

Step 6 – Transport to the OR-complex

6.1 At around 5:00 AM the carts will be transported to RdGG. The carts will arrive at the central storage at the RdGG.

In case of emergency surgeries it is possible to make an extra delivery. Depending on the urgency and time that the trays are needed. Where possible the trays will be delivered with the regular transport.

Calculated is that one delivery moment is possible concerning the number of carts that must be transported. Assumed is that the number of trays used per day is maximal 96, which is based on data of the used trays per day of the year 2014 and the assumption that this amount will not increase (also when knowing that the number of surgeries is decreasing, see Appendix A). In total 16 carts can be placed in the truck that each can include 16 trays of 10 cm high. There are also trays of 15 cm high, this leads to less capacity. Assumed is that the capacity is than 10 trays per cart. Based on the assumption of maximal 96

trays per day, there are 6 carts needed if all trays are 10 cm high or 10 carts if all trays are 15 cm high. This easily fits in the truck.

6.2 From the central storage the outer carts are transported to the entrance of the OR-department. This will be done by an employee of the internal transport. In the new situation there is an OR-department and OR-complex. The OR-department is not sterile, and thus the trays must be kept in the outer carts.

6.3 At 6:00 the front office employee of Combi-Ster will receive the carts at the incoming goods area. Here he will scan the outer carts, thus it will be registered that the trays are received at RdGG. The front office employee will bring the carts to the OR-complex.

Step 7 – Preparation at OR-complex

7.1 The logistic employee of the OR receives the carts and takes the PBTs out of the outer carts. The trays for the emergency storage are placed in the sterile storage at the OR-complex.

7.2 If necessary trays from the emergency storage must be added to the PBTs. The trays must be scanned when picking the trays from the emergency storage.

7.3 To complete the PBTs, laminate, disposables and other required goods for the surgery must be added to the cart. The PBTs must be taken to the preparation room.

7.4 Just before surgery a final check will be done based on the names of the trays (from the sterilization sticker).

7.5 Before the surgery starts the trays are opened and set out.

7.6 The packing of the opened trays is checked for damages. In case of a torn packing the tray is not sterile anymore and thus cannot be used during surgery.

7.7 The sterilization sticker will be scanned in ChipSoft.

7.8 For the coming surgeries of the day, repeat from step 7.5.

Step 8 – Use in OR

8.1 The tables with the set out trays will be brought to the OR.

8.2 During surgery the instruments will be used.

8.3 The surgeon must fill in the decontamination declaration. This is mostly done during or right after the surgery.

8.4 After surgery the OR assistant put the instruments as neat as possible back in the trays and checks if the trays are complete. The trays will be packed in the same packing when they arrived and placed at a soil cart in the soiled corridor.

8.5 Directly after the surgery the OR assistant must fill in the used loan trays and implants in ChipSoft.

8.6 The unused trays from the emergency storage must be placed back into the emergency storage and scanned as ingoing. The unused loan trays will be placed in an plastic bag and placed in the soiled cart

8.7 The front office employee of Combi-Ster will pick up the soiled trays and transport them to the outgoing area of the OR-department.

8.7 In the outgoing area the trays will be weighed and scanned, hereafter the trays will be placed back into the soiled cart.

Step 9 – Transport to Combi-Ster

9.1 The carts are transported to the central storage. This is done 3 or 4 times a day.

9.2 Empty soil carts for the next surgeries will be placed.

9.3 The soiled carts are loaded into the truck to get on transport to Combi-Ster.

9.4 Combi-Ster drives six times a day from the RdGG to Combi-Ster with goods. The first delivery will be done half an hour earlier compared to the current process. The transports schedule of the current process and a proposed schedule for the future designed process is proposed in Appendix E.

Step 10 – Cleaning and sterilization

10.1 When the carts arrive at Combi-Ster they are scanned in the soiled area to identify the tray and the cleaning and sterilization instructions from the internal digital system of Combi-Ster.

10.1' Clean loan trays are taken out of the soiled cart. The plastic bag will be removed and the trays will be brought to the instrumental storage.

10.2 After scanning the instruments the cleaning process will be started. Special conditions and/or requirements concerning cleaning and sterilization are retrieved from the system when scanning the trays.

10.2' The clean loan trays are opened and the label and barcode, which were attached in step 3.4 and 3.5, will be removed.

10.3 The trays will enter the clean area when the cleaning process is finished. Here the trays will be assembled and packed in a special packaging. This packaging is resistant for the autoclave processes that sterilizes the instruments. The instruments will be placed on an inner cart. To recognize the trays a sticker including the name of the tray, expiration date, and barcode pasted on the packing, called the sterilization sticker. If instruments are missing an additional sticker will be add with the names of the missing instrument(s).

The cleaned loan trays are checked on completeness and compiled. Loan trays do not need to be sterilized before they will be transported back to the manufacturer.

10.4 The normal trays will be sterilized in the autoclave.

10.4' If the loan trays are complete, they will brought to the instrumental storage and checked if set is complete.

10.5 The sterilization process will be checked based on temperature, pressure and time. This is done based on a report produced by the autoclave. When approved, the barcode from the sterilization stickers will be scanned so the system knows which trays are going on transport.

10.5' The decontamination declaration together with the other documents of the manufacturer (e.g. requirements/instructions for usage and cleaning and sterilization process) must be prepared before returning the sets back to the manufacturer. The decontamination declaration returns from the OR-complex in the clean carts.

10.6 The trays will be placed in the sterile storage or in a PBT.

10.6' The trays and documents from step 10.5' are put back in the boxes of the manufacturer.

Step 11 – Invoicing (and retour to manufacturer)

11.1 Every month Combi-Ster sends an invoice to the OR-complex based on the cleaned and sterilized trays of last month. Every tray has its own cleaning and sterilization price. For emergency sterilization Combi-Ster asks double the price of the normal sterilization price of the tray.

11.1' One day after the surgery the manufacturer calls Combi-Ster to verify if the set can be collected.

11.2 The trays will be picked up at Combi-Ster and transported to the manufacturer.

11.3 The manufacturer checks the instruments on usage and condition. When lending the instruments to another hospital the instruments need to be in good condition.

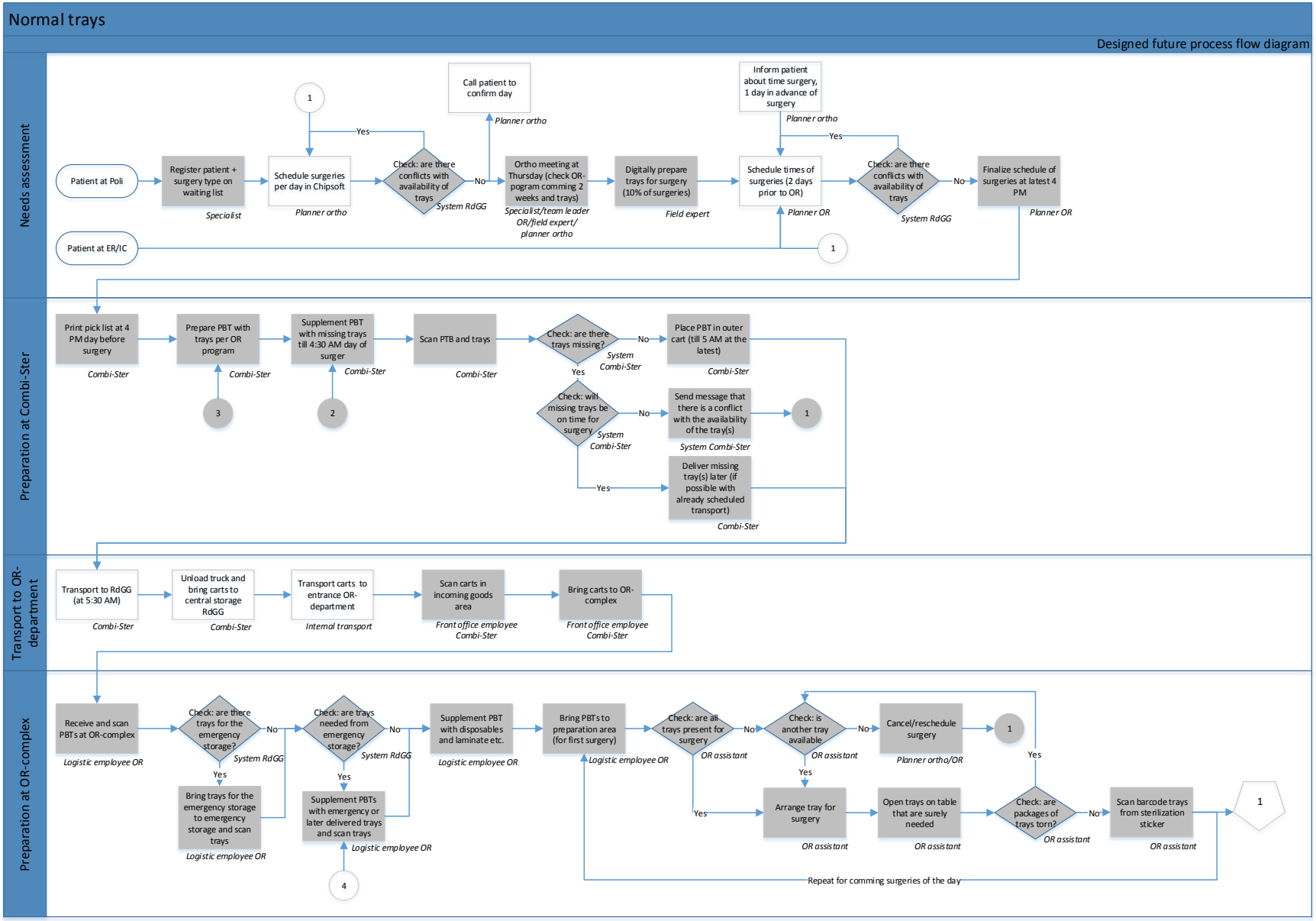
11.4 Based on the check done in 10.3' the manufacturer send an invoice to Z-XL.

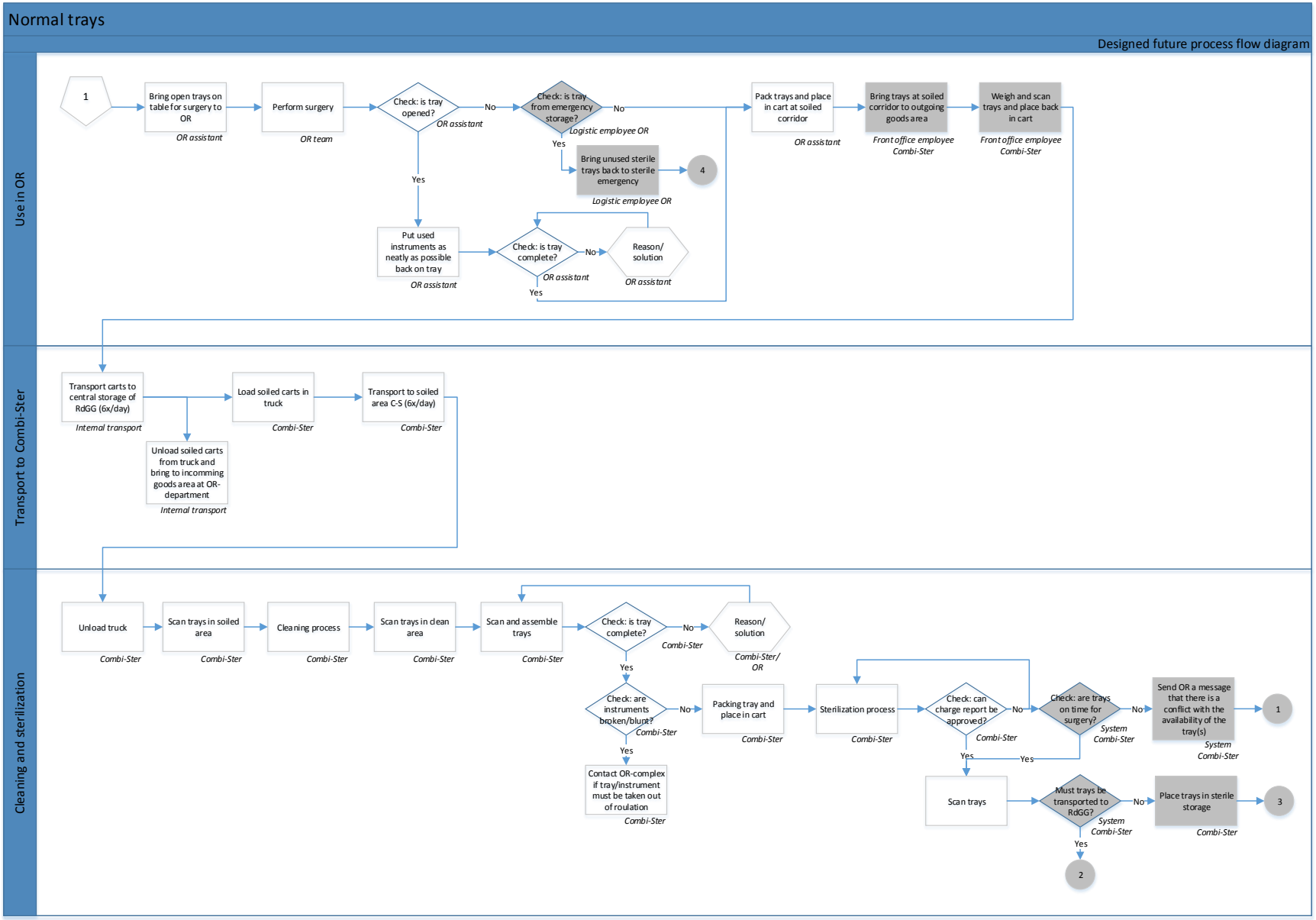
11.5 Z-XL receives the invoice and asks the orderer to confirm the invoice.

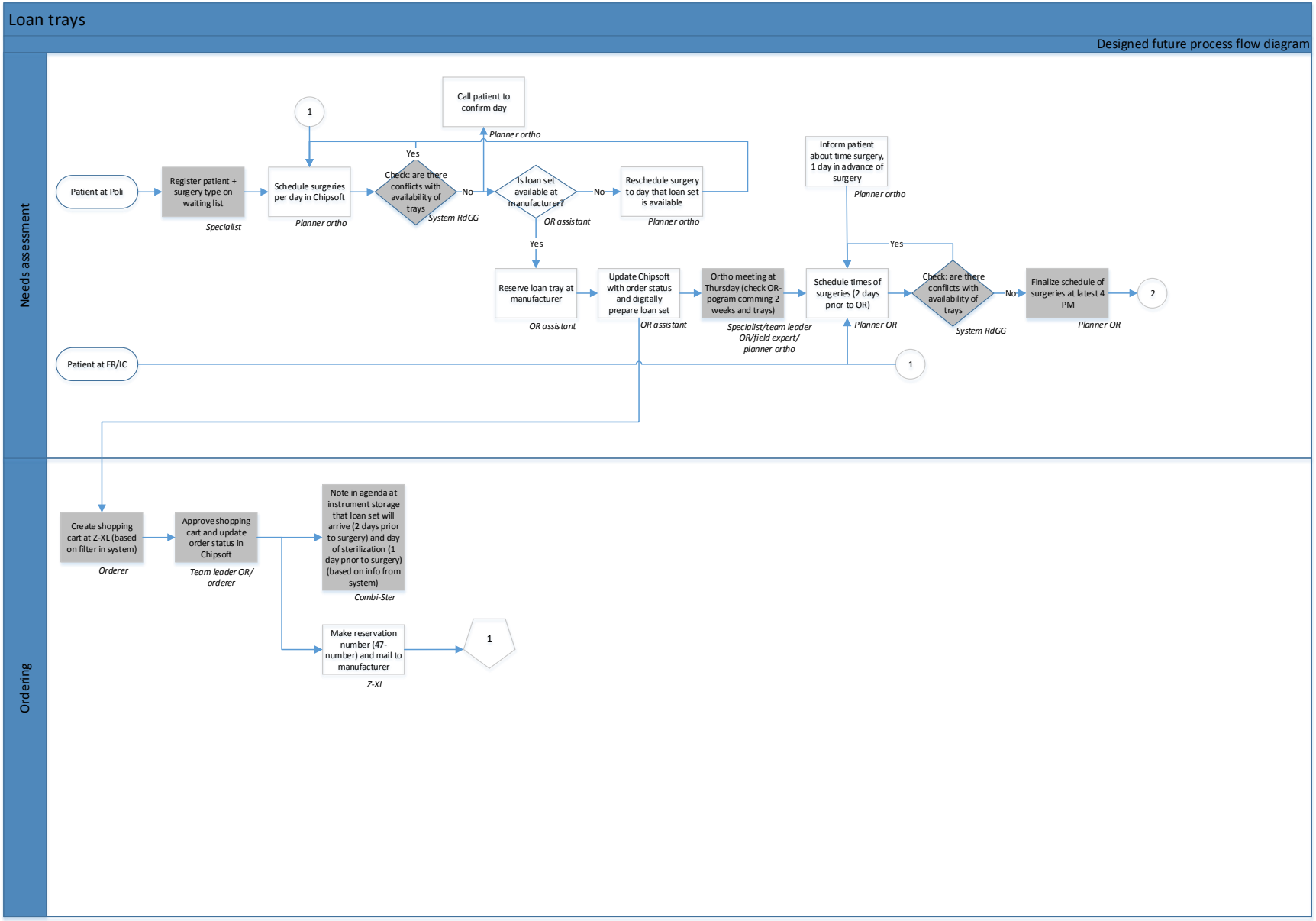
11.6 Before confirming the invoice the orderer checks the invoice with the shopping card (made in step 2.1) and the used material (step 8.5). When this all is correct the invoice will be confirmed.

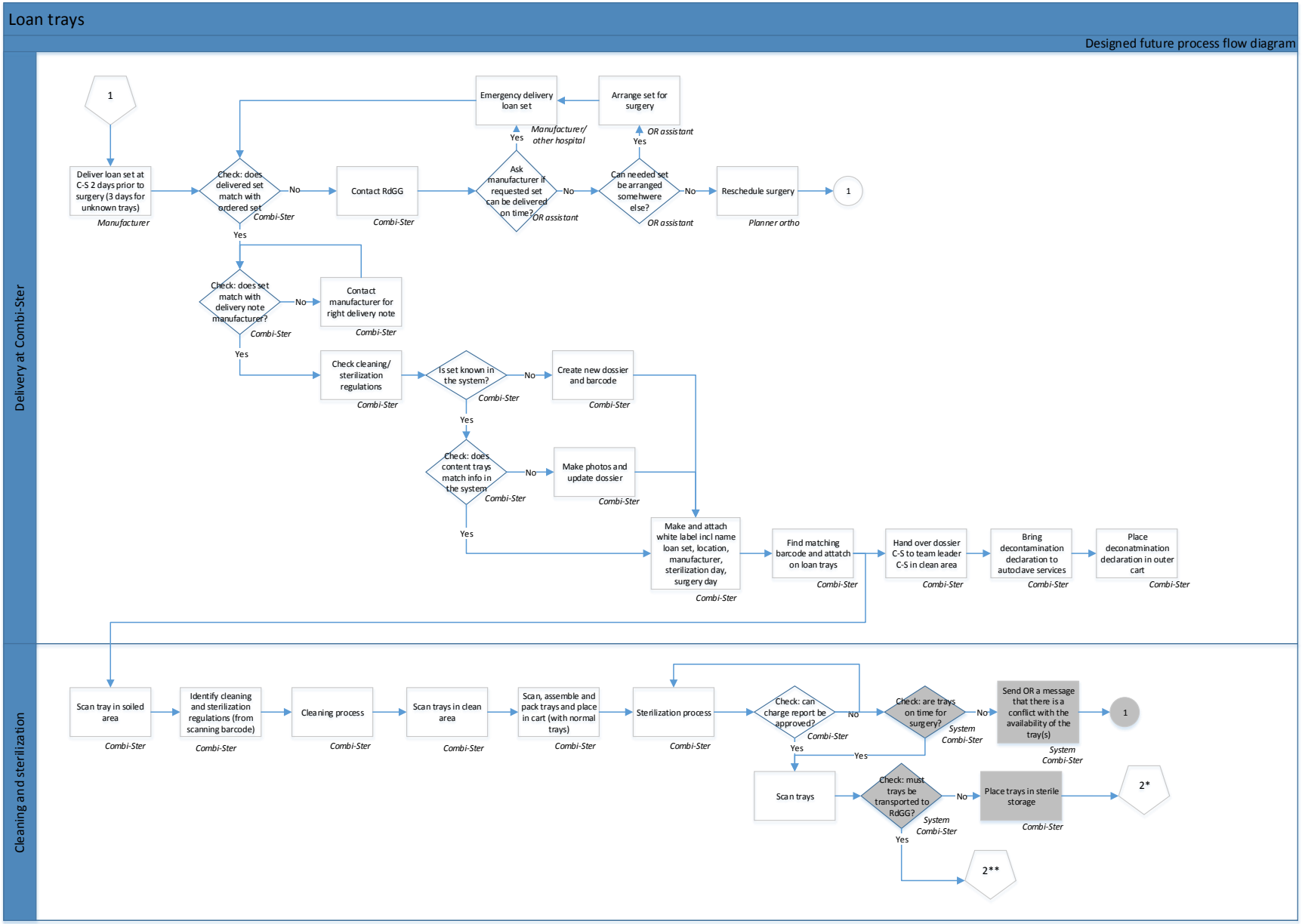
11.7 Z-XL checks the information from the orderer with the invoice and approves when they are similar.

