An analysis of the patient referral process of the orthopaedic patient journey at Maastricht UMC+

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January 15th, 2021

Bachelor Thesis
Industrial Engineering
Eindhoven University of Technology
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Executive Summary

Maastricht University Medical Center (MUMC+) is the academic hospital of Maastricht. During the past years, the department of orthopaedics has been dealing with long waiting times and market share loss in the region (Vektis, 2018). Simultaneously, demand for movement related care is expected to keep growing in the future (Volksgezondheid Toekomst Verkenning RIVM, 2018). In order to cope with these problematic trends, the Beweeghuis project has been initiated. The Beweeghuis project is a value-based healthcare initiative started by MUMC+ and ZIO (representing the general practitioners in the region) to optimize, among others, the patient referral process by business process redesign. The final goal of the Beweeghuis initiative is to improve on aspects of quadruple aim: healthcare costs, population health, patient experience and employee experience (Berwick, Nolan, & Whittington, 2008; Bodenheimer & Sinsky, 2014).

This thesis project aims aims to gain insights how to improve and evaluate aspects of the current orthopaedic referral process based on quadruple aim. The project has been structured in phases based on the Problem-Solving Cycle by van Aken et al. (2012). First, a literature study and case analysis are conducted. Next, a process model and problem framework are created to provide overview over problems in the current referral process. Quadruple aim is linked to the problem framework to evaluate the Beweeghuis initiative, which on its turn results in an evaluation framework.

Qualitative research was conducted to establish a problem-based evaluation framework. A literature study was conducted on quadruple aim, and a case on measuring quadruple aim in a previous similar evaluation effort was examined. Relevant literature and useful elements in the case for measuring quadruple aim were listed. Standardized and validated questionnaires and measurement methods were listed for measuring the quadruple aim.

Moreover, qualitative research was conducted to create a process model of the current patient referral process to Stadspoli, and a problem framework consisting of issues related to this process. Semi-structured interviews and multidisciplinary meetings were mainly used for modelling and mapping the process and problems (Layton, Moss, & Morgan, 1998). Meetings were planned with all stakeholders in the process; MUMC+, TIPP (referral agency), ZIO, Stadspoli and General Practitioners. Results on surveys regarding patient experience provided by TIPP and Stadspoli were used to complete the problem model. The problem framework

has been structured based on identified main subprocesses in the process model (van Aken et al., 2012). Each first-order problem listed in the problem framework has been examined to determine its influence on both quadruple aim and relevant stakeholders.

Results of the literature study and the case analysis revealed relevant dimensions and useful outcome measurement methods for measuring the quadruple aim. Health of population can be defined by the dimensions wellbeing and functioning (Stiefel & Nolan, 2012), and can be measured by using SF-12 and EQ-5D-5L, including EQ-VAS (Mols, Pelle, & Kupper, 2009; Versteegh et al., 2016). Patient experience can be defined by the dimensions patient satisfaction, timeliness, efficiency and effectivity (Stiefel & Nolan, 2012), and can be measured by using the CQ-index. Employee experience can be measured by determining the following dimensions: job satisfaction, timeliness and effectiveness (Bodenheimer & Sinsky, 2014; Hackman & Oldham, 1976). Sentiments among support staff can be determined by multidisciplinary meetings about the referral process which covers relevant topics on identified problem areas such as: timeliness, work effectiveness, job satisfaction, data infrastructure and communication. Finally, healthcare costs can be measured by determining cost per capita (Stiefel & Nolan, 2012). By analysing data on patient volumes, referral decision volumes and overall costs, cost per capita can be calculated.

By discussing the process model and problem framework, six main problem areas were identified. Examining these problem areas resulted in the following recommendations. The first recommendation is to place the triage before the actual planning of a patient. Secondly, all second line referrals must be sent directly to the HSD at MUMC+. Third of all, the photo process must be redesigned. It must be clear when to include a photo, how the patient is referred, and who checks the presence of scans prior to consults. The fourth recommendation is to organize and integrate data reports. It must be clear which data is needed to provide overview on waiting times and patient volumes for the parties involved in the referral process. The resulting insightful reports/dashboard need to be discussed frequently by stakeholders in the process. Fifthly, clear arrangements must be made regarding the provision of working schedules by MUMC+. Finally, formats and guidelines with regards to sending referrals to MUMC+/TIPP need to be established and communicated internally and externally to save unnecessary administrative work.

Preface

I would like to thank dr. ir. Elke den Ouden for the great in-depth help she provided during my bachelor thesis project. Her feedback and directions made this thesis a pleasant challenge. I also want to thank her for broadening my perspectives on conducting research in a professional setting.