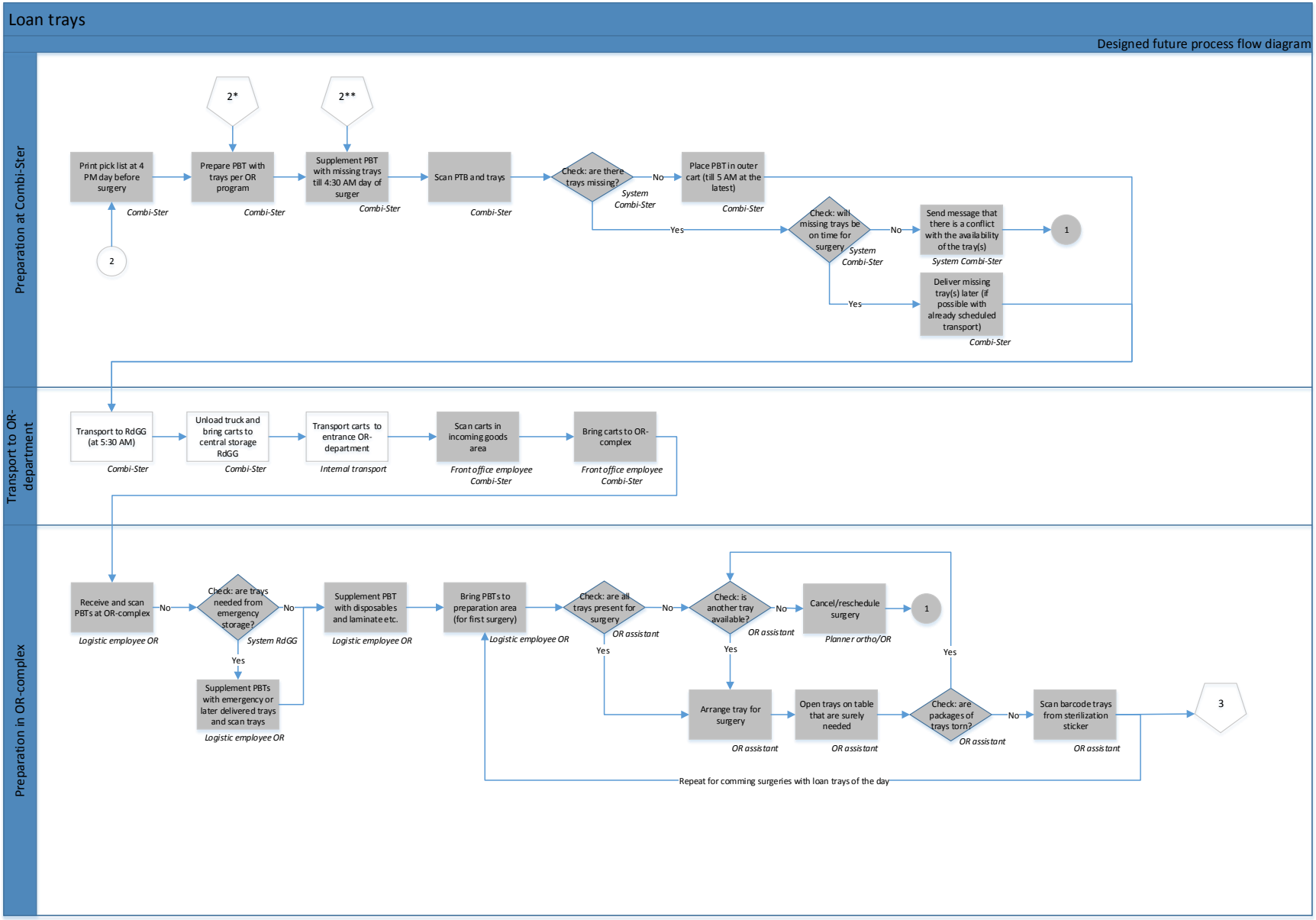
11.8 The reservation number (47-number) from step 2.3 will be changed in an order number (45-number) and linked to the 47-number. The invoice will be at the costs centre of orthopaedic.

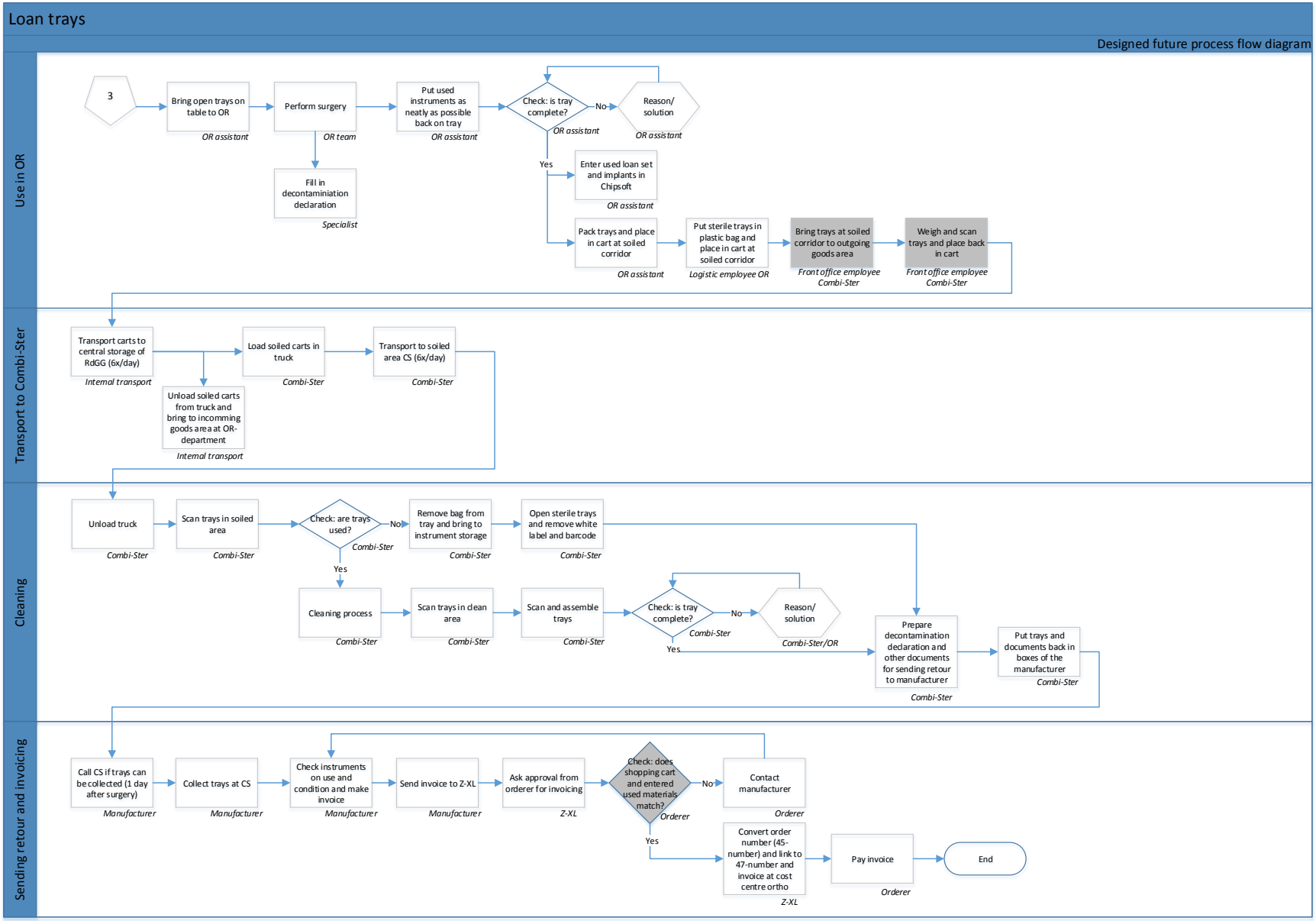

Normal trays
Designed future process flow diagram
Needs assessment
Patient at Poli
Register patient + surgery type on waiting list
Specialist
Schedule surgeries per day in Chipsoft
Planner ortho
1
Yes
Check: are there conflicts with availability of trays
System RdGG
No
Call patient to confirm day
Planner ortho
Ortho meeting at Thursday (check OR-pogram comming 2 weeks and trays)
Specialist/team leader OR/field expert/ planner ortho
Digitally prepare trays for surgery (10% of surgeries)
Field expert
Inform patient about time surgery, 1 day in advance of surgery
Planner ortho
Yes
Schedule times of surgeries (2 days prior to OR)
Planner OR
Check: are there conflicts with availability of trays
System RdGG
No
Finalize schedule of surgeries at latest 4 PM
Planner OR
Patient at ER/IC
1
Preparation at Combi-Ster
Print pick list at 4 PM day before surgery
Combi-Ster
Prepare PBT with trays per OR program
Combi-Ster
3
Supplement PBT with missing trays till 4:30 AM day of surger
Combi-Ster
2
Scan PTB and trays
Combi-Ster
Check: are there trays missing?
System Combi-Ster
No
Yes
Place PBT in outer cart (till 5 AM at the latest)
Combi-Ster
Check: will missing trays be on time for surgery
System Combi-Ster
No
Send message that there is a conflict with the availability of the tray(s)
System Combi-Ster
1
Yes
Deliver missing tray(s) later (if possible with already scheduled transport)
Combi-Ster
Transport to OR-department
Transport to RdGG (at 5:30 AM)
Combi-Ster
Unload truck and bring carts to central storage RdGG
Combi-Ster
Transport carts to entrance OR-department
Internal transport
Scan carts in incoming goods area
Front office employee Combi-Ster
Bring carts to OR-complex
Front office employee Combi-Ster
Preparation at OR-complex
Receive and scan PBTs at OR-complex
Logistic employee OR
Check: are there trays for the emergency storage?
System RdGG
No
Yes
Bring trays for the emergency storage to emergency storage and scan trays
Logistic employee OR
Check: are trays needed from emergency storage?
System RdGG
No
Yes
Supplement PBTs with emergency or later delivered trays and scan trays
Logistic employee OR
4
Supplement PBT with disposables and laminate etc.
Logistic employee OR
Bring PBTs to preparation area (for first surgery)
Logistic employee OR
Check: are all trays present for surgery
OR assistant
No
Yes
Check: is another tray available
OR assistant
No
Yes
Cancel/reschedule surgery
Planner ortho/OR
1
Yes
Arrange tray for surgery
OR assistant
Open trays on table that are surely needed
OR assistant
Check: are packages of trays torn?
OR assistant
No
Scan barcode trays from sterilization sticker
OR assistant
1
Repeat for comming surgeries of the day


Normal trays
Designed future process flow diagram
Use in OR
Transport to Combi-Ster
Cleaning and sterilization
1
Bring open trays on table for surgery to OR
OR assistant
Perform surgery
OR team
Check: is tray opened?
OR assistant
No
Yes
Check: is tray from emergency storage?
Logistic employee OR
No
Yes
Bring unused sterile trays back to sterile emergency
Logistic employee OR
4
Put used instruments as neatly as possible back on tray
OR assistant
Check: is tray complete?
OR assistant
No
Yes
Reason/ solution
OR assistant
Pack trays and place in cart at soiled corridor
OR assistant
Bring trays at soiled corridor to outgoing goods area
Front office employee Combi-Ster
Weigh and scan trays and place back in cart
Front office employee Combi-Ster
Transport carts to central storage of RdGG (6x/day)
Internal transport
Unload soiled carts from truck and bring to incomming goods area at OR-department
Internal transport
Load soiled carts in truck
Combi-Ster
Transport to soiled area C-S (6x/day)
Combi-Ster
Unload truck
Combi-Ster
Scan trays in soiled area
Combi-Ster
Cleaning process
Combi-Ster
Scan trays in clean area
Combi-Ster
Scan and assemble trays
Combi-Ster
Check: is tray complete?
Combi-Ster
No
Yes
Reason/ solution
Combi-Ster/ OR
Check: are instruments broken/blunt?
Combi-Ster
No
Yes
Contact OR-complex if tray/instrument must be taken out of roulation
Combi-Ster
Packing tray and place in cart
Combi-Ster
Sterilization process
Combi-Ster
Check: can charge report be approved?
Combi-Ster
No
Yes
Check: are trays on time for surgery?
System Combi-Ster
No
Yes
Send OR a message that there is a conflict with the availability of the tray(s)
System Combi-Ster
1
Scan trays
Must trays be transported to RdGG?
System Combi-Ster
No
Yes
Place trays in sterile storage
Combi-Ster
3
2


Loan trays
Designed future process flow diagram
Needs assessment
Ordering
Patient at Poli
Register patient + surgery type on waiting list
Specialist
Schedule surgeries per day in Chipsoft
Planner ortho
Check: are there conflicts with availability of trays
System RdGG
Yes
No
Call patient to confirm day
Planner ortho
Is loan set available at manufacturer?
OR assistant
No
Reschedule surgery to day that loan set is available
Planner ortho
Yes
Reserve loan tray at manufacturer
OR assistant
Update Chipsoft with order status and digitally prepare loan set
OR assistant
Ortho meeting at Thursday (check OR-pogram comming 2 weeks and trays)
Specialist/team leader OR/field expert/ planner ortho
Inform patient about time surgery, 1 day in advance of surgery
Planner ortho
Yes
Schedule times of surgeries (2 days prior to OR)
Planner OR
Check: are there conflicts with availability of trays
System RdGG
No
Finalize schedule of surgeries at latest 4 P.M
Planner OR
2
1
Patient at ER/IC
1
Create shopping cart at Z-XL (based on filter in system)
Orderer
Approve shopping cart and update order status in Chipsoft
Team leader OR/ orderer
Note in agenda at instrument storage that loan set will arrive (2 days prior to surgery) and day of sterilization (1 day prior to surgery) (based on info from system)
Combi-Ster
Make reservation number (47-number) and mail to manufacturer
Z-XL
1


Loan trays
Designed future process flow diagram
Delivery at Combi-Ster
Cleaning and sterilization
1
Deliver loan set at C-S 2 days prior to surgery (3 days for unknown trays)
Manufacturer
Check: does delivered set match with ordered set
Combi-Ster
No
Yes
Contact RdGG
Combi-Ster
Emergency delivery loan set
Yes
Manufacturer/ other hospital
Ask manufacturer if requested set can be delivered on time?
OR assistant
No
Arrange set for surgery
Yes
OR assistant
Can needed set be arranged somehwere else?
OR assistant
No
Reschedule surgery
Planner ortho
1
Check: does set match with delivery note manufacturer?
Combi-Ster
No
Contact manufacturer for right delivery note
Combi-Ster
Yes
Check cleaning/ sterilization regulations
Combi-Ster
Is set known in the system?
Combi-Ster
No
Create new dossier and barcode
Combi-Ster
Yes
Check: does content trays match info in the system
Combi-Ster
No
Make photos and update dossier
Combi-Ster
Yes
Make and attach white label incl name loan set, location, manufacturer, sterilization day, surgery day
Combi-Ster
Find matching barcode and attatch on loan trays
Combi-Ster
Hand over dossier C-S to team leader C-S in clean area
Combi-Ster
Bring decontamination declaration to autoclave services
Combi-Ster
Place deconatmination declaration in outer cart
Combi-Ster
Scan tray in soiled area
Combi-Ster
Identify cleaning and sterilization regulations (from scanning barcode)
Combi-Ster
Cleaning process
Combi-Ster
Scan trays in clean area
Combi-Ster
Scan, assemble and pack trays and place in cart (with normal trays)
Combi-Ster
Sterilization process
Combi-Ster
Check: can charge report be approved?
Combi-Ster
No
Yes
Check: are trays on time for surgery?
System Combi-Ster
No
Yes
Send OR a message that there is a conflict with the availability of the tray(s)
System Combi-Ster
1
Scan trays
Check: must trays be transported to RdGG?
System Combi-Ster
No
Yes
Place trays in sterile storage
Combi-Ster
2*
2**


Loan trays
Designed future process flow diagram
Preparation at Combi-Ster
Transport to OR-department
Preparation in OR-complex
2*
2**
Print pick list at 4 PM day before surgery
Combi-Ster
Prepare PBT with trays per OR program
Combi-Ster
Supplement PBT with missing trays till 4:30 AM day of surger
Combi-Ster
Scan PTB and trays
Combi-Ster
Check: are there trays missing?
System Combi-Ster
No
Yes
Place PBT in outer cart (till 5 AM at the latest)
Combi-Ster
Check: will missing trays be on time for surgery
System Combi-Ster
No
Yes
Send message that there is a conflict with the availability of the tray(s)
System Combi-Ster
1
Deliver missing tray(s) later (if possible with already scheduled transport)
Combi-Ster
2
Transport to RdGG (at 5:30 AM)
Combi-Ster
Unload truck and bring carts to central storage RdGG
Combi-Ster
Transport carts to entrance OR-department
Internal transport
Scan carts in incoming goods area
Front office employee Combi-Ster
Bring carts to OR-complex
Front office employee Combi-Ster
Receive and scan PBTs at OR-complex
Logistic employee OR
No
Check: are trays needed from emergency storage?
System RdGG
No
Yes
Supplement PBTs with emergency or later delivered trays and scan trays
Logistic employee OR
Supplement PBT with disposables and laminate etc.
Logistic employee OR
Bring PBTs to preparation area (for first surgery)
Logistic employee OR
Check: are all trays present for surgery
OR assistant
No
Yes
Check: is another tray available?
OR assistant
No
Yes
Cancel/reschedule surgery
Planner ortho/OR
1
Yes
Arrange tray for surgery
OR assistant
Open trays on table that are surely needed
OR assistant
Check: are packages of trays torn?
OR assistant
No
Scan barcode trays from sterilization sticker
OR assistant
3
Repeat for comming surgeries with loan trays of the day


Loan trays
Designed future process flow diagram
Use in OR
3
Bring open trays on table to OR
OR assistant
Perform surgery
OR team
Fill in decontaminiation declaration
Specialist
Put used instruments as neatly as possible back on tray
OR assistant
Check: is tray complete?
OR assistant
No
Reason/ solution
OR assistant
Yes
Enter used loan set and implants in Chipsoft
OR assistant
Pack trays and place in cart at soiled corridor
OR assistant
Put sterile trays in plastic bag and place in cart at soiled corridor
Logistic employee OR
Bring trays at soiled corridor to outgoing goods area
Front office employee Combi-Ster
Weigh and scan trays and place back in cart
Front office employee Combi-Ster
Transport to Combi-Ster
Transport carts to central storage of RdGG (6x/day)
Internal transport
Unload soiled carts from truck and bring to incomming goods area at OR-department
Internal transport
Load soiled carts in truck
Combi-Ster
Transport to soiled area CS (6x/day)
Combi-Ster
Cleaning
Unload truck
Combi-Ster
Scan trays in soiled area
Combi-Ster
Check: are trays used?
Combi-Ster
No
Remove bag from tray and bring to instrument storage
Combi-Ster
Open sterile trays and remove white label and barcode
Combi-Ster
Yes
Cleaning process
Combi-Ster
Scan trays in clean area
Combi-Ster
Scan and assemble trays
Combi-Ster
Check: is tray complete?
Combi-Ster
No
Reason/ solution
Combi-Ster/OR
Yes
Prepare decontamination declaration and other documents for sending retour to manufacturer
Combi-Ster
Put trays and documents back in boxes of the manufacturer
Combi-Ster
Sending retour and invoicing
Call CS if trays can be collected (1 day after surgery)
Manufacturer
Collect trays at CS
Manufacturer
Check instruments on use and condition and make invoice
Manufacturer
Send invoice to Z-XL
Manufacturer
Ask approval from orderer for invoicing
Z-XL
Check: does shopping cart and entered used materials match?
Orderer
No
Contact manufacturer
Orderer
Yes
Convert order number (45-number) and link to 47-number and invoice at cost centre ortho
Z-XL
Pay invoice
Orderer
End

K. List of failure modes of designed future process flow

H-FMEA (bruikleen) instrumentarium - JIT processen in de nieuwbouw								
Alleen normale	**Alleen bruikleen**	**Potentiële faalwijze**	**Potentiele oorzaak**	**Freq**	**Ernst**	**Risico score**	**Accepteren, beheersen, elimineren**	**Beschrijving actie**
		1. Behoeftestelling						
		1.1 Patiënt bij poli en plaatsen op wachtlijst. Systematisch informatie invullen in ChipSoft (Behandelcode kiezen, keuze voor bruikleen, extra benodigdheden, nodige assistentie bij OK, check of informatie compleet is). Goedkeuren als alle info compleet is.						
		Informatie in ChipSoft verkeerd ingevuld	Verkeerde behandelcode ingevuld	2	4	8	accepteren	
			Onterecht geen behandelcode gekozen (handmatig ingevoerd)	2	2	4	accepteren	
		Informatie niet systematisch ingevuld	Vergeten/ te druk	2	2	4	accepteren	
			Vergissing	2	2	4	accepteren	
			Niet weten hoe het moet	2	2	4	accepteren	
		Verandering van de wensen voor de operatie	Andere operateur	4	2	8	beheersen	Beheerst door de check van de specialist stap 1.7
			Informatie over patiënt pas later bekend	2	2	4	beheersen	In ChipSoft aangeven (vinkje) als informatie nog niet compleet is.
		Verkeerd gedaan/onterecht goedgekeurd	Vergissing	2	4	8	accepteren	
		1.1' Spoed patiënten via SEH/IC. Aanmelden direct bij planner OK (spoed= 12-14 uur voor de operatie)						
		-						
		1.2 Inplannen voorlopige datum: patiënt en type operatie in ChipSoft (en bellen met patiënt). Automatische check van systeem over beschikbaarheid van de netten						
		Patiënt niet inplannen	Patiënt niet aangemeld in ChipSoft	3	2	6	accepteren	
			Patiënt niet op inplanlijst (bv. Niet bij anesthesie geweest, geen POS akkoord)	4	2	8	accepteren	
			Planner ortho niet aanwezig	2	3	6	accepteren	
	x	**1.3 Overleg met leverancier en bruikleen set reserveren**						
		Niet gedaan	Vergeten/ te druk	2	2	4	beheersen	Komt uit in ortho overleg in de lijst van operaties die nog klaargezet moeten worden of operaties met bruikleen
		Niet mogelijk op OK datum	Net niet beschikbaar op OK datum	2	2	4	accepteren	
			Te laat actie ondernomen (sommige netten moet je ver van te voren boeken)	2	3	6	accepteren	
			Patiënt te laat ingepland	2	3	6	accepteren	
	x	**1.4 In ChipSoft info over bruikleen aanvullen, bestelstatus updaten en digitaal klaarzetten van de operaties met normale en bruikleen netten**						
		Niet gedaan	Vergeten/ te druk	2	2	4	beheersen	Komt uit in ortho overleg in de lijst van operaties die nog klaargezet moeten worden of operaties met bruikleen
		1.5 Ortho overleg op donderdag. Check programma voor 2 weken en check netten (a.d.h.v. van selectie lijsten uit ChipSoft) voor: operaties zonder behandelcode; operaties waar bruikleen nodig; operaties die nog niet goedgekeurd zijn						
		Overleg gaat niet door		3	2	6	accepteren	
		Selectie lijsten uit ChipSoft niet aanwezig	Niet weten hoe de selectie lijsten (operaties met bruikleen, operaties waar nog	3	2	6	beheersen	Training geven betreft het gebruik van ChipSoft!!

			info mist, etc.) uit ChipSoft gehaald moeten worden					
		ChipSoft niet netjes geëupdate door OK assistent/terreindeskundige/ specialist (over bestelstatus bruikleen, of over info die nog mist in ChipSoft, etc.)	Vergeten/ geen tijd	2	2	4	beheersen	Dit wordt ondervangen tijdens het overleg. Kost alleen meer tijd
			Mist info	2	2	4	beheersen	Dit wordt ondervangen tijdens het overleg. Kost alleen meer tijd
x		**1.6 Digitaal klaarzetten voor de operaties zonder behandelcode/winkelmandje (schatting: 10% van de operaties)**						
		Niet gedaan	Vergeten/ te druk	3	2	6	beheersen	Dit wordt ondervangen door de planner OK die 2 dagen van te voren de operaties checkt die geen netten toegekend hebben gekregen.
			Nodige info nog steeds niet aanwezig	2	2	4	accepteren	
		Verkeerd gedaan	Vergissing	2	4	8	beheersen	Hier kom je pas vlak voor de OK achter. Beheersen door grijpvoorraad en spoed levering vanuit Combi-Ster
		1.6' SPOED: Digitaal klaarzetten voor de spoed operaties zonder behandelcode/winkelmandje (schatting: 10% van de operaties)						
		Nodige net niet aanwezig	Net nog in proces (OK of Combi-Ster)	2	4	8	accepteren/ beheersen	Er zijn altijd grenzen aan de aantal netten. Maar toch beheersen omdat we naar voorraad beheer gaan kijken.
		1.7 Check tijden en volgorde van de operaties per dag + check operaties die geen netten toegekend hebben, 2 dagen voor operatie						
		Geplande volgorde van de operaties is te krap	Niet naar de opmerkingen in ChipSoft gekeken (bv. Operatie liefst in de middag i.v.m. aanleveringen van Combi-Ster)	3	3	9	beheersen	Proces van Combi-Ster koppelen aan ChipSoft. Automatische check in ChipSoft.
		Geen check van de operaties die geen netten toegekend hebben	Vergeten/ te druk	2	4	8	beheersen	Herkenning (bv verschillende kleuren) in ChipSoft zodat het heel duidelijk is voor de planner OK dat er voor die operatie nog iets mist.
		1.8 Operatie tijd doorgeven aan patiënt, 1 dag van tevoren						
		Niet doorgeven	Patiënt niet bereikbaar (dan wordt het aan verpleegafdeling doorgegeven)	2	4	8	beheersen	Verpleegafdeling neemt contact op met patiënt? Patiënt belt zelf?
		1.9 Om 16:00 uur planning definitief af hebben, systeem ondersteunt maken planning door automatische check of het lukt met de netten.						
		Spoed sterilisatie nodig en niet doorgegeven	Vergeten/ te druk	3	4	12	beheersen	Prioriteiten lijst automatisch aangemaakt door ChipSoft. Bellen voor spoed voor de zekerheid, ook is het in het systeem.
		Geplande volgorde van de operaties is te krap	Niet naar de opmerkingen in ChipSoft gekeken (bv. Operatie liefst in de middag i.v.m. aanleveringen van Combi-Ster)	3	3	9	beheersen	Proces van Combi-Ster koppelen aan ChipSoft. Automatische check in ChipSoft.
		2. Bestelling						
	x	**2.1 Aanmaken winkelwagen bij Z-XL (info over bruikleen via filter/zoekactie in ChipSoft)**						
		Geen winkelwagen aangemaakt	Te druk/ vergeten	2	4	8	accepteren	
		Verkeerde winkelwagen aangemaakt	Vergissing	2	2	4	beheersen	Bij goedkeuren van de winkelwagen checkt OK teamleider/besteller of het goede net is besteld en geeft status update besteld in ChipSoft aan (stap 2.2)
	x	**2.2 Winkelwagen goedkeuren en bestelstatus in ChipSoft updaten**						
		Bestelstatus niet geüpdate	Vergeten / te druk	3	2	6	beheersen	Bij ortho overleg langs de operaties gaan waarbij de status nog niet geüpdate is naar besteld

		Winkelwagen niet goedgekeurd	Manager OK niet aanwezig (als teamleider de aanvraag heeft gemaakt)	3	2	6	beheersen	Bij ortho overleg langs de operaties gaan waarbij de status nog niet geüpdate is naar besteld
			Teamleider niet aanwezig	2	2	4	beheersen	Bij ortho overleg langs de operaties gaan waarbij de status nog niet geüpdate is naar besteld
	x	**2.3 Reserveringsnummer (47-nummer) maken en mailen aan leverancier**						
		-						
	x	**2.4 Print uitdraaien uit ChipSoft of in agenda schrijven in instrumenten magazijn op dag van levering (2 dagen voor OK) en op sterilisatie dag (1 dag voor OK)**						
		Niet gedaan	vergeten/ te druk	3	2	6	beheersen	Als bruikleen geleverd wordt extra stap om te onderzoeken voor welke operatie dit is
		3. Levering bij Combi-Ster						
	x	**3.1 Levering bij Combi-Ster 2 werkdagen voor de operatie voor de bekende bruikleen set (3 werkdagen voor nieuwe set)**						
		Niet geleverd	Direct op OK geleverd	2	2	4	accepteren	Met eerstvolgende transport naar Combi-Ster voor sterilisatie
			Incorrecte bestelling	1	3	3	accepteren	
			Vergissing leverancier	1	3	3	accepteren	
		Te laat geleverd	Uitgeleend bij andere ziekenhuis en te laat bij de leverancier terug	2	3	6	accepteren	
			Onbekend dat een nieuwe set 3 dagen voor de OK aanwezig moet zijn	2	2	4	beheersen	Communiceren aan besteller? Die moet dat goed inzetten in de winkelwagen.
			Vergissing leverancier	1	3	3	accepteren	
	x	**3.2 Check inhoud levering met pakbon leverancier, reinigings- en sterilisatie voorschriften, nieuw dossier en nieuwe barcode aanmaken**						
		Mist/kapotte instrumenten	Verkeerde check bij leverancier	2	4	8	accepteren	
		Mist een net	Soms moeilijk om te weten, het niet altijd bekend hoeveel netten in een set moeten zijn	2	4	8	beheersen	De besteller kan ik ChipSoft invoeren hoeveel netten de bestelling heeft.
		Reinigings- en sterilisatie voorschriften niet geleverd/ niet compleet	Vergeten bij leverancier	2	2	4	accepteren	
		Reinigings- en sterilisatie voorschriften niet te doen bij Combi-Ster		1	4	4	accepteren	
		Geen nieuwe dossier aangemaakt	ICT problemen	1	2	2	accepteren	
			Niet genoeg tijd (spoed)	2	2	4	accepteren	
			Voorschriften niet aanwezig	2	2	4	accepteren	
	x	**3.3 Checken foto's uit database. Foto's van inhoud maken als er iets veranderd is en dossier updaten**						
		Niet gecheckt	Vergeten/ te druk/ spoed	3	2	6	accepteren	
		Geen update	Vergeten/ te druk /spoed	3	2	6	accepteren	
			ICT problemen	2	2	4	accepteren	
			Camera kapot	1	2	2	accepteren	
		Fout gecheckt	Vergissing	2	2	4	accepteren	
	x	**3.4 Wit label maken met: bruikleen, locatie, leverancier, sterilisatie dag en datum operatie**						
		Verkeerde datum	Vergissing	2	4	8	beheersen	bruikleen komt op klaarzetlijst te staan
	x	**3.5 Barcode zoeken en plaatsen op bruikleen netten en scannen**						
		Verkeerde barcode	Vergissing	2	3	6	beheersen	bij het opdekken van het net komt dit naar voren (verkeerde foto's

								verschijnen op het scherm, van een ander net)
	x	**3.6 Dossier van Combi-Ster doorgeven aan teamleider Combi-Ster in schone ruimte (tegelijk met de netten naar de reinigingsruimte)**						
		Dossier niet doorgegeven	Vergeten/ te druk/ spoed	2	2	4	accepteren	
			Bruikleen verantwoordelijke niet aanwezig	2	2	4	accepteren	
	x	**3.7 Decontaminatie verklaring naar autoclaaf dienst (na de autoclaaf), die geven het mee in de buitenkar naar de OK**						
		Niet doorgegeven	Vergeten/ te druk/ spoed	2	1	2	accepteren	
		Niet in de kar gezet	Vergeten door autoclaaf dienst	2	1	2	accepteren	
			In verkeerde kar gezet door autoclaaf dienst	2	1	2	accepteren	
		4. Reiniging en sterilisatie						
	x	**4.1 Netten scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)**						
		Verkeerde barcode	Vergissing	2	2	4	accepteren	
		ICT problemen		2	2	4	accepteren	
	x	**4.2 Reinigingsproces**						
		-						
	x	**4.3 Netten samenstellen, check compleetheid en verpakken**						
		Map met overzicht van inhoud net is niet doorgegeven aan de teamleider	Vergeten/ te druk/ slechte communicatie tussen teamleiders	2	2	4	accepteren	
		Foto verkeerd gekoppeld	Vergissing	2	2	4	accepteren	
		Verkeerde sterilisatie sticker geplakt	Vergissing	2	5	10	accepteren/ beheersen	Werkflow afspraken
	x	**4.4 Sterilisatieproces**						
		Deel niet gesteriliseerd (deel levering)	Vergissing	2	4	8	accepteren	
			Problemen met verpakking/ net nat geworden	2	2	4	accepteren	
	x	**4.5 Goedkeuren sterilisatieproces en scan barcode van sterilisatie sticker**						
		-						
	x	**4.6 Plaats netten in klaarzetkar of in steriele voorraad**						
		Net wordt onsteriel	Stoten van het net, waardoor er een gat in de verpakking komt	4	3	12	accepteren	
		5. Klaarzetten bij Combi-Ster						
		5.1 Print klaarzetlijst gebaseerd op OK programma en grijpvoorraad om 16:00 1 dag voor operaties						
		Klaarzetlijsten niet up-to-date in ChipSoft	Verandering in klaarzetlijsten (nieuwe artsen, nieuwe spullen)	3	2	6	beheersen	Wie gaat de digitale klaarzetlijsten beheren? OK assistenten geven het door aan ' iemand' in de OK die de ChipSoft beheerder wordt
		Geen lijsten	IT storingen	1	2	2	beheersen	Noodplan uitwerken. Ernst = 2 als er ergens een papieren versie is.
		Lijst niet compleet	Patiënt na 16.00 niet als spoed aangemeld in het systeem	2	2	4	beheersen	Afspraak maken voor aanmelden van patiënten na 16.00. Na 16.00 → Bellen: overleg of het geleverd kan worden of uit grijpvoorraad pakken (hangt af van de tijd).
			Digitaal klaarzetten niet gedaan wanneer nodig	2	4	8	beheersen	Planner OK kan het doen, als verantwoordelijke voor de planning, indien nodig vragen aan OK assistenten wat er nodig is. Eis =

								operatie behandelcode is gemakkelijk zichtbaar voor planner OK.
		5.2 Verzamelen van de netten in de klaarzetkar uiterlijk om 4:30 uur						
		Netten niet aanwezig	Uit de roulatie	3	2	6	beheersen	Net uit roulatie bekend in systeem, maar de planner OK overruled het. Afspraken maken als net uit roulatie is, dat bv de planner checkt wanneer net nodig/geplant is in de komende weken.
			In grijpvoorraad	4	1	4	beheersen	Afspreken dat log. med. klaarzetkarren moet aanvullen. In systeem wordt dit aangegeven dat afwezige netten uit grijpvoorraad moeten komen
			In het proces	3	4	12	accepteren	Bellen, planning aanpassen
		Verkeerd klaarzetten	Vergissing	2	4	8	beheersen	Scannen van netten per operatie. 'Systeem' geeft een melding als het niet klopt.
		5.3 Klaarzetkar en netten scannen per operatie en plaatsen in buitenkar uiterlijk om 5:00 uur						
		Vergissing	Fout gescand	2	4	8	accepteren	Scannen na het klaarzetten = automatische check van het systeem
		5.1' SPOED: Spoed klaarzetlijst printen						
		Klaarzetlijsten niet up-to-date in ChipSoft	Verandering in klaarzetlijsten (nieuwe artsen, nieuwe spullen)	3	2	6	beheersen	Wie gaat de digitale klaarzetlijsten beheren? OK assistenten geven het door aan ' iemand' in de OK die de ChipSoft beheerder wordt
		Geen klaarzetlijsten	IT storingen	1	2	2	accepteren	Noodplan uitwerken. Ernst = 2 als er ergens een papieren versie is.
		5.2' SPOED: Verzamelen van de netten in de klaarzetkar						
		Netten niet aanwezig	Uit de roulatie	3	2	6	beheersen	Net uit roulatie is bekend in het systeem, maar de planner OK overruled het. Afspraken maken als net uit roulatie is, dat bv de planner checkt wanneer net nodig/gepland in de komende weken.
			In grijpvoorraad	4	1	4	beheersen	Afspraken log. med. moet klaarzetkarren aanvullen
			In het proces	3	4	12	accepteren	Bellen, planning aanpassen
		Verkeerd klaarzetten	Vergissing	2	4	8	beheersen	Scannen van netten per operatie. 'Systeem' geeft een melding als het niet klopt.
		5.3' SPOED: Klaarzetkar en netten scannen per operatie en plaatsen in buitenkar						
		Vergissing	Fout gescand	2	4	8	accepteren	Scannen na het klaarzetten = automatische check van het systeem
		6. Transport naar OK						
		6.1 Transport karren naar centraal magazijn RdGG om 05:30 op OK dag						
		Probleem met transport		1	3	3	accepteren	
		6.1' SPOED: Spoed karren naar centraal magazijn RdGG. Transport samen met ophaal/breng ritten als mogelijk. Anders extra chauffeur inzetten						
		-						
		6.2 Transport naar ingang OK-afdeling						
		Verkeerde afdeling gebracht	Vergissing	2	3	6	beheersen	Als om 6:30 uur nog niet bij OK is moet frontoffice medewerker Combi-Ster bellen naar interne logistiek
		6.3 Ontvangst en scannen karren in goederen ontvangstruimte om 06:00 en brengen naar OK-sluis						

		Niet gebracht	Vergeten	2	2	4	beheersen	Logistiek medewerker belt/gaat naar frontoffice medewerker Combi-Ster om karren te vragen
		7. Klaarzetten bij OK						
		7.1 Ontvangst van karren bij OK sluis. Grijpvoorraad netten naar grijpvoorraad brengen en scannen						
		Verkeerde karren	Fout gescand (foute locatie kiezen)	3	2	6	accepteren	Is er nog steeds keuze van locatie bij ChipSoft? Of hebben ze dat weg gehaald? Wie gaat het uitzoeken als het fout gaat?
		Kar kan niet open	Deur zit klem	3	2	6	beheersen	Karren onderhouden (indien een kar nog klemt doorgeven aan Combi-Ster dat een kar niet goed werkt)
		7.2 Vul klaarzetkarren aan met grijpvoorraad netten indien nodig en deze netten scannen						
		Protocollen/ klaarzetlijsten niet up-to-date	Verandering in klaarzetlijsten (nieuwe artsen, nieuwe spullen)	3	2	6	beheersen	Wie gaat de digitale klaarzetlijsten beheren? OK assistenten geven het door aan ' iemand' in de OK die de ChipSoft beheerder wordt
		Grijpvoorraad netten niet aanwezig	In het proces	2	4	8	accepteren	
			Fout gescand op eerder moment, waardoor informatie in systeem niet klopt	2	4	8	beheersen	Duidelijke werkafspraken maken wat betreft het scannen.
		7.3 Karren verder aanvullen met laminaat, disposables etc. + brengen naar opdekruimte (voor eerste operatie)						
		Verkeerde opdekruimte	Vergissing	2	2	4	accepteren	
		Protocollen/ klaarzetlijsten niet up-to-date	Verandering in klaarzetlijsten (nieuwe artsen, nieuwe spullen)	3	2	6	beheersen	Wie gaat de digitale klaarzetlijsten beheren? OK assistenten geven het door aan ' iemand' in de OK die de ChipSoft beheerder wordt
		Grijpvoorraad netten niet aanwezig	In het proces	2	4	8	accepteren	
			Fout gescand op eerder moment	2	4	8	beheersen	Duidelijke werkafspraken maken wat betreft het scannen.
		7.4 Check compleetheid netten en andere benodigdheden voor eerste operatie						
		Nodige net afwezig	Fout aangevraagd in ChipSoft	3	4	12	accepteren	Operatie wordt gecanceld/verplaatst naar later op de dag
			Protocollen/ klaarzetlijsten niet up-to-date	2	4	8	beheersen	Wie gaat de digitale klaarzetlijsten beheren? OK assistenten geven het door aan ' iemand' in de OK die de ChipSoft beheerder wordt
			Net voor andere operatie gebruikt in de tussentijd	2	4	8	beheersen	OK assistent belt voor spoed aanvraag
		7.5 Netten opdekken voor eerste operatie						
		Mist instrument (onverwacht)	Fout samengesteld door Combi-Ster	4	5	20	accepteren	Op dit moment accepteren. Misschien een apart project/onderzoek naar verbetering hiervoor. Bv RFID toepassing?
		Mist een (bruikleen) net	Onvolledige klaarzetlijsten	2	5	10	beheersen	Wie gaat de digitale klaarzetlijsten beheren? OK assistenten geven het door aan ' iemand' in de OK die de ChipSoft beheerder wordt
			Onvolledige levering van Combi-Ster	2	5	10	accepteren	
		Instrument niet goed gereinigd	Fout bij Combi-Ster	2	5	10	accepteren	
		7.6 Check voor gaten in verpakking van netten						
		Netten worden afgekeurd/niet meer steriel	Gat in de verpakking	5	5	25	accepteren	Apart onderzoek opzetten waardoor dit echt komt en hoe dit te beheersen/elimineren. En achter te halen eerder in het proces?
		7.7 Netten scannen in ChipSoft						

		Niet scannen	Te druk/ vergeten	5	2	10	beheersen	Duidelijke werkafspraken. Kan desnoods na de operatie?
			Sticker met barcode kwijt	5	2	10	accepteren	
			ICT problemen	2	2	4	accepteren	
		7.8 Herhaal vanaf stap 7.5 voor alle volgende operaties dezelfde dag						
		-						
		8. Gebruik in OK						
		8.1 Breng opdektafels naar de OK						
		Net/instrument wordt onsteriel	Net/instrument valt op de grond of komt in aanraking met niet steriel product	2	5	10	accepteren	
		8.2 Operatie						
		Instrument is/gaat kapot/onsteriel		4	2	8	accepteren	
		Belangrijk instrument is/gaat kapot/ onsteriel		2	5	10	accepteren	
		Mist een instrument (onverwacht)	Fout samengesteld door Combi-Ster	2	5	10	accepteren	Op dit moment accepteren. Misschien een apart project/onderzoek naar verbetering hiervoor. Bv RFID toepassing?
		Aanvullende spullen nodig tijdens operatie	Onverwacht verloop van operatie	5	2	10	accepteren	
		Aanvullende spullen niet beschikbaar	Nog in het proces	3	5	15	accepteren	
		Instrumenten niet goed gereinigd	Foute reiniging bij Combi-Ster	2	5	10	accepteren	
	x	**8.3 Decontaminatie verklaring invullen**						
		Verklaring niet ingevuld	Vergeten/ te druk	4	1	4	accepteren	
			Verklaring kwijt	4	1	4	accepteren	
			verklaring in verkeerde kar gezet	4	1	4	accepteren	
		8.4 Instrumenten terug op de netten leggen en check compleetheid, verpakken en in de kar op de vuile gang neerzetten						
		Gebruikte implantaten (schroeven en platen) niet aangevuld	Vergeten/ te druk/ geen overzicht	2	2	4	beheersen	Deels; frontoffice medewerker Combi-Ster gaat de netten wegen, waardoor meer gecontroleerd kan worden of alle instrumenten op het net liggen. Zit marge in het gewicht dus kan er alsnog niet opgemerkt worden
		Verkeerd aangevuld	Vergissing	2	3	6	accepteren	
		Instrument kwijt	Per ongeluk weggegooid	2	2	4	beheersen	Deels; frontoffice medewerker Combi-Ster gaat de netten wegen, waardoor meer gecontroleerd kan worden of alle instrumenten op het net liggen
	x	**8.5 Direct na operatie in ChipSoft zetten welke bruikleennetten en implantaten gebruikt zijn**						
		Niet gedaan	vergeten/ te druk	3	2	6	accepteren	Accepteren voor nu. Richtlijnen hierover gaan veranderen.
	x	**8.6 Schone netten in plastic tas in de vuile kar**						
		Niet gebeurt, terug in de steriele voorraad	Vergissing	4	2	8	accepteren	
		8.7 Breng vuile netten naar de afval uitgaande ruimte						
		-						
		8.8 Netten wegen, scannen en in kar terugzetten						
		Niet gedaan	vergeten/te druk	2	2	4	accepteren	