In addition, I also want to greatly thank dr. ir. Rob Vanwersch for realizing the opportunity to participate in the Beweeghuis project at MUMC+. The insights and critical feedback provided by Vanwersch guided me towards the successful completion of this thesis.

Moreover, I want to thank Ronald Meerlo and Judith Hazelzet from ZIO for connecting me with relevant parties in the referral process. Finally, I want to thank the personnel from TIPP, Stadspoli and staff from MUMC+ for their contribution to this project.

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1. Introduction

1.1 General context

Maastricht University Medical Center (MUMC+) is the academic hospital of Maastricht. MUMC+ is a collaboration between azM – academic hospital Maastricht – and Maastricht University. MUMC+ consists of various departments to provide healthcare to a wide variety of patients. Two of the large departments of MUMC+ are the orthopaedics and rheumatology department, which provide movement related care. The orthopaedics department focuses on a branch of healthcare concerned with movement related care: the correction or prevention of deformities, disorders, or injuries of the skeleton and associated structures, such as tendons and ligaments (Cambridge English Dictionary, 2020). At MUMC+, a distinction can be made between seven different types of orthopaedics: hip, knee, shoulder, spine, feet and child orthopaedics. The rheumatology department specializes in disorders caused by inflammation in the musculoskeletal system (joints, muscles, tendons) and internal organs in which the immune system plays a role (Reumatologie Maastricht UMC+, 2020). In 2019, about 23.200 orthopaedic consults took place at MUMC+, of which about 5.100 cases were 'new' consults (MUMC+, 2020). Currently, the capacity for movement related care is consumed by a large number of patients which do not need a treatment at MUMC+. A lot of these patients could be treated with conservative treatments externally by general practitioners and physiotherapists. As the result of striving towards an optimized utilization of capacity/resources in order to improve healthcare, there are four direct causes why MUMC+ decided to redesign and optimize the referral process for movement related care (Toelichting Beweeghuis, 2020):

1. Long waiting lists/times (e.g., total hip replacement > 6 months). This results in lower patient satisfaction, including a lower perceived quality of the care provided and confidence in the care provider (Bleustein et al., 2014).
2. Unclarity among GPs regarding patient referral (e.g., when and where to refer to).
3. Orthopaedic market share loss in Maastricht region over past years (Vektis, 2018) (see figure 1). The resulting lower revenue provides incentives to reduce the market share loss. Figure 1 shows the market share of orthopaedics in Maastricht and an adjacent municipality. A trend can be observed which shows a decline in market share for the entire 043-region (Maastricht region) over a period of five years, indicating regional loss of patients while demand for orthopaedic care is increasing (figure 2). The regional market share loss could be explained by the combination of long waiting times and unclarity about treatment options. As a result, patients could be dissatisfied,

implicating they are more likely to go to hospitals in other regions for treatments (Bleustein et al., 2014).

4. Future perspective; expected growth of orthopaedic patients in the Netherlands in the period 2015-2040 (see figure 2) (Volksgezondheid Toekomst Verkenning RIVM, 2018). Figure 2 shows the total amount of expected patients per specific medical condition. Both the number of arthrosis and neck and back complaints are expected to grow further over the next twenty years. Demand for top referent care (TRF) (ultra specialistic care) is growing, putting extra pressure on the orthopaedics/rheumatology department of MUMC+ (Toelichting Beweeghuis, 2020).

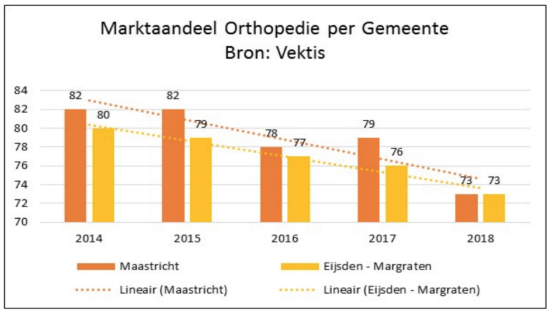

Figure 1 – Market share of orthopaedics per municipality (Vektis, 2018)

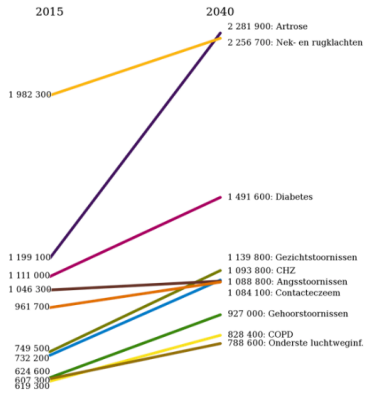

Figure 2 – Prevalence of patients with a certain condition 2015-2040 (Volksgezondheid Toekomst Verkenning, RIVM, 2018)

Based on these four problem areas, the Beweeghuis project has been initiated. The Beweeghuis project is a value-based, patient-centred healthcare initiative started by MUMC+ and Zorg In Ontwikkeling (ZIO), to optimize, among others, the patient referral process to MUMC+ by redesign of the current referral processes related to movement related care (Porter, Pabo, & Lee, 2013; Putera, 2017). The project is part of the larger regional 'Blauwe Zorg' movement, which consists of similar initiatives on optimizing regional healthcare.