		Niet gewogen	vergeten/te druk	3	2	6	accepteren	Scannen moet toch dus dan is logische volgorde stap (misschien in systeem inbouwen dat er gewogen MOET worden?)
		9. Transport naar Combi-Ster						
		9.1 Transport naar centraal magazijn RdGG (3-4x/dag)						
		-						
		9.2 Lege vuile karren neerzetten voor volgende operaties						
		-						
		9.3 Vuile/schone karren in vrachtwagen laden						
		-						
		9.4 Transport naar vieze/voorraad ruimte Combi-Ster (6x/dag)						
		Transport problemen		1	3	3	accepteren	
		10. Reiniging en sterilisatie						
		10.1 Netten scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)						
		Niet gescand	Scanner doet het niet	5	2	10	beheersen	Extra handscanner als reserve hebben
	X	**10.1' Voor schone netten in vuile kar: zak eraf en naar instrumenten magazijn**						
		-						
		10.2 Reinigingsproces						
		-						
	X	**10.2' Schone netten openmaken, label en barcode eraf halen**						
		-						
		10.3 Netten samenstellen, check compleetheid en verpakken						
		Net niet compleet of instrument kapot	lets mis gegaan in OK of in wasmachine	3	2	6	accepteren/ beheersen	Deels beheersen door het wegen
		Verkeerde sterilisatie sticker geplakt	Vergissing	2	5	10	accepteren/ beheersen	Werkflow afspraken
X		**10.4 Sterilisatieproces**						
		Deel niet gesteriliseerd (deel levering)	Vergissing	2	4	8	accepteren	
			Problemen met verpakking/ net nat geworden	2	2	4	accepteren	
	X	**10.4' Netten terug naar instrumenten magazijn en check compleetheid van aantal netten**						
		Netten door gegaan naar de sterilisatie i.p.v. naar de instrumenten magazijn	Cover label niet gelezen	3	2	6	accepteren	
		Net niet compleet of instrument kapot	lets mis gegaan in OK of in wasmachine	3	2	6	accepteren	
		Mist een net	Net achter gebleven in OK	2	2	4	beheersen	scannen uitgaande netten per OK door frontoffice medewerker Combi-Ster
X		**10.5 Goedkeuren sterilisatieproces en scan barcode van sterilisatie sticker**						
		-						
	X	**10.5' Decontaminatie verklaring en andere documenten van de leverancier klaarmaken voor retour**						
		Verklaring mist	In de OK gebleven of kwijt	4	2	8	accepteren	
X		**10.6 Plaats netten in steriele voorraad of in klaarzetkar**						
		Net wordt onsteriel	Stoten van het net, waardoor er een gat in de verpakking komt	4	3	12	accepteren	

	X	**10.6' Netten terug zetten in dozen van leverancier**						
		-						
		11. Retour en facturatie						
	x	**11.1 1 dag na OK bellen naar Combi-Ster of de netten opgehaald kunnen worden**						
		Niet gebeld	Vergeten/ te druk	2	1	2	accepteren	
	x	**11.2 Netten ophalen bij Combi-Ster**						
		Net niet klaar om op te halen	Geen tijd afgesproken tussen leverancier en Combi-Ster	3	1	3	accepteren	
			Netten zijn nog op OK/ in schoonmaak proces	3	2	6	beheersen	systeem kan een schatting maken wanneer netten weer beschikbaar zijn (frequentie moet dus naar beneden)
		Leverancier niet gekomen	Vergeten	1	1	1	accepteren	
	x	**11.3 Check instrumentarium op verbruik en staat (bot of kapot)**						
		Net niet compleet of instrument kapot	Iets mis gegaan in OK of wasmachine en was niet ontdekt door instrumenten magazijn	2	1	2	accepteren	
		Instrumenten niet schoon	Was procedure niet goed gecontroleerd	2	1	2	accepteren/ beheersen	duidelijke werkafspraken
	x	**11.4 Factuur sturen aan Z-XL**						
		-						
	x	**11.5 Goedkeuring vragen aan besteller**						
		Niet gedaan	Vergeten/ te druk	2	2	4	accepteren	
	x	**11.6 Vergelijken factuur met winkelwagen en verbruikt materiaal en goedkeuren**						
		Verkeerde aanvraag bij factuur	Vergissing	3	2	6	accepteren	
		Aanvraag en factuur komen niet overeen	Vergissing	3	2	6	accepteren	
		Verbruik niet ingevuld	Vergeten/ te druk	3	2	6	accepteren	
	x	**11.7 Vergelijken met factuur en goedkeuren**						
		-						
	x	**11.8 Omzetten in ordernummer (45 nummer) en koppelen aan 47-nummer en factureren op kostenplaats ortho**						
		-						

L. Supply Chain Collaboration Maturity Model; attribute description and improvements

Attribute description of the Supply Chain Collaboration Maturity Model

Trust in collaborative party

At level 1, the trust in each other is based on the commitment of the parties to the contract. There is little confidence in each other's behavior and work, which also leads to lots of checks in the process. At level 2 the contractual trust still exists, only there is a basis of mutual understanding of each other's capabilities. The checks are somewhat reduced, but are still necessary for the customer to control the supplier. Contractual trust and also competence trust exists at level 3. The confidence in the other party has grown, which has led that monitoring and inspections are greatly reduced. At level 4 the parties have a short-term goodwill trust and have the will to do more than only what is expected based on the contract. The confidence in each other's behavior and the reliability of the received information is strong. At level 5 a long-term goodwill trust exists, the commitment of the parties goes far beyond the contract. A full confidence in each other's work exists which makes the monitoring and inspection unnecessary.

Communication

At level 1, no information is exchanged openly, which makes it impossible to learn from each other. At level 2, little information is shared timely, but the effectiveness is low since the data is often guarded. There is almost no learning and innovation sharing between the parties. Some information is exchanged openly at level 3. The parties begin to be aware of the importance of learning and information sharing. At level 4, much information is exchange openly and timely between the parties. There is somewhat invested in the knowledge to effective communication. All partners have accepted sharing learning, and this is applied on regular scale. At level 5, most information is exchanged timely and openly. On regular basis workshops and meetings are held to improve the effectiveness of the communication. The partners understand the importance of continuous improvements and sharing learning and innovation are done continuously.

Collaboration

At level 1, the relationship between the parties lacks of any degree of alignment and is aversive. A high blame culture exists, and parties try to blame each other for problems. Everyone thinks that another's struggling or difficulties are not related to them, thus no support is given to another party. At level 2, a limited cooperation is beginning to exist. Parties only concentrate on defending their own interest. And only support is given if there is some kind of self-interest. At level 3, the transaction from cooperation and collaboration appears. The blame culture is abandoned and parties often support each other. At level 4, a collaboration relation exists. Instead of blaming one other, the time and concentration goes to finding the best solution. This also led to a high support for each other. At level 5, a close collaboration exists and long-term mutual objectives are achieved. There is a common understanding and mutual interest which led to always supporting one other's party.

Knowledge

At level 1, the knowledge within and between the parties is not recognized as an asset. Therefore this is not documented and is often shared informally between staff. This could be done through tips, techniques,

and lessons learned. At level 2, the knowledge is recognized as an asset. The knowledge shared is made explicit by harvesting and documentation. At level 3, the documented knowledge is adequately stored to be able to retrieve the knowledge when needed. At level 4, the knowledge is integrated into the system of the organization. The knowledge is easy accessible and retrievable. At level 5, knowledge is systematically reviewed and enhanced and the structures are responsible for acquisition, representation and dissemination.

Customer order management

At level 1, no formal standard for order management exists, which leads to a high degree of manual intervention. There is no updating information to the customers on their placed orders. At level 2, a formal order management process is available. However, this is only within functions and is not consistent across units. The information is mainly functionally oriented, thus on specific groups. At level 3, an automated order management exists and invoicing is done across units. The information of the customer is shared across the different departments within the company, but is limited to transactions. Formal procedures and policies exists for customer order management. At level 4, the order transaction and movement is visible to the other parties. The information is shared between suppliers and supply chain partners, to improve the process. At level 5, the order and updates are online real-time visible. Customers know at any time what the status of their order is. The order management and supply chain planning and execution of processes are fully aligned.

Problem solving

At level 1 there is no risk identifications and early warnings do not exists. Problems often leads to disputes. Problems have to become actual to be noticed and cannot be solved successfully. They are often recurring, because of the lack of sharing learning between each other. At level 2, there is still no early warning mechanism. Informal approaches are used to detect potential problems. Problems can still lead to disputes and can recur, since learning and sharing learning is not often applied. A timely warning mechanisms between exists at level 3. This leads that some problems can be timely resolved with almost having no impact. Learning and sharing learning is used which leads to few recurring problems. At level 4, an early warning mechanisms exists between the parties, helping to anticipate on potential problems. Many problems can be timely solved at their lowest level. Almost no problems are repeated since learning and sharing learning are used. At level 5, most problems are solved at their lowest level. Continuous learning and sharing learning is applied, which leads to almost no problems are repeated.

Process improvement

At level 1, no common performance measures and formal feedback exists within the supply chain. This leads to the inability of parties to perform process improvement based on data. No joint effort is made for process improvements. At level 2, there a small joint effort is made to improve the process. Feedback is given to each other, but this is on irregular basis. The parties are mainly interested in self-improvement and use the partial performance data in an ad hoc manner to improve processes. At level 3, the common measures somewhat increases and on a regular basis formal feedback is given. The performance data is still used in an ad hoc manner to improve processes. At level 4, there are a lot of common measures. The performance data is systematically used to improve and optimize the process. The improvements made are partially systematically implemented and controlled. At level 5, there is continuous feedback between

parties. The systematically usage of data of process performances leads to improvements and optimization of the process. These improvements are systematically implemented and controlled.

Network

At level 1, no network solutions exist, and if there are any they are ad-hoc. The organizations (single location or dispersed), project teams, and individuals use whatever tools found to communicate and share data. All parties lack the infrastructural network to harvest and share knowledge, thus no knowledge is shared. At level 2, network solutions for information sharing and controlling access are identified between organizations, and the requirements are identified. The connection between project teams and parties is based on low-bandwidth connections. At level 3, the parties manage the harvesting, storing, and sharing of data and knowledge through common platforms (e.g. intranet or extranets). Tools concerning content and asset management are deployed and regulate structured and unstructured data shared across high-bandwidth connections. At level 4, data, information and knowledge of multiple facets of the process are seamlessly ream-time shared. This is done through project-specific networks/portals enabling data-intensive exchange (interoperable exchange) between the parties. At level 5, the latest tested innovations are applied for the network solutions. The networks facilitates the parties to acquisition, store, and share data and information between the parties. There is a continuous optimization of integrated data, processes, and communication channels.

Communication technology

At level 1, only traditional information technology exists based on a stand-alone functional system. At level 2, the technology for information sharing is used to improve the communication facilities. Modern information and communication technologies (ICT) are applied and improvements in the communication and collaboration across departments within the parties are made. An intranet system is applied at level 3. This helps parties to better share information and data within the company by use of one system. At level 4, a closer collaboration is possible through inter-enterprise communication facilities, allowing frequent communication and partnership. Efficiency improvements and cost reductions are realized, since the e-fulfillment is a common practice. At level 5, global satellite positioning is used to track and trace the goods. Radio-frequency equipment is used to communicate the position. The requested information is always real-time.

Software

At level 1, the software used is unmonitored and unregulated. No agreements are made about data usage, storage, and exchange within the parties. Exchanges of data is (almost) due to the limits of the software. At level 2, the software is unified within the organizations. The storage and usage of data are well defined within the organizations and can be exchanged internally and are defined and prioritized. The selection of software for usage is controlled and managed by use of defined deliverables at level 3. The data used, stored, and exchanged is monitored and controlled within the organization. The data flow is managed and documented. Interoperable data exchanges are mandated and closely monitored. At level 4, the selection of software and deployment is strategically made, and not just based on the operational requirements. Data usage, storage, and exchange are part of an overall organization or project team and are regulated. At level 5, the software tools are continuously revisited to improve the productivity and align with the strategic objectives made. Everything that is related to interoperable data usage, storage, and exchange is documented, controlled, reflected upon, and proactively enhanced.

Actions that must be done in order to reach the desired maturity level

One of the most important bottlenecks is that the level of trust is insufficient. Especially RdGG must increase its confidence in Combi-Ster and reduce the number of checks on incoming trays. Currently during the pilots the lack of trust is even further decreased, mainly caused by mistakes made in the delivery of trays, e.g. wrong trays are delivered, missing trays in the delivery, or there is no delivery at all. Several reasons can be identified for this, such as lack of IT support, differences in viewpoints of the usage of the emergency storage, problems due to planning, and internal problems. A large part of these failures can be solved by better IT support, SLA's and improved communication (this can be facilitated by IT). Within the current process Combi-Ster pushes all sterile trays back to RdGG and is only informed when needed trays are still at Combi-Ster. This has to change since Combi-Ster must be informed about the total demand in order to be able to work based on a pull delivery system. It is also recommended that both employees of RdGG and Combi-Ster can see the location of the trays, and the order status. By introducing inter-enterprise system communication between the systems of RdGG and Combi-Ster employees from both companies can have access to this information without contacting the other party. Currently the systems cannot satisfy the minimal needed requirements, e.g. communication between the systems of RdGG and Combi-Ster. A connection between the two systems will be made in order to automatically exchange data between the two systems. RdGG will also implement the module ChipSoft Steriel, which leads to more system applications. RdGG is also planning to implement a new version of ChipSoft in 2016, called HIX, about six months after the rehousing. Although important, this report will not elaborate on the system specifications. However the (system) requirements as stated in Section 5.3 should be taken into account when building the connection and elaborating the systems.

To be able to reach the desired future situation, Table L.1 shows the actions needed to be done to reach the right maturity level. Behind each action, a reference to the implementation task from Section 7.2 or 7.3 is made. Based on this reference the order of implementing the actions can be derived. However, the attribute trust cannot be improved by only performing the actions. Improving the level of trust must come over time, when the process (and the other party) has proven itself. A point that is suggested is to implement a key performance indicator (KPI) report. By recording the reasons of failures and the corresponding action(s) to solve the failure a good quantitative overview of the performances can be made. This KPI report can also be used for process improvements, e.g. by making process to eliminate or reduce failures. Meetings between RdGG and Combi-Ster are suggested to discuss these performances, process improvements, and other important businesses. By these meetings the two parties can learn from each other and adapt the processes better on each other. It is suggested to have a more meetings in the beginning before and right after the rehousing (e.g. monthly), and reduce this gradually to finally once per half year. There are two actions indicated in grey, one at the attribute process improvements and the other at software. The action at process improvements "Use data systematically to improve processes (e.g. to see if trays must be purchased) (extra to improve to L4)" is made grey since this is not a required action, but is indicated to improve this attribute to an even higher level. The other action "Protocol for (big) software updates/improvements" is indicated in grey since this is not directly connected to the process of the instrument trays, but it would be an added value to apply this.

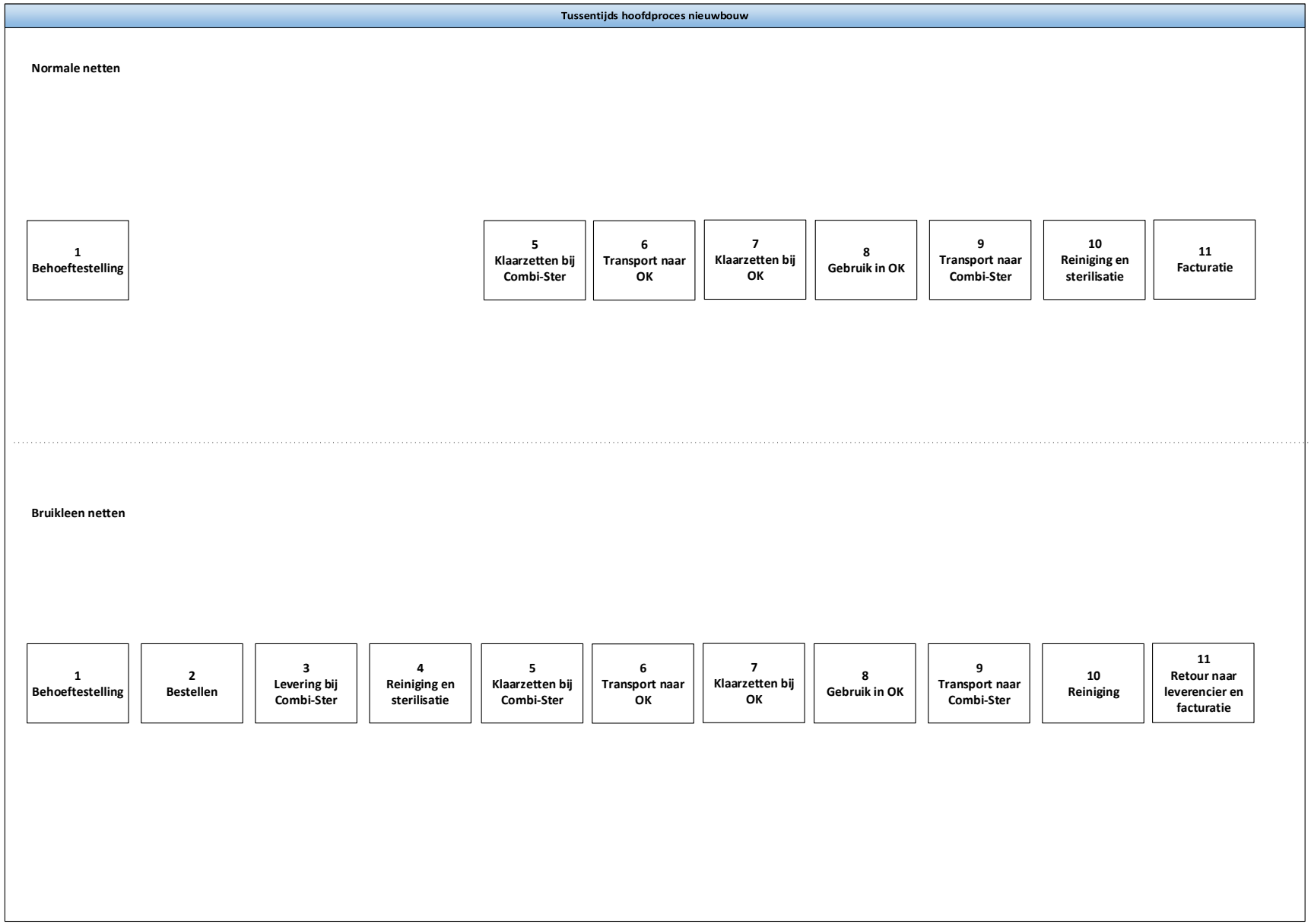
TABLE L.1: TABLE OF ACTIONS TO IMPROVE THE LEVEL OF MATURITY PER ATTRIBUTE

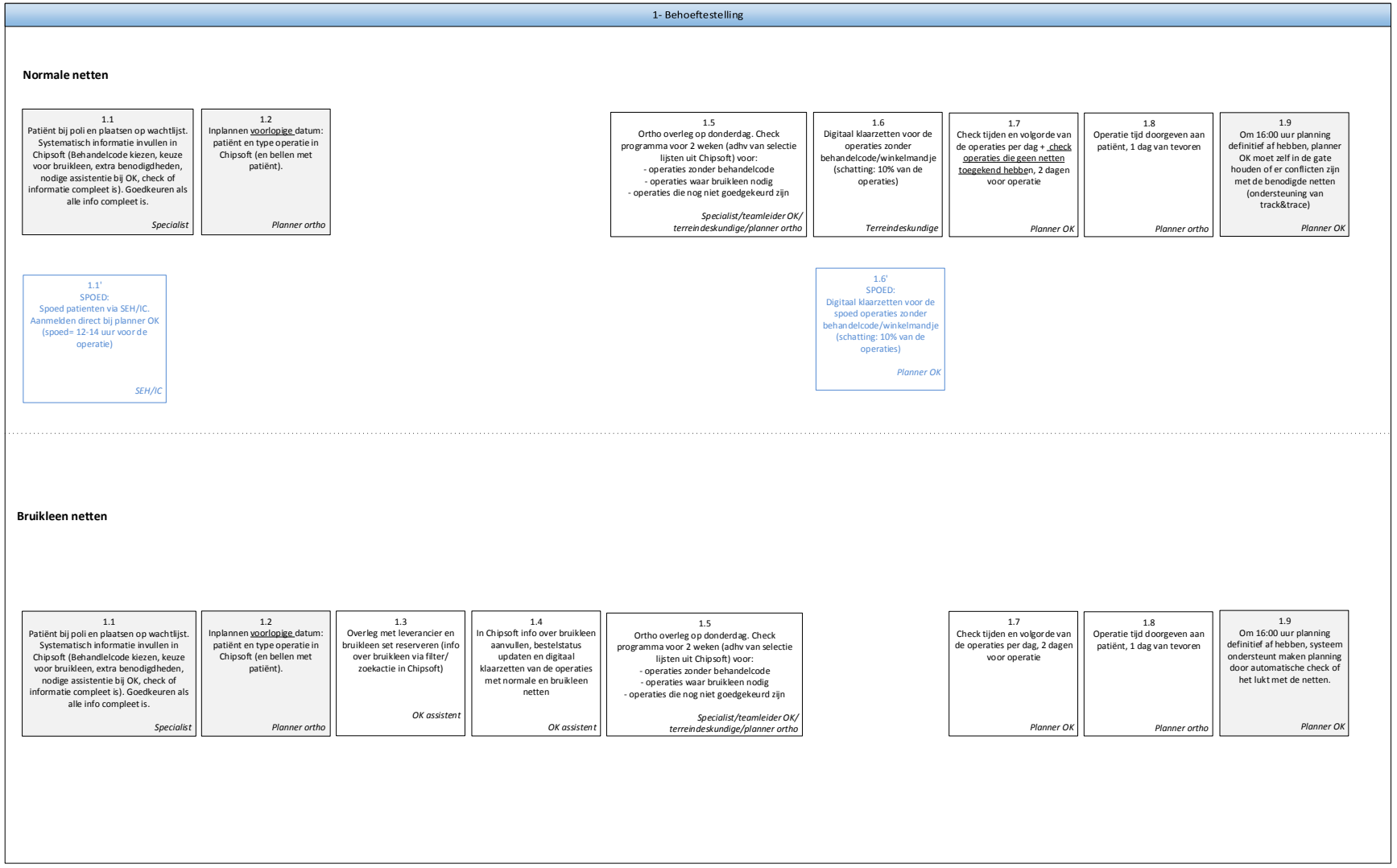
Attribute	What	How	Implementation nr.
Trust in collaborative party	Create mutual understanding	Become known with each other's processes, e.g. by making a short film clip	6
	Improve confidence	KPI report	3
		SLAs	1
	Reduce checks	More support and checks by the systems (e.g. planning)	8; 19; 27; 33
		Check relevant treatment codes and trays with each specialism	14
Communication	Information sharing	Share pick list (based on planning)	8
		Track and trace of the trays at both locations visible during the whole process	8
		Make clear which trays are for which surgery in PBT	20
		Information concerning loan trays in system (Combi-Ster must be able to retrieve this information)	30
		Create and maintain digital information of the (loan) trays (e.g. content, weight, pictures, missing instruments) both accessible for RdGG and Combi-Ster	8; 27; 30
	Internal communication	Change structure of ortho meeting	12
		Possibility to change/add information in system after planning surgery	19
		Ability to enter used implants/loan trays in ChipSoft (RdGG)	30
		Change ChipSoft to support the users to systematically enter information	17
	Shearing learning	KPI report	3
		Meeting with RdGG and Combi-Ster on regularly basis (e.g. monthly in beginning, less later)	2; 26
		Communication person(s) at both RdGG and Combi-Ster	15; 23
Collaboration	Abandon blame culture	KPI report	3
		Communication person(s) at both RdGG and Combi-Ster	15; 23
	Support	Create understanding of interdependence (become known with each other's processes, e.g. by making a short film clip)	6; 7
		SLAs	1
		Make clear which trays are for which surgery in PBT	20
Knowledge	Document knowledge	Update and maintain digital protocols	11
		Connection between systems of RdGG and Combi-Ster e.g. to share protocols	8; 27
		Make backup of protocols and update regularly (at both RdGG and Combi-Ster)	11
		Create and maintain digital information of the (loan) trays (e.g. content, weight, pictures, missing instruments) both accessible for RdGG and Combi-Ster	8; 27; 30
Customer order management	Availability trays	Connection of the OR planning in the system to availability of the trays (conflicts must be noticed/denoted by system)	8; 31; 32
		Track and trace of the trays at both locations visible during the whole process	8
		Information concerning loan trays in system (Combi-Ster must be able to retrieve this information)	30
		System keeps track of expiration date	35
		Connection between systems of RdGG and Combi-Ster (to retrieve pick list)	8; 27
		Combi-Ster system must work with two inventory locations	21
	Flexibility	Priority levels of the trays in the system	22
		SLAs	1
Problem solving	Timely warning	Weighing of trays	33

		Priority levels of the trays in the system	22
	Problem solving	Connection of the OR planning in the system to availability of the trays (conflicts must be noticed/denoted by system)	8; 31; 32
		Warning system if trays are not available on time during the process (e.g. sterilization process must be disapproved)	32
		System keeps track of expiration date	35
	Repeated problems	KPI report	3
		SLAs	1
		Meeting with RdGG and Combi-Ster on regularly basis (e.g. monthly in beginning, less later)	2; 26
Process improvement	Feedback	KPI report	3
		Meeting with RdGG and Combi-Ster on regularly basis (e.g. monthly in beginning, less later)	2; 26
		Control and monitor improvements	2; 26
	Improvements	Filters in system to support searching	18
		ChipSoft supports to systematically enter information	17
		Information concerning loan trays in system (Combi-Ster must be able to retrieve this information)	30
		Use data systematically to improve processes (e.g. to see if trays must be purchased) (extra to improve to L4)	28
Network	Harvesting data	KPI report	3
		Filters in system to support searching	18
		Identify data that must be retrievable and shared	8; 27
	Sharing data	Connection between systems of RdGG and Combi-Ster	8; 27
		Data in both systems is unambiguous	5
		Availability of list with data that must be shared and keep supervision	4
		Used implants/loan trays must be entered in ChipSoft	30
	Regulate data	Assign contact person for system/software problems	16; 24
		Track and trace of the trays at both locations visible during the whole process	8
		ChipSoft supports to systematically enter information	17
		Connection of the OR planning in the system to availability of the trays (conflicts must be noticed/denoted by system)	8; 31; 32
Communication technology	Systems connection	Make data in both systems unambiguous	5
		Ability to see an overview of missing trays at PBT, trays that must be supplemented from the emergency storage	8; 18
		Create and maintain digital information of the (loan) trays (e.g. content, weight, pictures, missing instruments) both accessible for RdGG and Combi-Ster	8; 27; 30
		Share digital pick list with Combi-Ster	8
		Priority levels of the trays in the system	22
		Track and trace of the trays at both locations visible during the whole process	8
		Connection of the OR planning in the system to availability of the trays (conflicts must be noticed/denoted by system)	8; 31; 32
Software	Manage data	Meeting with RdGG and Combi-Ster on regularly basis (e.g. monthly in beginning, less later)	2; 26
		System keeps track of expiration date	35
	Data exchange	Assign trays to treatment codes (to quickly digitally prepare trays)	13
	Control	Assign contact person for system/software problems	16; 24
		Protocol for (big) software updates/improvements	

M.The preliminary process flow

This process flow is designed for the time when RdGG is relocated to the new building, but not all implementations are fulfilled. Expected is that this will take around half a year before all implementations are executed. Below first the general main process is shown, followed by the sub-steps of each main process. The steps shown in grey indicate the steps that differ compared to the designed future process flow. One should keep in mind that the times and risks of each process are not equal to those as presented in Appendix I, J, and K of the proposed future process flow designed together with the multidisciplinary team. During this preliminary process flow less system support is available, thus more handlings and checks must be done by hand.


Tussentijds hoofdproces nieuwbouw
Normale netten
1 Behoeftestelling
5 Klaarzetten bij Combi-Ster
6 Transport naar OK
7 Klaarzetten bij OK
8 Gebruik in OK
9 Transport naar Combi-Ster
10 Reiniging en sterilisatie
11 Facturatie
Bruikleen netten
1 Behoeftestelling
2 Bestellen
3 Levering bij Combi-Ster
4 Reiniging en sterilisatie
5 Klaarzetten bij Combi-Ster
6 Transport naar OK
7 Klaarzetten bij OK
8 Gebruik in OK
9 Transport naar Combi-Ster
10 Reiniging
11 Retour naar leverencier en facturatie


1- Behoeftestelling
Normale netten
1.1
Patiënt bij poli en plaatsen op wachtlijst. Systematisch informatie invullen in Chipsoft (Behandelcode kiezen, keuze voor bruikleen, extra benodigdheden, nodige assistentie bij OK, check of informatie compleet is). Goedkeuren als alle info compleet is.
Specialist
1.2
Inplannen voorlopige datum: patiënt en type operatie in Chipsoft (en bellen met patiënt).
Planner ortho
1.5
Ortho overleg op donderdag. Check programma voor 2 weken (adhv van selectie lijsten uit Chipsoft) voor:
- operaties zonder behandelcode
- operaties waar bruikleen nodig
- operaties die nog niet goedgekeurd zijn
Specialist/teamleider OK/ terreindeskundige/planner ortho
1.6
Digitaal klaarzetten voor de operaties zonder behandelcode/winkelmandje (schatting: 10% van de operaties)
Terreindeskundige
1.7
Check tijden en volgorde van de operaties per dag + check operaties die geen netten toegekend hebben, 2 dagen voor operatie
Planner OK
1.8
Operatie tijd doorgeven aan patiënt, 1 dag van tevoren
Planner ortho
1.9
Om 16:00 uur planning definitief af hebben, planner OK moet zelf in de gate houden of er conflicten zijn met de benodigde netten (ondersteuning van track&trace)
Planner OK
1.1'
SPOED:
Spoed patienten via SEH/IC. Aanmelden direct bij planner OK (spoed= 12-14 uur voor de operatie)
SEH/IC
1.6'
SPOED:
Digitaal klaarzetten voor de spoed operaties zonder behandelcode/winkelmandje (schatting: 10% van de operaties)
Planner OK
Bruikleen netten
1.1
Patiënt bij poli en plaatsen op wachtlijst. Systematisch informatie invullen in Chipsoft (Behandelcode kiezen, keuze voor bruikleen, extra benodigdheden, nodige assistentie bij OK, check of informatie compleet is). Goedkeuren als alle info compleet is.
Specialist
1.2
Inplannen voorlopige datum: patiënt en type operatie in Chipsoft (en bellen met patiënt).
Planner ortho
1.3
Overleg met leverancier en bruikleen set reserveren (info over bruikleen via filter/ zoekactie in Chipsoft)
OK assistent
1.4
In Chipsoft info over bruikleen aanvullen, bestelstatus updaten en digitaal klaarzetten van de operaties met normale en bruikleen netten
OK assistent
1.5
Ortho overleg op donderdag. Check programma voor 2 weken (adhv van selectie lijsten uit Chipsoft) voor:
- operaties zonder behandelcode
- operaties waar bruikleen nodig
- operaties die nog niet goedgekeurd zijn
Specialist/teamleider OK/ terreindeskundige/planner ortho
1.7
Check tijden en volgorde van de operaties per dag, 2 dagen voor operatie
Planner OK
1.8
Operatie tijd doorgeven aan patiënt, 1 dag van tevoren
Planner ortho
1.9
Om 16:00 uur planning definitief af hebben, systeem ondersteunt maken planning door automatische check of het lukt met de netten.
Planner OK

2- Bestelling

Normale netten

Bruikleen netten

2.1
Aanmaken winkelwagen bij Z-XL (info over bruikleen via filter/ zoekactie in Chipsoft) en mailen Combi-Ster in cc groep OK assistenten
Besteller

2.2
Winkelwagen goedkeuren en bestelstatus in Chipsoft updaten.
Teamleider OK/ besteller

2.3
Reserveringsnummer (47-nummer) maken en mailen aan leverancier
Z-XL

2.4
In agenda schrijven in instrumenten magazijn op dag van levering (2 dagen voor OK) en op sterilisatie dag (1 dag voor OK)
Combi-Ster

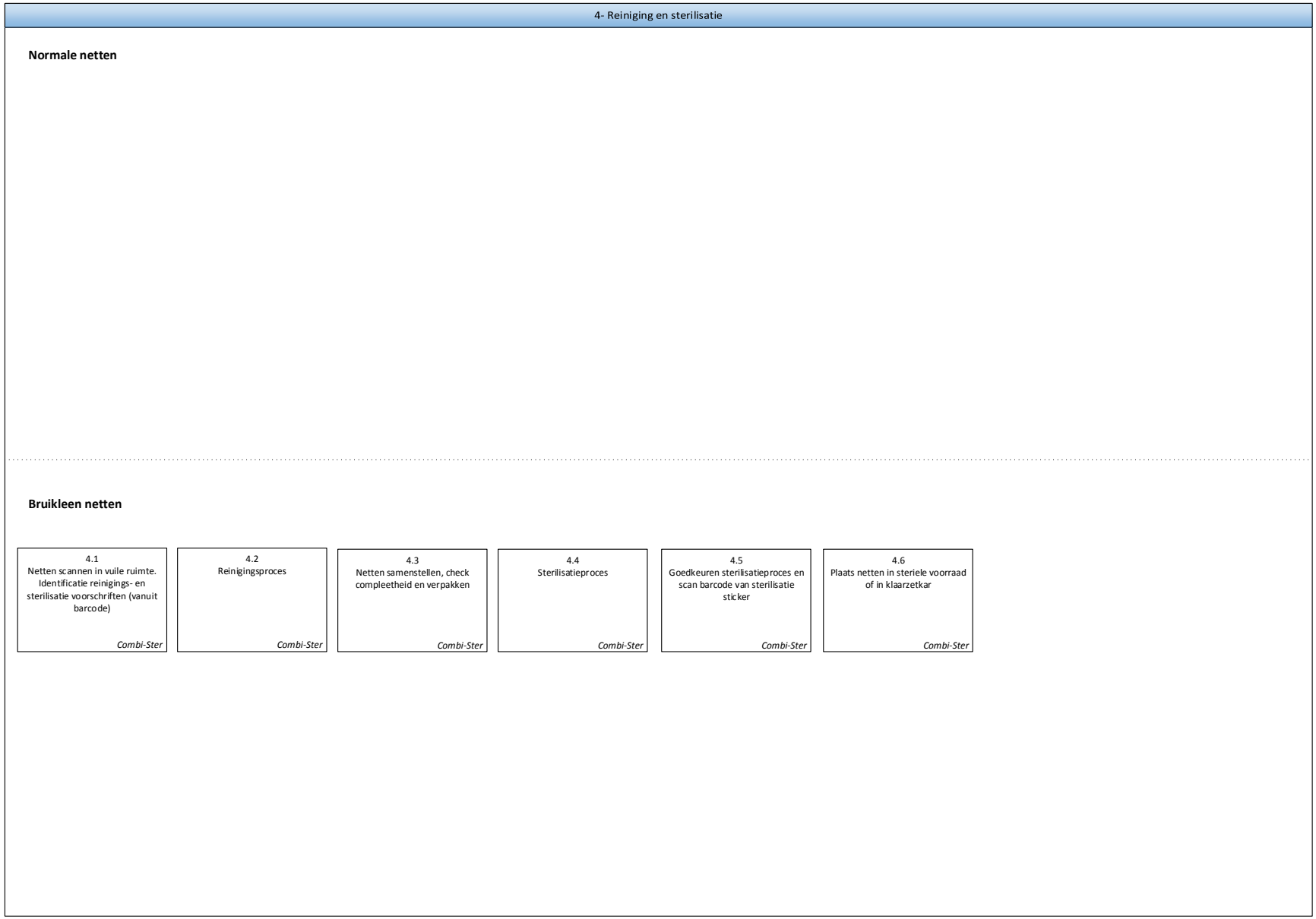
2.5
Mail aanvraag bruikleen uitprinten en in map van Combi-Ster stoppen
Combi-Ster

3- Levering bij Combi-Ster

Normale netten

Bruikleen netten

3.1	3.2	3.3	3.4	3.5	3.6	3.7
Levering bij Combi-Ster 2 werkdagen voor de operatie voor de bekende bruikleen set (3 werkdagen voor nieuwe set)	Check inhoud levering met pakbon leverancier, reinigings- en sterilisatie voorschriften, nieuw dossier en nieuwe barcode aanmaken	Checken foto's uit database. Foto's van inhoud maken als er iets veranderd is en dossier updaten	Wit label maken met: bruikleen, locatie, leverancier, sterilisatie dag en datum operatie	Barcode zoeken en plaatsen op bruikleen netten en scannen	Dossier van Combi-Ster doorgeven aan teamleider Combi-Ster in schone ruimte (tegelijk met de netten naar de reinigingsruimte)	Decontaminatie verklaring naar autoclaaf dienst, die geven het mee in de buitenkar naar de OK
Leverancier	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*


4- Reiniging en sterilisatie
Normale netten
Bruikleen netten
4.1
Netten scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)
Combi-Ster
4.2
Reinigingsproces
Combi-Ster
4.3
Netten samenstellen, check compleetheid en verpakken
Combi-Ster
4.4
Sterilisatieproces
Combi-Ster
4.5
Goedkeuren sterilisatieproces en scan barcode van sterilisatie sticker
Combi-Ster
4.6
Plaats netten in steriele voorraad of in klaarzetkar
Combi-Ster

5- Klaarzetten bij Combi-Ster

Normale netten

5.1
Print klaarzetlijst gebaseerd op OK programma en grijpvoorraad om 16:00 1 dag voor operaties

Combi-Ster

5.2
Verzamelen van de netten in de klaarzetkar tot uiterlijk 4:30 uur

Combi-Ster

5.3
Klaarzetkar en netten scannen per operatie en plaatsen in buitenkar tot uiterlijk 5:00 uur

Combi-Ster

5.1'
SPOED:
Spoed klaarzetlijst printen

Combi-Ster

5.2'
SPOED:
Verzamelen van de netten in de klaarzetkar

Combi-Ster

5.3'
SPOED:
Klaarzetkar en netten scannen per operatie en plaatsen in buitenkar

Combi-Ster

Bruikleen netten

5.1
Print klaarzetlijst gebaseerd op OK programma en grijpvoorraad om 16:00 1 dag voor operaties

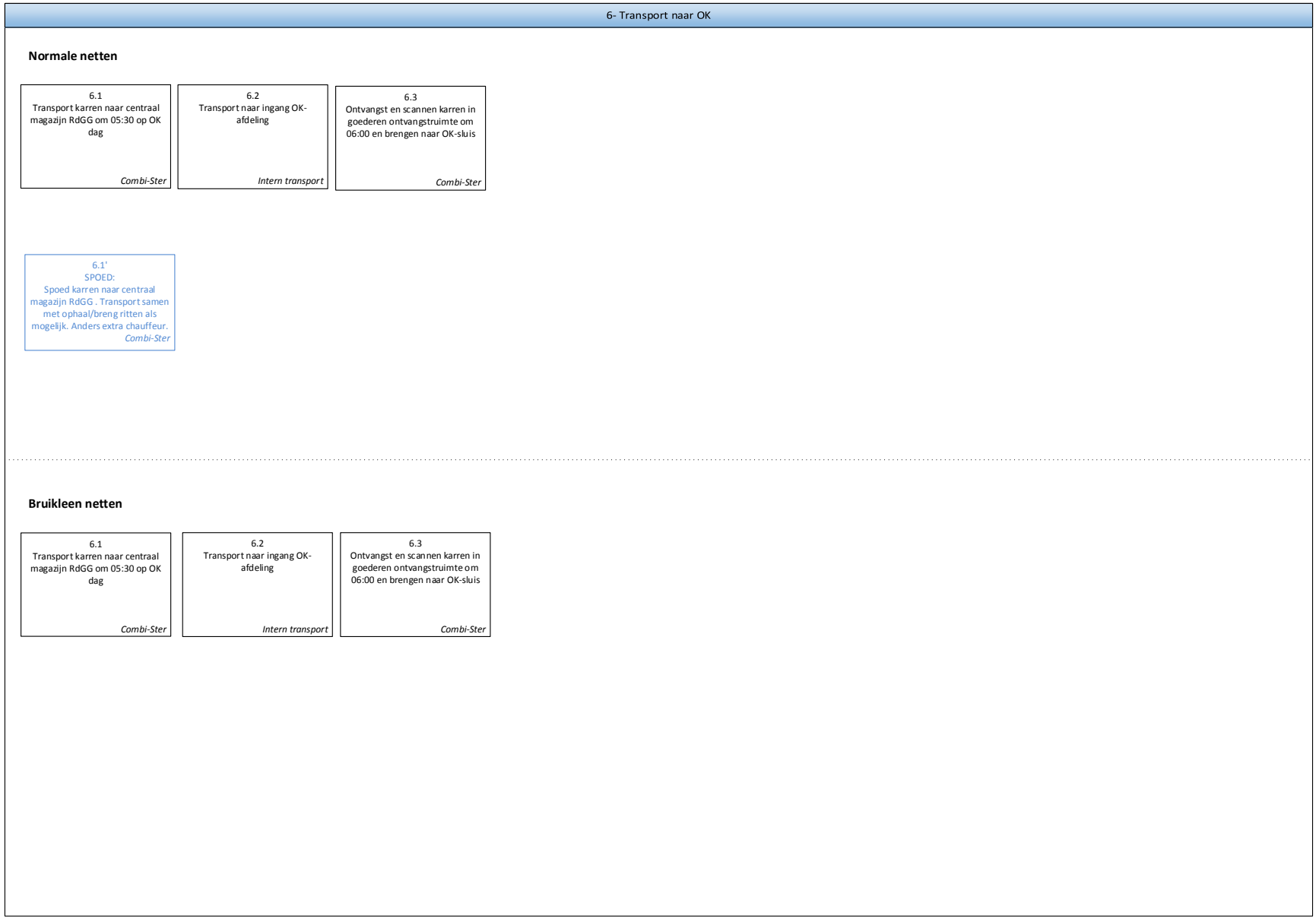
Combi-Ster

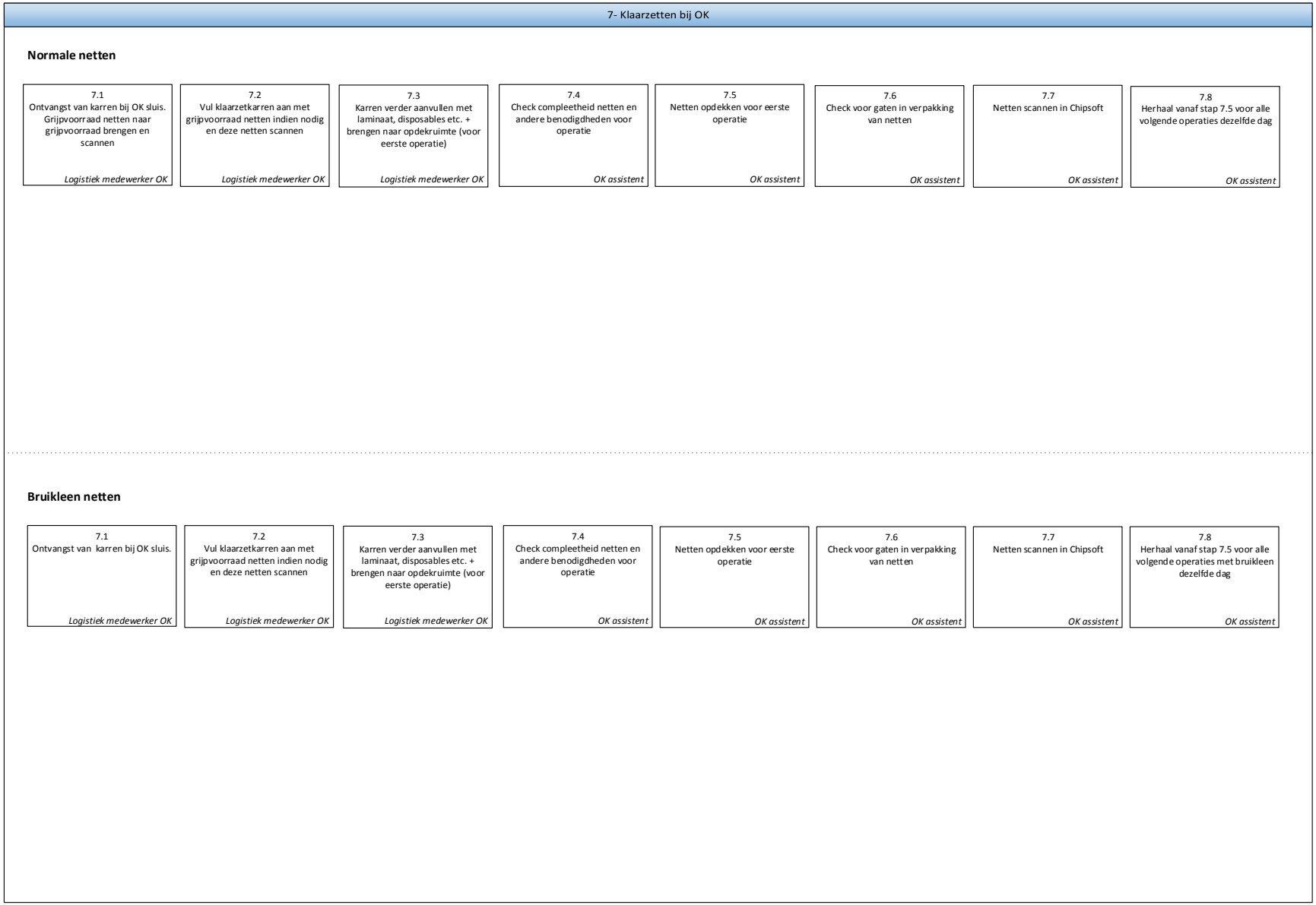
5.2
Verzamelen van de netten in de klaarzetkar tot uiterlijk 4:30 uur