The main aim of the Beweeghuis project is to reduce healthcare costs, improving patient experience, employee experience and population health. The latter four elements are also known as 'quadruple aim'. The quadruple aim framework is key for determining the regional effectiveness of the performed efforts initiated by the Beweeghuis project group (Berwick et al., 2008; Bodenheimer & Sinsky, 2014).

1.2 The Beweeghuis project

1.2.1 Project structure

To get a more in depth understanding of the Beweeghuis project – and the related research that is to be conducted – the project structure is broken down (figure 3). A projectized matrix or 'thematical' trans-organizational structure is used in the Beweeghuis project: one or several managers manage the project and oversee the complete picture whilst a variety of disciplines is involved (Larson & Gobeli, 1989). The management and authority of the Beweeghuis project is equally divided between the MUMC+ and ZIO (represents general practitioners (GPs), TIPP (transmural interactive patient platform) and Stadspoli). More than ten healthcare professionals are involved in the project, participating in seven thematic project subgroups.

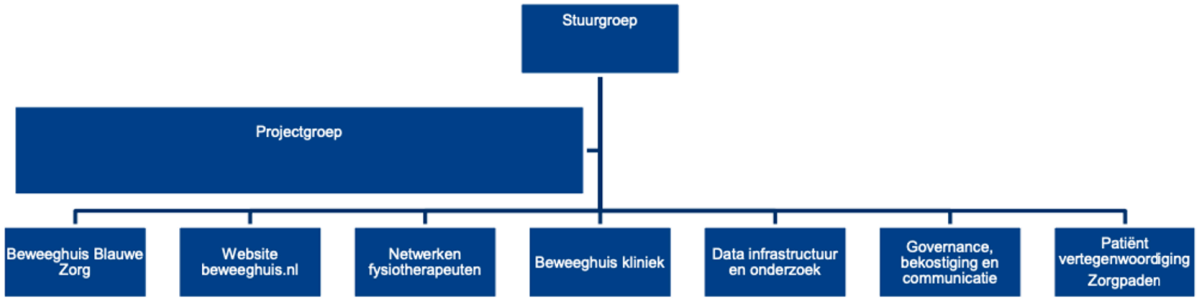

Figure 3 - Project structure (Toelichting Beweeghuis, 2020)

The Beweeghuis project consists of three stages (Toelichting Beweeghuis, 2020). In the first stage, the main target is to connect the stakeholders/parties and to start negotiations. In the second stage, in which the project is right now, Stadspoli 2.0 (Blauwe Zorg) is to be established and launched (see figure 4 (orange section) and figure 5). In the third stage, the main focus is to set up the Beweeghuis clinic, in which surgical care can be provided.

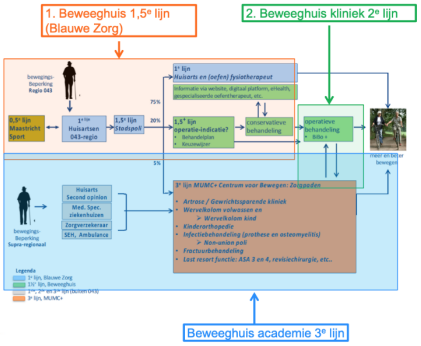

Figure 5 – Beweeghuis concept (Toelichting Beweeghuis, 2020)

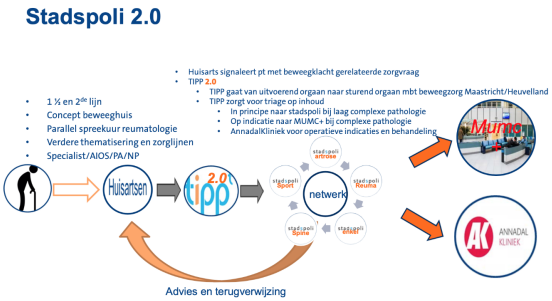

Figure 4 – Stadspoli 2.0 (Toelichting Beweeghuis, 2020)

1.2.2 Stakeholders

In the Beweeghuis project, two groups of stakeholders can be identified: direct and indirect stakeholders. Medical staff of MUMC+, patients, GPs, TIPP (referral application), Stadspoli and physiotherapists (FysioNet) are direct stakeholders involved in the Beweeghuis project. The patient is the main stakeholder in the business process redesign initiative, because patients will experience the eventual redesigned referral process. The redesign effort could impact both the patient journey and experienced clinical effectiveness (Doyle, Lennox, & Bell, 2013; Porter et al., 2013).