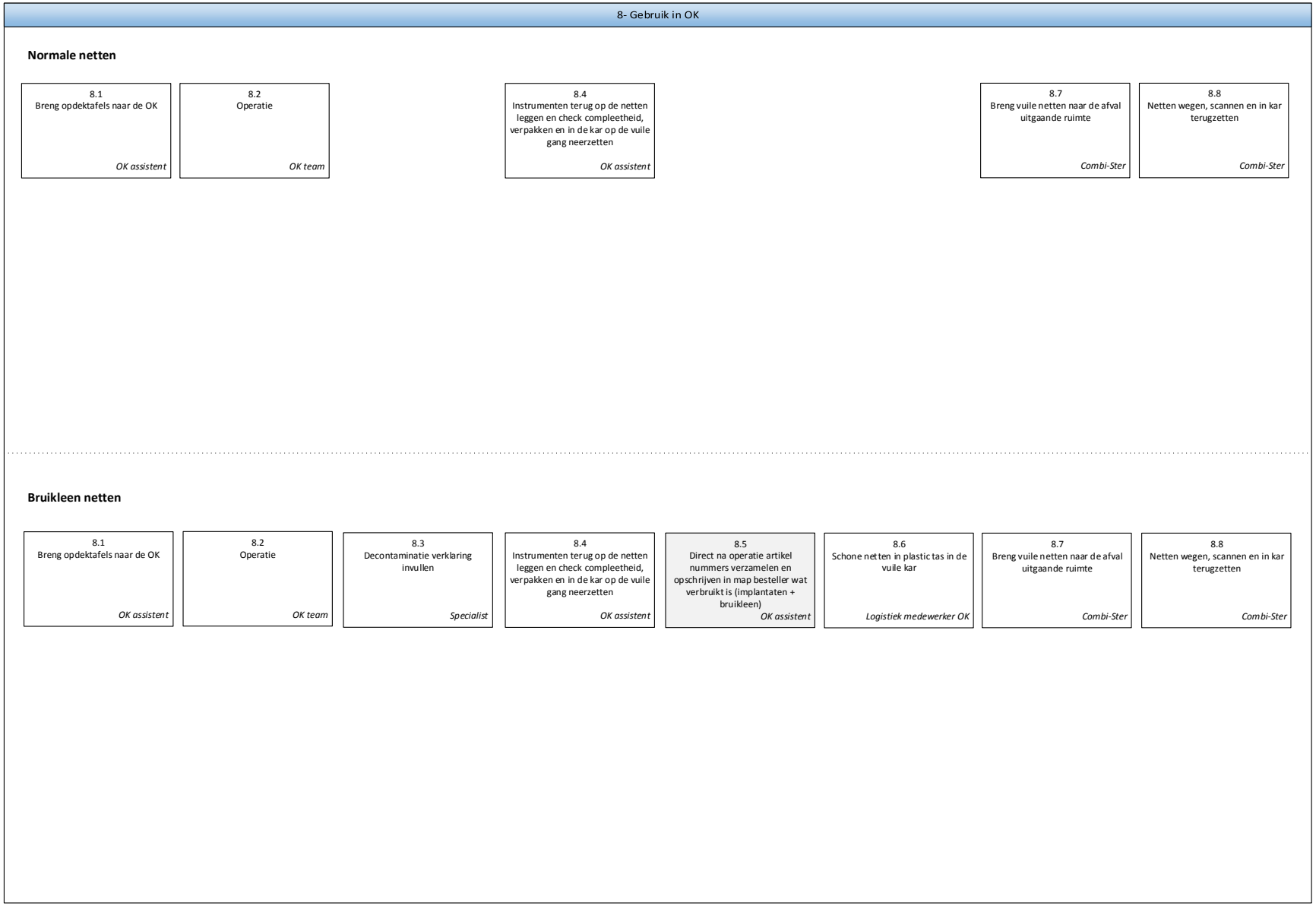
Combi-Ster

5.3
Klaarzetkar en netten scannen per operatie en plaatsen in buitenkar tot uiterlijk 5:00 uur

Combi-Ster


6- Transport naar OK
Normale netten
6.1
Transport karren naar centraal magazijn RdGG om 05:30 op OK dag
Combi-Ster
6.2
Transport naar ingang OK-afdeling
Intern transport
6.3
Ontvangst en scannen karren in goederen ontvangstruimte om 06:00 en brengen naar OK-sluis
Combi-Ster
6.1'
SPOED:
Spoed karren naar centraal magazijn RdGG . Transport samen met ophaal/breng ritten als mogelijk. Anders extra chauffeur.
Combi-Ster
Bruikleen netten
6.1
Transport karren naar centraal magazijn RdGG om 05:30 op OK dag
Combi-Ster
6.2
Transport naar ingang OK-afdeling
Intern transport
6.3
Ontvangst en scannen karren in goederen ontvangstruimte om 06:00 en brengen naar OK-sluis
Combi-Ster


7- Klaarzetten bij OK
Normale netten
7.1
Ontvangst van karren bij OK sluis. Grijpvoorraad netten naar grijpvoorraad brengen en scannen
Logistiek medewerker OK
7.2
Vul klaarzetkarren aan met grijpvoorraad netten indien nodig en deze netten scannen
Logistiek medewerker OK
7.3
Karren verder aanvullen met laminaat, disposables etc. + brengen naar opdekruimte (voor eerste operatie)
Logistiek medewerker OK
7.4
Check compleetheid netten en andere benodigdheden voor operatie
OK assistent
7.5
Netten opdekken voor eerste operatie
OK assistent
7.6
Check voor gaten in verpakking van netten
OK assistent
7.7
Netten scannen in Chipsoft
OK assistent
7.8
Herhaal vanaf stap 7.5 voor alle volgende operaties dezelfde dag
OK assistent
Bruikleen netten
7.1
Ontvangst van karren bij OK sluis.
Logistiek medewerker OK
7.2
Vul klaarzetkarren aan met grijpvoorraad netten indien nodig en deze netten scannen
Logistiek medewerker OK
7.3
Karren verder aanvullen met laminaat, disposables etc. + brengen naar opdekruimte (voor eerste operatie)
Logistiek medewerker OK
7.4
Check compleetheid netten en andere benodigdheden voor operatie
OK assistent
7.5
Netten opdekken voor eerste operatie
OK assistent
7.6
Check voor gaten in verpakking van netten
OK assistent
7.7
Netten scannen in Chipsoft
OK assistent
7.8
Herhaal vanaf stap 7.5 voor alle volgende operaties met bruikleen dezelfde dag
OK assistent


8- Gebruik in OK
Normale netten
8.1
Breng opdektafels naar de OK
OK assistent
8.2
Operatie
OK team
8.4
Instrumenten terug op de netten leggen en check compleetheid, verpakken en in de kar op de vuile gang neerzetten
OK assistent
8.7
Breng vuile netten naar de afval uitgaande ruimte
Combi-Ster
8.8
Netten wegen, scannen en in kar terugzetten
Combi-Ster
Bruikleen netten
8.1
Breng opdektafels naar de OK
OK assistent
8.2
Operatie
OK team
8.3
Decontaminatie verklaring invullen
Specialist
8.4
Instrumenten terug op de netten leggen en check compleetheid, verpakken en in de kar op de vuile gang neerzetten
OK assistent
8.5
Direct na operatie artikel nummers verzamelen en opschrijven in map besteller wat verbruikt is (implantaten + bruikleen)
OK assistent
8.6
Schone netten in plastic tas in de vuile kar
Logistiek medewerker OK
8.7
Breng vuile netten naar de afval uitgaande ruimte
Combi-Ster
8.8
Netten wegen, scannen en in kar terugzetten
Combi-Ster

9- Transport naar Combi-Ster

Normale netten

9.1	9.2	9.3	9.4
Transport naar centraal magazijn RdGG (6x/dag)	Lege vuile karren neerzetten voor volgende operaties	Vuile/schone karren in vrachtwagen laden	Transport naar vuile ruimte Combi-Ster (6x/dag)
Intern transport	*Logistiek medewerker OK*	*Combi-Ster*	*Combi-Ster*

Bruikleen netten

9.1	9.2	9.3	9.4
Transport naar centraal magazijn RdGG (6x/dag)	Lege vuile karren neerzetten voor volgende operaties	Vuile/schone karren in vrachtwagen laden	Transport naar vuile ruimte Combi-Ster (6x/dag)
Intern transport	*Logistiek mededewerker OK*	*Combi-Ster*	*Combi-Ster*

10- Reiniging en sterilisatie

Normale netten

10.1	10.2	10.3	10.4	10.5	10.6
Netten scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)	Reinigingsproces	Netten samenstellen, check compleetheid en verpakken	Sterilisatieproces	Goedkeuren sterilisatieproces en scan barcode van sterilisatie sticker	Plaats netten in steriele voorraad of in klaarzetkar
Combi-Ster	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*

Bruikleen netten

10.1	10.2	10.3	10.4'	10.5'	10.6'
Netten scannen in vuile ruimte. Identificatie reinigings- en sterilisatie voorschriften (vanuit barcode)	Reinigingsproces	Netten samenstellen en check compleetheid	Netten terug naar instrumenten magazijn en check compleetheid van aantal netten	Decontaminatie verklaring en andere documenten van de leverancier klaarmaken voor retour	Netten terug zetten in dozen van leverancier
Combi-Ster	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*	*Combi-Ster*

10.1'	10.2'
Voor schone netten in vuile kar: zak eraf en naar instrumenten magazijn	Schone netten openmaken, label en barcode eraf halen
Combi-ster	*Combi-ster*

11- Factureren (en retour leverancier)

Normale netten

11.1
Maandelijkse factuur naar OK

Combi-Ster

Bruikleen netten

11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8
1 dag na OK bellen naar Combi-Ster of de netten opgehaald kunnen worden	Netten ophalen bij Combi-Ster	Check instrumentarium op verbruik en staat (bot of kapot)	Factuur sturen aan Z-XL	Goedkeuring vragen aan besteller	Vergelijken factuur met winkelwagen en verbruikt materiaal en goedkeuren	Vergelijken met factuur en goedkeuren	Omzetten in ordernummer (45 nummer) en koppelen aan 47-nummer en factureren op kostenplaats ortho
Leverancier	*Leverancier*	*Leverancier*	*Leverancier*	*Z-XL*	*Besteller*	*Z-XL*	*Z-XL*

N. Minutes of interviews and meetings

Overview of the interviews and meetings

This report contains the minutes made from meetings and interviews held for the design of the process flow for the surgical instruments concerning the accommodation of the sterile storage at Combi-Ster. In Table N.1 an overview of all meetings and interviews can be seen. The minutes made are in Dutch, since the meetings where also held in Dutch.

Not of all meeting minutes have been made. Mostly because of the outcome of these meetings are processed in the current or designed process or it contained a guided tour as background information and a more clear and visible understanding of the processes.

TABLE N.1: LIST OF INTERVIEWS AND MEETINGS

Date	Who	Subject	Minutes
4-8-2014	HFMEA group	1st HFMEA on current process	No
21-8-2014	HFMEA group	2nd HFMEA on current process	No
4-9-2014	HFMEA group	3rd HFMEA on current process	No
11-9-2014	HFMEA group	4th HFMEA on current process	No
6-10-2014	Bianca van Nelfen	Current process	No
6-10-2014	John Vermeer	Current process	No
6-10-2014	Marion Poot, Sandra Tas, Mieke Schildmeijer	Current process	No
9-10-2014	HFMEA group	5th HFMEA on current process	No
10-10-2014	AT Osborne	Look into feasibility study RLC	Yes
23-10-2014	Danielle Kramer from Malysse-Sterima	Telephone interview about processes RLC	Yes
28-10-2014	Vivian Hoeijmans	Run through new process	No
29-10-2014	UMCU	ChipSoft Steriel	Yes
3-11-2014	JIT pilot group	JIT pilot meeting	Yes
4-11-2014	Marion Poot	New process	Yes
6-11-2014	John Vermeer and Hans Klinkenberg	New process	Yes
12-11-2014	Imca Krakau	Possibilities ChipSoft for new process	Yes
20-11-2014	Imca Krakau	Possibilities ChipSoft for new process	Yes
20-11-2014	Marion Poot and Sandra Tas	New process	Yes
27-11-2014	John Vermeer and Hans Klinkenberg	New process	Yes
4-12-2014	HFMEA group	1st HFMEA on designed future process	No
9-12-2014	HFMEA group	2nd HFMEA on designed future process	No
19-1-2015	Joost van Linge	Designed future process	Yes
4-2-2015	Michiel Schuuringa and Yvonne Coenraadts	Evaluation at plastic surgery	Yes
3-3-2015	Imca Krakau	Checking the applicability of the composed IT system needs for new process	Yes
10-3-2015	Marion Poot en John Vermeer	Fill in maturity framework for current process	Yes

N.1 Inkijken rapport Medisch Centrum Alkmaar haalbaarheidsonderzoek Regionaal Logistiek Centrum

Utrecht, 4 april 2007

AT Osborne en CEANconsulting

Inkijken rapport betreffende een rapport over het regionaal logistiek centrum:

Definitie STE (standaard eenheid): volume eenheid van 60x30x30 cm3 (lxbxh) beladen op een voor sterilisatie en steriele opslag geschikte wijze (bron: collegebouw zorgvoorzieningen – bouwmaatstaven centrale sterilisatieafdeling 18 november 2002)

Bron: strategic management of health care supply chain E.S. Schneller + L.R. Smeltzer 2006

Service level agreements voor afnemers van CSA en steriele magazijn worden opgesteld

Geen karrenwas waardoor karren niet afdoende kunnen worden gereinigd volgens de hygiëne eisen. Transport vuil en steriel in verschillende karrensystemen uitgevoerd en onvermijdelijk dat er met lege karren wordt gereden. Het is niet efficiënt dat er meer karren in omloop zijn dan nodig.

CSA en steriel magazijn bereiden samen de procedure based trolleys (PBT) voor de OK. PBT's leveren vele voordelen op voor het primaire proces (bron: prestatie Logi Ster BV ziekenhuisketen 2006)

Uit gegevens van het MCA (Bron: gegevens Navision mei 2006 tot en met nov 2006 voor OK, POK en ANA-pijnbestreiding – leidinggevende logistiek CSA) blijkt dat 34% van de artikelen in een PBT niet wordt gebruikt. Daarbij komt dat 6% van de huidige PBT's geheel ongebruikt retour komt, in totaal ca. 40% ongebruikt retour. De oorzaak hiervan is onder meer dat van instrumentarium meerdere maten worden aangeleverd terwijl maar één wordt gebruikt, te weinig kennis van de behoefte van de gebruiker bestaat, weinig standaardisatie in gebruik instrumentarium en wegens het uitvallen van productie huidige situatie retourstroom grotendeels weer gebruikt worden. Bij afstand (en zeker 3e partij) hoe om te gaan met retourstroom? Invoer van standaardisatie en tracking & tracing kan ertoe leiden dat de retourstroom wordt gereduceerd.

Er zal via een andere wijze worden gewerkt, randvoorwaarden tot gevolg waaraan resultaten zijn gekoppeld:

Nieuwe werkwijze	Resultaten
Professioneel, meer protocol, SLA's	Operationeel performance management
Communicatie met afnemers, klantmanagement	Fouten reductie en toename veiligheid
Informatie management; proces redesign, automatisering, pakketkeuze, tracking & tracing, labeling	Financiële performance - Demand management - Risico management
Management van levering en voorraadbeheer	CSA + logistiek worden de core business
Kennis van het medisch proces is cruciaal	Transparantie en klant tevredenheid
Vertrouwen bij de medisch specialist	Heldere electieve stroom op de OK, en bij andere afnemers
Integrale benadering interface-processen CSA/interne klanten	

Uitplaatsen CSA, steriel magazijn + magazijn eisen: (o.a.)

- Centraliseren aansturing (incl. instrumentariumbeheer)
- Process redesign alle stromen (incl. retourstroom)
- Eenduidige systemen en pakketkeuze

- Standaardiseren productkeuze
- Systematisch bijhouden van gegevens
- PBT, logistok-concept handhaven (optimaliseren)
- Omvang van instrumentarium neemt toe, i.v.m. safetystock en instrumenten dat zich in de pijplijn bevindt.
- Opschonen instrumentarium, standaardisatie en overgaan naar meer disposables
- Aan-/afvoer van CSA materiaal zal op gezette tijden plaatsvinden. Ervaring leert dat ca. 3-7x per dag is
- Labelen van instrumentarium en tracking & tracing is zeer wenselijk

Labeling zeer wenselijk als meerdere ziekenhuizen van CSA gebruik maken

Productie parameters

CSA

Volume: STE/jaar; procedure trays, CSA; exploitatie incl. steriel magazijn (ex overhead)

FTE's: FTE productie (excl. logistiek); FTE staf (excl. steriel magazijn en incl. instrumentariumbeheer)

Steriel magazijn

Voorraad steriel magazijn	€310.000
Artikelen SM	ca. 900
Vervangingswaarde instrumenten (grove schatting)	€7.000.000

Instrumentarium neemt toe, ten gevolge van safety stock en pipeline, vooral orthopedie (wellicht daling tgv meer disposables en opschonen en standaardiseren). Beter instrumentarium beheer.

Vervoer van/naar MCA-LC opzetten. Vrachtwagen en FTE (ca. 50.000/jaar/wagen) aan-afvoer 3-7x per dag.

Labeling en tracking & tracing is wenselijk op instrumenten niveau. Hier zijn opbrengsten te rekenen tgv reductie safety stock en betere performance. Voorkomen van steriliseren van instrumenten dat niet wordt gebruikt. Automatisering koppelen met huidige systemen.

Prijspeil 2006 inclusief BTW

M2 steriel magazijn m2 nuttig: 330 m2 bruto: 450

Impact assessment: SWOT

Op afstand plaatsen

Sterkten
- Verbetering van de kwaliteit van de CSA producten
- Integrale interne leveringen, afdelingsgericht
- Passend binnen visie MCA + LTHP +CBZ
- Nieuwe state off the art faciliteiten
- Meer ruimte voor patiënten –processen op LAH
- Geen verbouwactiviteiten in huis + interim situatie

Zwakten
- Tijdelijk grote reservevoorraden houden
- Automatiseren, ICT, vergaande standaardisering
- Aanloopproblemen t.a.v. nieuwe werkwijze
- Personele consequenties (emotie)
- Afbreuk risico automatiseringstraject

- Communicatie en cultuur

Kansen

- Katalysator voor supply chain optimalisatie (2% belofte)
- CSA als value added service (core business)
- Professionaliseren proces en prikkel en een betere focus naar rest van de organisatie (SLA's), transparantie
- Betere kwaliteit, reductie van fouten
- Mogelijkheden voor opschalen en schaalvoordelen
- Logistieke integratie meerdere locaties
- Van product naar afdeling, minder voorraad
- Goedkoper; beter gebruik van dure middelen
- Minder logistieke beweging en overlast

Bedreigingen

- Veranderingsbereidheid: medewerking OK en medisch specialist is vereist, OK-proces zoveel mogelijk in gepland regime organiseren
- Leercurve proces optimalisatie
- Nieuwe situatie voor het personeel (contracten)
- Leveringen komen te laat, bottle necks
- Wat te doen met leeggekomen ruimte
- Uitval apparatuur
- Tgv nieuwe situatie toch teveel stafety stock aanhouden door afdelingen
- Ontwikkelingen in de markt m.b.t. labeling nog niet uitgekristalliseerd

Risico's:

A. Op afstand plaatsen vereist transparante informatie beschikbaarheid van de instrumenten en vitale apparatuur

Mitigatie:
Opzetten informatie management. Hierin zijn 2 niveaus: de fysieke capaciteit in mensen en middelen. Het andere niveau is die van de investeringen en toerekening. Implementeren 2 way SLA's en boete systeem. Invoeren instrumenten-volg-systeem (labelen); echter risico dat labeling nog niet uitontwikkeld is in de markt. Overgaan naar meer disposables i.p.v. reusables. Bij overgang naar nieuwe situatie, eerst schaduw draaien en noodvoorraad houden

B. Leercurve procesoptimalisatie

Mitigatie:
Opzetten kennismanagement: Helder proces beschrijving, trainingsprogramma, score card, performance management

C. Veranderingsbereidheid / te grote verandering in één keer, continuïteit

Mitigatie:
Meten van de veranderingsbereidheid o.b.v. gesprekken met de belangrijke toekomstige klanten van de CSA/steriel magazijn: OK, specialisten, apotheek; van het logistiek centrum, de verpleegafdelingen. Vervolgens deze spelers in het veranderingsproces opnemen

Starten met invoeren van de autonome veranderingen; proces redesign, SLA's informatie management, instrumenten-volg-systeem, integrale planning CSA/OK etc.

D. Werkwijze en cultuur LC

Mitigatie:

Vooral bij opschalen komen meerdere culturen en werkwijze samen. Hier de ervaring en best practice inzetten van externe partij. Contracteren personeel met ervaring met nieuwe werkwijze.

E. Zelf doen, outsourcen of samenwerken

Mitigatie:
Diepere analyse nodig o.b.v. gesprekken aanbieders welke samenwerk mogelijkheden er zijn, vervolgens afweging maken aspecten t.a.v. governance, kwaliteit-medewerkers, financiën en wet en regelgeving integraal afwegen

F. Te laat- 'CSA melt down'

Mitigatie:
Inventariseren grootste risico's van CSA apparatuur, uitwerken work arounds

Voorbeelden autonome ontwikkelingen

- Optimaliseren logistok-concept; standaardisatie van procedure trays en basis-sets i.v.m. multifunctionaliteit; op basis van specialisme i.p.v. specialist (generiek en reduceren type instrumenten) er zijn voorbeelden van reductie tot 10% (referentie)
- benamingen standaardiseren
- Opzetten labeling en tracking & tracing

N.2 Telefonisch interview STERIMA-VANGUARD 23 Oktober 2014 13:30-14:00, Delft

Geïnterviewde; Danielle Kramer – Plant manager namens Sterima-Vanguard
Interviewer: Thekla Rakers

STERIMA-VANGUARD BV verzorgt verscheidene functies vanuit het Regionaal Logistiek Centrum (RLC) aan het Medisch Centrum Alkmaar (MCA), waaronder de het volledige proces van reiniging en sterilisatie van de instrumentennetten en het samenstellen van procedure based trolleys, bestaande uit gesteriliseerde instrumentennetten samen met andere steriele disposables (o.a. verbandgazen, operatiekleding, proceduretrays, etc.).

Algemeen

- Sterima beheert de hele logistieke voorraad met uitzondering van voedsel, medicijnen en bloed producten. Dit houdt dus onder andere alle non- en steriele producten, het instrumentarium en implantaten in.
- Al het instrumentarium is van MCA zelf, Sterima beheert het instrumentarium. Het instrumentarium ligt op voorraad bij Sterima en de noodvoorraad ligt in het MCA. Afhankelijk van de gemaakte afspraken beheert de OK het instrumentarium of Sterima. Deze afspraken zijn per klant/afdeling gemaakt. Maar te allen tijde hebben de afdelingen wel een noodvoorraad beschikbaar op eigen locatie.
- In het systeem wordt aangegeven of netten bij de klant/afdeling worden opgeslagen of in het RLC
- Sterima werkt tussen 7:00 uur en 23:00 uur en heeft hiernaast nog oproepdiensten, zodat ze 24/7 beschikbaar zijn.
- Het gehele proces vanaf de order tot de instrumenten en procedure based trolleys op de OK staan duurt minimaal 6 uur.
- Problemen in het begin waren vooral kinderziektes, bijvoorbeeld elkaar niet goed begrijpen. Beide partijen moesten wennen aan de nieuwe manier van werken. Dit is allemaal binnen een paar maanden goed opgelost door middel van goede communicatie vanaf beide kanten.

Communicatie

- Er wordt gewerkt met een hoger management systeem waar bestelling in geplaatst worden door de afdelingen van MCA en Sterima heeft hier toegang toe. Voor de traceerbaarheid van de netten maakt het MCA gebruik van hetzelfde programma als Sterima. Er is dus één systeem waarin gewerkt wordt bij Sterima en MCA. Dit is erg van belang voor het proces en de communicatie.
- Geplande ingrepen worden op basis van orders besteld en Sterima zorgt dat dit op de gewenste datum en tijd geleverd wordt.
- Trauma of noodvoorraad wordt meteen terug naar de afdeling binnen het MCA gebracht.
- Spoed patiënten (=binnen 6 uur) worden via het systeem doorgegeven en bij calamiteiten (=per direct, mits voorradig) wordt er gebeld en ook nog bevestigd via de mail. Aan calamiteiten zijn ook andere kosten verbonden.
- Als de steriliteit van de netten in de voorraad bij MCA vervalt worden ze via het systeem aangeboden voor reiniging en sterilisatie. Het aantal aangeschafte netten is afgestemd op het aantal operaties.

Klaarzetten

- Er wordt continu klaargezet. Op het moment van binnenkomen van de order worden de spullen klaargezet.
- Voor het reguliere programma geldt dat voor het dagprogramma van de volgende dag tot 16:30 de dag ervoor geleverd kan worden bij de klant/afdeling zodat deze de levering dan kan controleren. Leveringen worden gedaan voor een dagdeel. Voor spoed is dit anders.
- Elke stap in het proces is een controlemoment. Er zijn 4 à 5 controlemomenten. Uiteindelijk wordt er officieel getekend met alle procesgegeven voordat er vrijgegeven kan worden.

Bruikleen

- Via het communicatiesysteem wordt Sterima op de hoogte gesteld voor wanneer een bruikleen set is gereserveerd.

- Een nieuwe bruikleen set die nog nooit eerder is ontvangen moet minimaal een week van tevoren worden aangeleverd door de firma (spoed overruled deze regel). Dan wordt de set beoordeeld of deze op de juiste manier gereinigd en gesteriliseerd kan worden en wordt er gekeken of hiermee akkoord gegaan wordt. Vervolgens wordt de bruikleen set beschreven en in het systeem opgenomen. Alle bruikleen sets worden eerst gecontroleerd op compleetheid voor het de deur uitgaat naar de klant/afdeling.
- Bij het klaarzetten wordt de bruikleen set in dezelfde kar gezet als de normale netten.

Transport

- Sterima heeft eigen medewerkers in het MCA werken, deze ontvangen de karren en brengen die naar de OK.
- Elk half uur wordt er gereden (minimaal 16 keer per dag) en worden netten geleverd bij het MCA. Wat klaar is wordt vervoerd.
- In principe kan de planning van de OK worden ingezien betreft de benodigde spullen, maar hier zijn andere afspraken over gemaakt. Alles wat voor 18:00 uur wordt binnengebracht wordt staat de volgende dag voor 08:00 uur weer klaar staat voor de ingreep. Hierdoor kan het instrument veel gebruikt worden en wordt het rendement hoog gehouden.

N.3 Bezoek CS Steriel UMCU

Datum: 29 oktober 2014

Aanwezig: Leendert Jan Zonneveld, Marion Poot, Nico Haring, Thekla Rakers, John Vermeer, Imca Krakau, Vivian Hoeijmans, Anja Broekhuizen (UMCU-kwaliteitsmedewerker CSA en beheerder CS Steriel) en Peter van Leeuwen (UMCU- Logistiek manager)

Briefing voorafgaand aan bezoek

Wij zijn benieuwd naar jullie algemene ervaringen met CS Steriel. Daarbij zijn we in het bijzonder geïnteresseerd in de ondersteuning van CS Steriel met betrekking tot de volgend onderwerpen.

- Voorraadbeheer met 1 of meer voorraadlocaties
- CSA-planning v OK planning
- Kwaliteitsbeheer (track & trace, communicatie, rapportage)
- Klaarzetproces
- Logistieke proces

Besproken punten

Algemeen

- UMCU heeft de keuze gemaakt alle voorraden aanwezig te laten zijn op de OK's. De CSA is onderdeel van UMCU en is ook in het gebouw gelegen. De CSA werkt ook voor andere locaties zoals het Wilhelmina Kinderziekenhuis. Anja gaf aan dat het Maasstad ziekenhuis een vergelijkbaar concept (voorraad bij CSA) heeft als RdGG.
- UMCU werkt al heel lang met CS Steriel en zijn hebben de functionaliteit heel goed doordacht. De functionaliteit en de schermen zagen er duidelijk en overzichtelijk uit.
- UMCU heeft zelf een groot aantal overzichten gebouwd binnen CS Steriel. Deze stellen zij gratis beschikbaar aan ziekenhuizen (ChipSoft vraagt namelijk een meerprijs voor alle overzichten en omdat de tabelnamen redelijk standaard zijn, zijn ze gemakkelijk over te nemen).
- Afspraak tussen CSA en de OK's is dat geplande steriele materialen uiterlijk 2 uur voor de operatie op de het OK complex aanwezig zijn. De OK geeft dan uiterlijk om 14 uur de dag tevoren de planning door.
- Naast het goed scannen is het standaardiseren van netten een belangrijke randvoorwaarde om het proces optimaal te kunnen ondersteunen met bv een CS Steriel
- UMCU heeft een jaar lang een dag per week besteed aan het implementeren van CS Steriel. Het Beatrix ziekenhuis in Gorinchem heeft een recent een CS Steriel implementatie gedaan, het is handig om daar navraag te doen hoe lang een implementatie duurt.
- Bij de scanmomenten kan het fout gaan dat er onder de verkeerde stap gescand wordt. Dit kan wel gevolgen hebben voor de track and trace (bv dat er onder voorraad gescand wordt terwijl het net naar transport gaat of andersom). (voorbeeld toen uit het systeem dat ipv klaarzetten onder steriele voorraad was gescand, maar 1 uur later gebruikt was in OK).
- Het toverwoord is in alle gevallen 'standaardisatie'.
- CS-Steriel is geïntegreerd in ChipSoft, waardoor in 1 systeem alle informatie die nodig is om kwalitatieve hoogwaardige zorg te bieden aanwezig is.

Planning

- OK planning en CSA planning is geïntegreerd. CS Steriel is voorzien van een aantal regels (minimale voorraad die op de OK aanwezig moet zijn bijvoorbeeld) zodat men op de CSA kan werken met een prioriteitenlijst. Ook werkt men in de vuile ruimte met een prioriteitenlijst.
- Wat ik (John) nog niet voldoende gezien heb is het spoed proces met daarbij de consequenties voor de voorraden. Wat ik begrijp wordt bij een spoedgeval het net uit de voorraad of de voorraad die klaar gezet is onttrokken. Dit wordt niet digitaal vastgelegd, dus wat zijn de consequenties voor de

voorraden? Kan wel zien dat het net op de OK is, maar hoe is het met de voorraad in het magazijn en misschien wel het belangrijkste, hoe is het met de klaar zet voorraad.

- Het voorraadbeheer wordt in SAP bijgehouden. Op dit moment is UMCU bezig met te kijken of het mogelijk is een koppeling te maken tussen SAP en ChipSoft.
- ChipSoft maakt continue een rekensom of planning mogelijk is. Bij de planning voor de OK komt er een pop-up naar voren als er een conflict is met de netten. Dit kan genegeerd worden en is dus (nog) niet geborgen.
- Door de koppeling is het mogelijk om op de afdeling CS een verandering in het programma direct te zien en daarop te acteren. Er zullen wel duidelijke afspraken gemaakt moeten worden over hoe vervolgens met deze informatie om te gaan.
- CS-Steriel is dynamisch: bij het toevoegen van een net op de OK via CS-Steriel komt dit direct op de picklist van de CSA.

Voorraadinformatie

- Van een net is altijd zichtbaar waar het zich bevindt. Voorwaarde is dan wel dat medewerkers de netten op de afgesproken momenten scannen.
- Per instrument kan gezocht worden in welk net het zit.
- Planning systeem OK, geïntegreerd met de instrumentarium voorraad, levert veel bruikbare informatie op. Het is mogelijk voor OK en CSA om snel te zien waar een net zich bevindt.
- CS Steriel heeft de mogelijkheid om de samenstelling van de netten aan te passen voor als bijvoorbeeld een instrument mist op een net, maar nog wel in roulatie gehouden wordt.
- Voorraadbeheer met 1 of meer voorraadlocaties
  Het is met CS Steriel aan te geven waar een net zich bevindt en er kan een ‘’urgentie’’ aan een net gekoppeld worden zodat een urgent net met voorrang behandeld wordt. Dit zou veel (mis) communicatie schelen ten opzicht van de huidige situatie. Door de netten te koppelen aan’’ locatie grijpvoorraad’’ zou het duidelijk moeten zijn waar de netten horen en hoe snel ze weer retour moeten.
- Kwaliteitsbeheer (track & trace, communicatie, rapportage): Hier ben ik (Marion) zeer enthousiast over. Mits er voldoende scanmomenten worden ingebouwd is het mogelijk om de netten te traceren. Dit geeft veel duidelijk en tijdwinst.
- CS steriel kan een ondersteuning betekenen in het huidige logistieke proces d.m.v. de korte lijnen die erdoor ontstaan en het track en trace gedeelte.
- Met CS-Steriel zijn foto’s van individuele instrumenten en inhoud van netten beschikbaar te maken. Dit is een wens.

Klaarzetten

- Wat ik (John) niet gezien heb is het digitaal klaarzetten. UMC zet nog steeds klaar met papieren protocollen. Dit proces is voor het JIT project erg belangrijk.
- Klaarzetproces: Met betrekking tot het JIT is het lastig om aan te geven of de software hierin ook op de gewenste wijze faciliteert. Het UMC werkt niet op deze wijze.
- Door ‘mandjes’ of ‘klaarzetcodes’ te maken a.d.h.v. de klaarzetprotocollen kun je gemakkelijk digitaal klaarzetten. Je hoeft maar 1 item toe te voegen om alle standaard-netten die bij een ingreep nodig zijn klaar te zetten. De voorbereidingen die we nu doen voor de pilot sluiten hier goed bij aan. De teamleider OK geeft aan dat dit prima werkt op die manier. Dit wordt overigens tijdens de pilot ORTHO B voor een aantal ingrepen uitgebreid getest.
- Doordat de klaarzetprotocollen waar mogelijk afgestemd zijn (of gedurende de pilot nog afgestemd gaan worden) op de behandelcode die wij gebruiken om een patiënt op de wachtlijst voor OK te zetten, is er ook een mogelijkheid om via die weg netten (of ‘mandjes’ of ‘klaarzetcodes’ hoe je ook maar wilt noemen) te koppelen. Dit zal nooit bij alle patiënten werken, omdat niet elke patiënt via de wachtlijst-route binnenkomt. Zie ook punt 3.
- Je kunt in CS-Steriel aangeven of netten zijn klaargezet. Dit heb ik (Imca)niet gezien, maar wel vernomen. Dit is dan eenvoudig zichtbaar in ChipSoft en een wens van de gebruikers.

Conclusie van de aanwezigen uit het JIT project

- **John**: Ik kijk misschien met een wat kritisch oog naar de software omdat voor Combi-Ster de keuze veel gevolgen zal hebben. Ik ben er op dit moment nog steeds van overtuigd dat onze huidige software minimaal dezelfde mogelijkheden biedt. Ik denk dat we nog een aantal zaken goed moeten uitzoeken willen we een besluit kunnen nemen.
- **Thekla**: CS Steriel geeft ondersteuning voor een pull-systeem, wat voor de JIT situatie noodzakelijk is. Doordat de informatie van de CSA en OK in één systeem zitten en inzichtelijk voor beide is track & trace goed mogelijk en kunnen eigen processen afgestemd worden op informatie uit het systeem i.p.v. direct contact te zoeken.
- **Marion**: Overal ben ik enthousiast over de software, in het achterhoofd houdend dat ik geen I&I achtergrond heb. Mijn advies zou zijn om ondersteuning uit het UMC te vragen, omdat daar al geruime tijd met de software gewerkt wordt.
- **Imca**: Samenvattend: ik ben enthousiast over hetgeen ik gezien heb. Van wat ik gezien heb lijkt CS-Steriel de voornaamste knelpunten voor ons op te lossen. In de besluitvorming moet worden meegenomen dat het HAGA-ziekenhuis voornemens is (99% zeker) over te gaan op ChipSoft met ingang van 01-01-2016. Aangezien 2 ziekenhuizen dan gebruik maken van ChipSoft, we beiden werken volgens JIT en bij voorkeur ChipSoft applicaties gebruiken lijkt het me goed om hier wat betreft de aanschaf van een pakket rekening mee te houden. De voorbereidingen die nu al gedaan zijn met betrekking tot klaarzetprotocollen (maken van de klaarzetprotocollen nieuwe stijl) sluiten goed aan bij hetgeen nodig is voor de inrichting van CS-Steriel.
- **Leendert Jan**: Een koppeling EZIS-Steriel geeft wijzigingen in de OK-planning direct door aan de CSA. Dat is belangrijk voor de JIT situatie. Er is natuurlijk wel een grens aan de flexibiliteit van CombiSter ten aanzien van mutaties. Deze beperkingen moet bij voorkeur ook in het systeem worden meegenomen. Zoals ChipSoft al aangaf, en nu blijkt, laat het systeem toe om leveringen te putten uit meerdere voorraadlocaties (CombiSter/grijpvoorraad)
- **Vivian**: CS Steriel lijkt een toegevoegde waarde te bieden aan het JIT proces en lijkt de belangrijkste knelpunten die we nu hebben op te lossen. Bij implementatie zouden we voordeel kunnen halen door de inrichting van UMCU als uitgangspunt te nemen en de overzichten van hen over te nemen.
- **Nico**: geen input ontvangen

N.4 Verslag 4 november 2014 – Marion Poot

Aanwezig: Marion Poot, Annetje Guédon, Thekla Rakers

Doel van de meeting

Voorgestelde/concept nieuwe proces bespreken.

Uitkomst van de meeting

- Het invullen van de patiënt- en operatiegegevens in ChipSoft door de specialist moet weinig tijd kosten, maar wel systematisch gebeuren. Marion vond het voorgestelde idee voor het invullen erg goed eruit zien (zie hieronder). Alleen moet de behandelend chirurg nog wel ergens akkoord geven.

- Ortho overleg gaat veranderen. Er wordt gekeken naar hoe het beter kan, meer gestroomlijnd. Op dit moment heeft het overleg geen duidelijk structuur.
- Op dit moment wordt er bij spoedoperaties geen tijd toegewezen in de planning. De operatie wordt vaak aan het eind van de dag gedaan, maar kan ook ergens tussen gepland worden als bijvoorbeeld een andere operatie uitvalt.
- Voor de nieuwbouw moet er met Combi-Ster gecommuniceerd worden voor wanneer spoed binnen moet zijn. Dit kan bijvoorbeeld door dit in het systeem aan te geven, waardoor er minder gebeld gaat worden dan nu.
- Er zijn klaarzetprotocollen voor niet standaard operaties. Bijvoorbeeld bij een operatie waar de patiënt een nieuwe heup krijgt. Er zijn drie verschillende soorten heup implantaten die gebruikt kunnen worden. Elke heup heeft een klaarzetprotocol.
- Voor de pilot zet de logistiek medewerker alles (digitaal) klaar: netten, procedure trays, laminaat, disposables.
- In de nieuwbouw komt er een frontoffice medewerker van Combi-Ster. Deze frontoffice medewerker gaat de netten wegen na gebruik en voor vertrek naar Combi-Ster.
- In de nieuwbouw heeft de opdekruimte een hogere luchtdruk dan de OK's. Deze ruimte wordt gebruikt om de netten klaar te zetten en de tafels op te dekken met de netten.

- Voor de nieuwe situatie zal het handig zijn om de mogelijkheid te hebben om ergens (bv in het systeem) aan te kunnen geven uit hoeveel netten een bruikleen set bestaat. Dit om verwarring te voorkomen.
- In het huidige proces wil Combi-Ster graag een akkoord van de leidinggevende krijgen als een bruikleen set is aangevraagd.
- De OK assistent die de bruikleen set reserveert bespreekt met de firma welke set/netten nodig zijn voor de operatie.
- Besteller kan niet inzien wat er nodig is voor de operatie. Het is dus niet handig om de besteller, zonder tussenkomst van bijvoorbeeld een OK assistent, direct de bruikleen set te laten bestellen.
- Het zou mogelijk kunnen zijn om voor 8:00 uur de klaarzetkarren van Combi-Ster aan te vullen met de spullen die bij RdGG opgeslagen zijn zoals laminaat en disposables.

N.5 Verslag 6 november 2014 – Combi-Ster

Aanwezig: John Vermeer, Hans Klinkenberg, Annetje Guédon, Thekla Rakers

Doel van de meeting

Voorgestelde/concept nieuwe proces bespreken

Uitkomst van de meeting

- Op dit moment bij de JIT pilot is er een knelpunt bij de middaglevering. Door afgesproken levertijd in de middag (+/- 15:00 uur) wordt er meestal rond de 70% van de aangevraagde netten geleverd, de rest zit nog in de pijplijn (bij RdGG of Combi-Ster) en is nog niet gesteriliseerd.
- Voor Combi-Ster is het JIT leveren wel heel voordelig, de werkdruk kan meer verspreid worden. Er kunnen betere keuzes gemaakt worden betreft de prioriteit van de netten die verwerkt moeten worden. Netten die naar de Combi-Ster voorraad gaan en dus niet meteen gebruikt worden hoeven niet direct verwerkt te worden, en kunnen buiten de pieken/drukte verwerkt worden.
- Het invullen van de decontaminatie verklaring is een juridisch verhaal, dit moet via de raad van bestuur van RdGG gaan. Een algemene verklaring, zodat niet elke keer de verklaring ingevuld hoeft te worden geld alleen voor de Combi-Ster deconaminatie verklaring en niet die van de firma.
- Op dit moment is de pilot voor het specialisme Chirurgie gaande. Het klaarzetten hiervoor duurt ongeveer 0.5 uur.
- Tijdens de pilots wordt om 8:00 uur de picklist uitgeprint. De afspraak is dat veranderingen in de planning na 8:00 uur de dag ervoor doorgebeld en gemaild moeten worden. De netten worden op de klaarzetkarren gezet en om 16:00 uur vertrekt de vrachtwagen vanaf Combi-Ster zodat het om 16:30 uur aankomt bij RdGG. Om 6:00 uur wordt een backorder klaargezet. De checkmomenten van de klaargezette netten worden gedaan door de teamleiders om 16:00 uur en 7:00 uur, vlak voor het transport.
- Voor de nieuwbouw wordt er een dagtaak gerekend voor het klaarzetten van alle netten (1 persoon 8 uur per dag). Het idee is dat er per ingreep de netten gescand zullen worden.
- Voor de nieuwbouw is een gehele daglevering handiger, dus dag van tevoren alles leveren en eventueel ’s ochtends dag van OK een backorder levering. ’s Avonds leveren heeft de voorkeur, aangezien de levering dan meer compleet omdat meer netten dan gesteriliseerd zijn. Tevens kunnen veranderingen in de planning voor de volgende dag die gedurende de dag worden gemaakt ook vaker meegenomen worden in het klaarzet proces.
- Het JIT leveren gaat alleen werken als de planning klopt.
- Eventueel is het mogelijk om standby/schaduw karren voor de OK te zetten. Dit zijn karren met netten die niet direct nodig zijn bij de operatie, maar wel beschikbaar moeten zijn voor als de operatie anders gaat dan gepland.
- Netten hebben verschillende redenen dat ze verlopen. Het kan zijn dat een net niet vaak gebruikt wordt maar als stand-by gehouden wordt. Verder is het belangrijk om te kijken naar de aantal netten in omloop.
- Net als op dit moment zullen er twee soorten buitenkarren zijn; schoon en vuil.

N.6 Verslag 12 november 2014 – Imca Krakau

Aanwezig: Imca Krakau, Annetje Guédon, Thekla Rakers

Doel van de meeting

Mogelijkheden ChipSoft bespreken voor het proces in de nieuwbouw

Uitkomst van de meeting

- Er zijn nu 80 behandelcodes ingevoerd in ChipSoft, maar dit kunnen er veel meer worden.
- Imca is bezig met 'winkelmandjes' te maken binnen ChipSoft die gekoppeld zijn aan behandelcodes. Deze winkelmandjes bevatten al voorgeselecteerde netten. Als een behandelcode gekozen wordt, worden automatisch in het systeem de netten aan de operatie gekoppeld en dus klaargezet.
- CTG code is een financiële code die vaak gekoppeld is aan een behandelcode. Eerst gedacht om de winkelmandjes hieraan te koppelen, maar dit blijkt toch niet te werken.
- Het is nu mogelijk om aan de operaties waar een winkelmandje aan is gekoppeld extra netten of benodigdheden toe te voegen.
- Het maken van deze winkelmandjes is een hele klus, omdat locaties Voorburg en Delft soms met andere netten werken. Tevens kunnen verschillende operateurs verschillende netten voor dezelfde operatie gebruiken, maar de grootste verschillen zitten in het gebruik van laminaat.
- Er zijn protocollen waar geen behandelcodes van zijn
- Op dit moment in de pilot worden de netten 2 dagen voor de operatie gekoppeld aan de operaties
- Behandelcodes en klaarzetprotocollen zijn niet op elkaar afgestemd (niet dezelfde code)
- ChipSoft is zelf lerend een voorbeeld als je de vorige keer net X hebt klaargezet bij operatie Y, de volgende keer als je operatie Y invult komt ergens net X in een hokje te staan zodat je die gemakkelijk kunt klaarzetten (en dus niet hoeft te zoeken in het systeem).
- Artsen kunnen een printje uitdraaien met wat ze hebben aangevraagd.
- De rechtenstructuur van ChipSoft is lastig. Het is erg lastig om iemand voor het ene deel wel en het ander deel geen rechten te geven binnen ChipSoft.
- In ChipSoft-Steriel is het mogelijk om aan te geven of de netten zijn klaargezet.
- RdGG heeft op dit moment het beleid om zo min mogelijk in ChipSoft erbij te ontwikkelen/maken.
- De plannen zijn om in maart 2016 (dus dan is de nieuwbouw al in gebruik) over te gaan op HIX dit is een nieuwe versie van ChipSoft
- Een belangrijk punt is dat de namen van de netten die RdGG gebruikt overeenkomen met die van Combi-Ster.

N.7 Verslag 20 november 2014 – Imca Krakau

Aanwezig: Imca Krakau, Annetje Guédon, Thekla Rakers

Doel van de meeting

Mogelijkheden ChipSoft bespreken voor het proces in de nieuwbouw

Uitkomst van de meeting

- Het is nu mogelijk om een overzicht te maken betreft geplande operaties over een bepaalde tijd (bv komende 7 dagen). In dit overzicht staan de operaties, de geplande operateur, vrije veld en de benodigde spullen (als ze al aan een behandelcode zijn gekoppeld).
- Imca weet niet of het mogelijk is om bijvoorbeeld 'informatie niet compleet' op te nemen in ChipSoft. Het beleid is dat RdGG zo weinig mogelijk aanpast in ChipSoft, voornamelijk omdat in 2016 (half jaar na overgang naar nieuwbouw) overgegaan wordt op HIX.
- Het aanpassen en toepassen van mogelijkheden in ChipSoft is niet onbeperkt. HIX en ChipSoft-Steriel hebben meer toepassingen dan de versie van ChipSoft nu.
- Er moet opgepast worden dat wanneer het toepassen van vinkjes in ChipSoft/HIX dit niet een cultuur gaat worden.
- Er is een mogelijkheid om bruikleen op te nemen in ChipSoft, de applicatie hiervoor moet dan wel gemaakt worden. Een mogelijkheid is in het tabblad aanvullend specialisme, in aanvraag opname tab.
- Er is ook bruikleen omloop wat voor langere tijd gebruikt wordt, dus langdurig in gebruik is.
- In de huidige inrichting van ChipSoft is de rechtenstructuur lastig.
- Standaardisatie is eigenlijk een vereiste betreft de netten voor de JIT situatie. Het aanpassen en standaardiseren van de netten moet eigenlijk gelijk opgaan met het JIT project, maar dat gebeurt nu niet.
- Op de OK wordt meestal met een algemene inlognaam gewerkt, maar een overzicht van bv de netten is alleen beschikbaar als met het eigen account wordt ingelogd, en dus niet met het algemene account.
- Er zullen twee systemen zijn, ChipSoft-OK en ChipSoft-Steriel. Deze zullen met elkaar samenwerken.
- Een eis volgens Imca is dat de gebruikers op de OK niet tussen systemen moeten gaan switchen om de benodigde informatie te verkrijgen. Ze moeten in één (hetzelfde) systeem werken.
- Er moet rekening gehouden worden dat op dit moment niet elke pc internet heeft in de OK. Dit is toentertijd bewust gedaan. Ze weet niet hoe dit in de nieuwbouw gaat worden.

N.8 Verslag 20 november 2014 – Marion Poot en Sandra Tas

Aanwezig: Marion Poot, Sandra Tas, Annetje Guédon, Thekla Rakers

Doel van de meeting

Voorgestelde/concept nieuwe proces bespreken

Uitkomst van de meeting

- Ortho overleg: Nico draait uitdraaien voor overleg.
- Bij stap 1.5 (in final design stap 1.4) aanvullen bestelstatus leen instrumenten in ChipSoft moet ook “extra informatie” toegevoegd kunnen worden.
- Op dit moment is het niet mogelijk om de benodigdheden van een operatie niet te veranderen nadat deze is ingepland door de planner ortho. Een optie kan zijn om de status op voorlopige OK datum te zetten, zodat de informatie nog wel toegevoegd kan worden (betreft aanvraag bruikleen) en na bestellen de datum op definitief gezet wordt.
- Eén levering op een dag is niet genoeg i.v.m. spoedpatiënten, handig zou zijn dat meerdere levertijden mogelijk zijn.
- Voorstel op logistiek medewerker eerder te laten beginnen om de netten klaar te zetten is mogelijk, ’s ochtends is het erg druk. Moet wel rekening gehouden worden met aan het eind van de dag.
- Voorstel: Klaarzetlijst laat zien welke netten waar de netten zich bevinden (en welke niet in de voorraad zijn). → om 16:00 OK planning laten weten of het lukt, als dit niet zo is kan de planning nog aangepast worden.
- De gekozen grijpvoorraad voor de nieuwbouw is nog te groot, hier moet in gekort worden.
- Vertrouwen in Combi-Ster is er nu (nog) niet en dat moet er eerst wel echt komen.

N.9 Verslag 27 november 2014 – Combi-Ster

Aanwezig: John Vermeer, Hans Klinkenberg, Annetje Guédon, Thekla Rakers

Doel van de meeting

Voorgestelde/concept nieuwe proces bespreken

Uitkomst van de meeting

- Op dit moment komen we veel vervuiling tegen in het systeem, veel netten die in het systeem staan zijn er niet meer. Het is goed dat dit op deze manier aan het licht komt.
- Gedachte over JIT (Combi-Ster voorraad en RdGG grijpvoorraad) zijn tussen Combi-Ster en RdGG verschillend. Als je 7 van de 8 netten inplant loop je vast met de grijpvoorraad, omdat deze dan niet meer gevuld is, hier gaat het onder andere op fout. Door medewerkers OK uit te leggen hoe voorraden werken zal er minder paniek zijn als de grijpvoorraad niet volledig is.
- Grijpvoorraad is iets wat gebruikt gaat worden en prioriteit heeft om aangevuld te worden.
- Op dit moment is de grijpvoorraad nog te ruim ingedeeld, in de nieuwbouw zijn er maar 270 plekken. De toegewezen grijpvoorraad op dit moment past daar niet in.
- Zal fijn zijn als software kan werken met het aanvullen van de grijpvoorraad, ook als het in de Combi-Ster voorraad al staat (als dit ondersteund wordt door de software).
- Zal fijn zijn als status net beschikbaar/inzichtelijk is voor iedereen.
- Combi-Ster heeft beschikking over 2 vrachtwagens.
- Vrachtwagen kan maximaal 16 karren transporteren. Op dit moment in de pilot worden er gemiddeld 8 karren getransporteerd per locatie (OK-B, OK-H). In de pilot is alleen het specialisme neurologie nog niet opgenomen, maar dit is maar 1 dag per week. Verwacht wordt dus dat in de nieuwbouw 16 karren geleverd moeten worden (aanname).
- In de pilot wordt nu ’s middags aangeleverd waardoor niet alles geleverd kan worden. Hierdoor ontstaat onder andere een gebrek aan vertrouwen. Als leveringen meer compleet zijn zal het vertrouwen toenemen.
- Bij Combi-Ster moet het werkproces ook veranderen. Er moet gewerkt gaan worden op basis van prioriteit. Op dit moment wordt er FIFO gewerkt, dus niet op prioriteit.
- Een mogelijkheid tegen de onzekerheid is het inzetten van bruikleen instrumenten voor een bepaalde tijd, zodat er meer instrumenten in omloop zijn en iedereen goed kan wennen aan de nieuwe situatie.
- Het proces moet niet georganiseerd worden op uitzonderlijke situaties. Hiervoor bestaat een noodprocedure.
- Wens is dat frontoffice medewerker van Combi-Ster gaat wegen/controle uitvoert. Of dit mogelijk is ligt aan het systeem of dit ondersteund wordt.
- Combi-Ster heeft 1 routing van de netten, alles wat binnen wordt gebracht wordt als vuil gezien. Er wordt vanuit gegaan dat er geen schone netten terug van de OK komen, als dit wel zo is wordt dit gezien als een uitzondering en wordt het net alsnog schoongemaakt en gesteriliseerd. Combi-Ster wilt niet aansprakelijk staan voor de netten die ‘steriel’ terugkomen. Zij weten niet wat ermee gebeurd is. Ook het gaatjes problematiek komt hierbij kijken, aangezien het vaker getransporteerd wordt en op een andere kar wordt gezet (mogelijkheid tot stoten).
- Voor de vuilstroming heeft Combi-Ster liever vaker momenten om op te halen dan alles in één keer. Dit omdat er dan pieken komen in de werkdruk bij Combi-Ster. Bij het halen van vuil transport van RdGG is het ook mogelijk om (spoed/grijpvoorraad)leveringen te brengen.
- Op dit moment wordt er 6x vuile karren opgehaald (dit is inclusief 1x steriele JIT aanlevering).
- RdGG moet zelf met intern transport regelen dat de karren naar het OK-complex worden gebracht. Ook als bijvoorbeeld leveringen eerder/later op de dag worden gepland voor de nieuwbouw (e.g. 5.30 uur aanleveren).
- Bruikleen kan soms ook spoed zijn.

- Idee is om bruikleen apart in te voeren in ChipSoft (zie meeting Imca Krakau 20-11-2014) en dat de bruikleen ook automatisch op de packlijst wordt gezet. John en Hans zijn groot voorstander als dit geautomatiseerd kan worden.
- Volgens Hans kan aan spoedoperaties kan geen operatietijd toegekend worden in ChipSoft. Misschien kan dit wel in HIX, dit is onbekend. Volgens Hans en John zou het niet erg zijn als dit bv telefonisch gecommuniceerd wordt.
- Combi-Ster heeft ruimte om 1200 netten op te slaan.

N.10 Verslag 19 januari 2015 – Joost van Linge

Aanwezig: Joost van Linge, Annetje Guédon, Thekla Rakers

Doel van de meeting

Bespreken proces flow voor de situatie in de nieuwbouw met een specialist van orthopedie, omdat deze ontbrak tijdens de HFMEA sessies.

Uitkomst van de meeting

- Voor stap 1.1 als patiënt bij de poli komt kunnen operaties al goedgekeurd worden. Het is belangrijk om alleen operaties goedkeuren waarvan je 100% zeker bent dat je weet welke spullen er nodig zijn. De check van de specialist dus alleen als je zeker weet dat je zelf opereert, of altijd dezelfde spullen nodig zijn.
- Het gebeurt wel eens dat een andere operateur de operatie uitvoert, dan de specialist die de operatie in ChipSoft heeft gezet. Dit gebeurt vooral bij algemene operaties. Het gebeurt niet vaak dat er dan andere netten nodig zijn (10% van de gevallen dat er een andere operateur is).
- Het beleid van RdGG is om geen pup-ups te weergeven tenzij het echt belangrijk is. Voor de planning van de operaties, zou dit wel handig zijn i.v.m. de beschikbaarheid van de netten.
- Een extra stap waar de specialist de operatie op een later moment nog moet goedkeuren zal fout gaan volgens Joost. Het is beter om dit op te nemen in het ortho overleg. Door hier te filteren op operaties die nog niet zijn goedgekeurd kan dit meteen besproken en gedaan worden. Hierna kan ook de datum definitief gesteld worden.
- Het is eventueel nog een optie om een double check te maken voor specialist en terreindeskundige. Als deze beide zijn goedgekeurd wordt de voorlopige datum op definitief gezet. Na de check van de terreindeskundige hoeft de specialist geen akkoord meer te geven.

N.11 Verslag 4 februari 2015 – Plastische chirurgie

Aanwezig: Michiel Schuringa, Yvonne Coenraads, Vivian Hoeijmans, Annetje Guédon, Thekla Rakers

Doel van de meeting

Bespreken proces flow voor de situatie in de nieuwbouw (tweede iteratie van het Participatory Design).

Input van de meeting

De input van de meeting was het HFMEA rapport, de procesflow en de lijst van risico's van het ontworpen toekomstige proces (Appendix I, J, and K). Er is vooral gekeken naar de procesflow.

Uitkomst van de meeting

Algemeen over plastische chirurgie

- Plastisch heeft zo goed als niet te maken met bruikleen instrumentennetten, misschien één of twee keer per jaar.
- Plastisch heeft te maken met relatief standaard netten en weinig dat hier buiten gebruikt wordt.
- Tijdens het systematisch invullen van de informatie in ChipSoft bij stap 1.1 is het belangrijk dat de standaard pakketten/behandelcodes goed ingedeeld zijn. Tevens mag het niet meer tijd in beslag gaan nemen. Door het invullen van extra (lege) velden heeft de specialist minder tijd voor de patiënt. Dit moet snel en overzichtelijk gedaan kunnen worden.
- Spoed aanvragen komen rond de één tot twee keer per maand. Dit kan ook via de poli aangemeld worden.
- Veel netten wisselen tussen DHV en H-gebouw.

Proces

- Tijdens het JIT proces moet er voldoende back-up zijn van de netten
- Stap 1.5, ortho overleg – Er is één keer per maand overleg. Verder wordt veel besproken via e-mails en gedurende het dagelijks contact.
- Stap 1.6, digitaal klaarzetten operaties zonder behandelcode – Het komt niet vaak voor dat er operaties gedaan worden die niet standaard zijn. Gemiddeld één tot twee keer per maand. Het handigst is om dit tussen de werkprocessen door te doen, dit moet elke dag al gedaan worden voor protheses (die via Z-XL besteld worden).
- Het gebeurt soms ook dat een patiënt niet meteen in ChipSoft wordt ingevuld, maar pas op het laatste moment. Dit is niet handig voor de levering van de netten.
- Door de eerste twee operaties van de dag een standaard operatie te laten zijn haal je risico uit het proces. Op dit moment worden spoed patiënten over het algemeen ook aan het einde van de dag gepland.

Conclusie

- Stap 1 is cruciaal in het proces. Vooral stap 1.1
- Netwerk wordt nog belangrijker, dit moet dus goed werken.
- Behandelcodes en namen van de operatie moeten goed met elkaar overeen komen. Michiel en Yvonne stellen zelf voor om dit te checken.

N.12 Verslag 3 maart 2015 – Imca Krakau

Aanwezig: Imca Krakau, Vivian Hoeijmans, Annetje Guédon, Thekla Rakers

Doel van de meeting

Opgestelde ICT aanpassingen voor het nieuwe proces doornemen

Input van de meeting

De input van de meeting was het HFMEA rapport van het ontworpen toekomstige proces (Appendix I). Er is vooral gekeken naar de gestelde systeemeisen.

Uitkomst van de meeting

- Het idee is dat er een koppeling komt tussen de systemen van RdGG en Combi-Ster. De synchronisatie van de systemen zal ongeveer één minuut duren, en zal dus up-to-date zijn.
- Combi-Ster zal de hoofdtabel van de netten gaan beheren en deze delen met RdGG.
- Volgens ChipSoft zijn bepaalde conflicten, zoals bij de planning, op te lossen met hun systeem.
- Op dit moment werkt men op de OK met 2 kleurcodes, geel voor spoed en groen als er opmerkingen bij de operatie zijn gezet en dit dus aandacht vereist. Dit is dus al een soort van filtering.
- Op dit moment staat bruikleen niet speciaal in het systeem. Als er bruikleen nodig is wordt dit aangegeven in ChipSoft onder het kopje speciaal instrumentarium. Als Combi-Ster in de hoofdtabel van de instrumenten ook bruikleen gaat opnemen zal het mogelijk zijn om echt die te selecteren en digitaal klaar te zetten.
- Betreft prioritering van de netten werkt OR Locate met 3 prioriteiten; urgent, spoed, en normaal. Er moeten duidelijke afspraken gemaakt worden over wanneer welk label en duidelijke lever afspraken.
- In de weekenden worden alleen spoedoperaties uitgevoerd.
- Er zal ook veel in het werkproces van de werknemers zelf veel veranderen. Het kan lastig worden om de gedachte van de werknemers op het juiste spoor te krijgen.

Conclusie

- Geconcludeerd kan worden dat alle gestelde IT behoeftes mogelijk zijn om in te voeren.
- Niet alle eisen kunnen voor de nieuwbouw geïmplementeerd worden.
- Sommige IT-systeem eisen hebben duidelijke werkafspraken nodig voor het gebruik hiervan.

N.13 Verslag 10 maart 2015 – Marion Poot en John Vermeer

Aanwezig: Marion Poot, John Vermeer, Thekla Rakers

Doel van de meeting

Invullen Supply Chain Collaboration Maturity Model voor huidige situatie, dus waar nog geen JIT is geïntroduceerd. De input was het model, vertaald in het Nederlands.

Uitkomst van de meeting

- Vertrouwen; Voor nu op niveau 2. Eens in de zoveel tijd overleg tussen RdGG en Combi-Ster. Er was geen noodzaak voor continue checken. Op dit moment is het vertrouwen misschien wel gezakt naar niveau 1 i.v.m. de JIT pilots.
- Communicatie; Niveau 3. Er wordt altijd al gedeeltelijk informatie uitgewisseld, bijvoorbeeld als een instrument op een net niet meer bruikbaar is. Er wordt dan overlegd wat er met het net en het instrument moet gebeuren. Communicatie is altijd al op verschillende lagen binnen de organisaties geweest. Sharing learning is ook altijd deels aanwezig geweest via een meeting en bijhouden van KPIs als totale productie, bruikleen, noodprocedures en kwaliteit.
- Samenwerking; Niveau 2. Er is altijd wel een zelfverdediging van belangen geweest.
- Kennis; Niveau 3. De kennis is opgeslagen binnen de systemen van RdGG en Combi-Ster zoals de protocollen.
- Order management; Niveau 2. Combi-Ster heeft veel meer data die kan helpen binnen het totale proces van Combi-Ster en RdGG, maar wat nooit gebruikt is.
- Problemen oplossen; Niveau 3. Al herhalen problemen zich soms nog wel eens. Toch worden sommige problemen tijdig opgelost en zijn er niet vaak geschillen.
- Proces verbetering; Niveau 2. Er zijn weinig gemeenschappelijke meeteenheden.
- Netwerk; Niveau 1. Er is totaal geen connectie en samenhang tussen de beide systemen van Combi-Ster en RdGG.
- Communicatie technologie; Niveau 2. Er wordt gebruik gemaakt van fax, telefoon en email. Het is ook mogelijk voor Combi-Ster om in ChipSoft in te loggen, maar wordt vrijwel nooit gedaan.
- Software; Niveau 2. Er vind geen gegevens uitwisseling plaats, al worden de softwareapplicaties wel binnen de organisaties gemanaged.