A group of indirect stakeholders that could provide incentives and simultaneously profit from the Beweeghuis project are healthcare insurance companies. The Beweeghuis project aims on reducing abundant treatments/consultations and focuses on conservative treatment, thus reducing redundant costs. Another important indirect stakeholder is the Dutch state, which is characterized as a welfare state. A welfare state is primarily responsible for providing wellbeing among its population (Cambridge English Dictionairy, 2020); in other words, the state is obliged to the provide the best possible healthcare to Dutch citizens. National/regional healthcare targets and standards are set by the Ministry of Public Health which must be met in order to improve and maintain the wellbeing of the population. This pursuit is translated into policies and lean healthcare efforts, such as the Beweeghuis project is part.

1.2.3 Healthcare division concepts

A distinction can be made between different types of healthcare. Defining these types is key, since the terminology is used throughout the project. Healthcare types are defined based on layers of intensity (Starfield, 1994) and are divided in so called 'care lines'. The following relevant care types can be distinguished (Toelichting Beweeghuis, 2020):

- 0th line care; care that is always present (no demand by individuals). Examples of 0th line care are general/national preventive care and national research.
- 0.5^{th} line care; pure/more specialistic preventive care (e.g., physiotherapists).
- 1st line care or primary care; care that is triggered by an individual. First line specialists can refer to medical specialists with expertise in a particular field. General practitioners are categorized as primary caregivers.
- 1.5^{th} line care; collaboration between first line caregivers and second line specialists, also known as primary care plus (van Hoof et al., 2016). Second line specialists give advice to the patient from the primary care (GPs) about treatment options. Setting up

this care line is one of the main focus areas of the Beweeghuis project and Blauwe Zorg movement. In this case, 1.5th line care is provided at Stadspoli, which provides intermediate second line consults in a first line setting (not at MUMC+).

- 2nd line care or secondary care (MUMC+); care that is only accessible by patients who have been referred for further treatment by a primary caregiver.
- 3rd line care or tertiary care (TRF); highly specialistic healthcare; provided by few medical specialists with a certain expertise in a particular specialism/field.

1.2.4 Scope

Since the Beweeghuis project is a large project, the scope of this thesis is restricted to the second phase of the project and to the referral processes related to orthopaedics and Stadspoli. Currently patients are directly referred to Stadspoli by the GP, or after re-examination of second line referrals at MUMC+. All referrals for Stadspoli are processed by TIPP. TIPP is an abbreviation for 'transmural interactive patient platform' and has been established in 2012 to support the Blauwe Zorg healthcare movement (TIPP, 2016). If the referral is complete, TIPP contacts and plans the patient at Stadspoli. After contacting the patient, the referral is sent to Stadspoli for examination. If the case is suitable, the consult will take place. If the case is not suitable for Stadspoli, the appointment of the patient cancelled, and the patient is referred to the second line. The to be conducted research will take place within the scope of these processes.

2. Problem definition

The Beweeghuis project group aims on redesigning the referral process of patients with movement related care complaints in order to improve aspects of the quadruple aim: patient experience, employee experience, population health and healthcare costs (Berwick et al., 2008; Bodenheimer & Sinsky, 2014). Despite the pursuit of monitoring and improving on elements of the quadruple aim framework, there is currently no evaluation system present that the Beweeghuis project group can use to monitor the effectiveness of the second phase implementations. It is crucial for lean healthcare projects to be monitored and evaluated intensively in order to adapt timely and to save resources (Lipovetsky, Tishler, Dvir, & Shenhar, 1997). Therefore, it is essential to timely set up an evaluation system that can be used to determine the effectiveness of the second phase implementations.

A root cause diagram in the form of a cause and effect diagram (Andersen & Fagerhaug, 2002) indicates why there is no evaluation system present for evaluating quadruple aim in the context of the second phase of the Beweeghuis project (figure 6). From the diagram can be deducted that limited resources, project complexity and process complexity result in a lack of overview over the referral process, data infrastructure and relevant problem areas. The lacking overview over the available data in the complex referral processes makes it difficult to set up an evaluation system that is reliant on the current data infrastructure. Eventually, the overall lack of overview over the processes, lack of resources, and general complexity of evaluation efforts in a healthcare setting (e.g., use of dimensions, standardized questionnaires), result in the absence of a suitable evaluation framework based on quadruple aim.

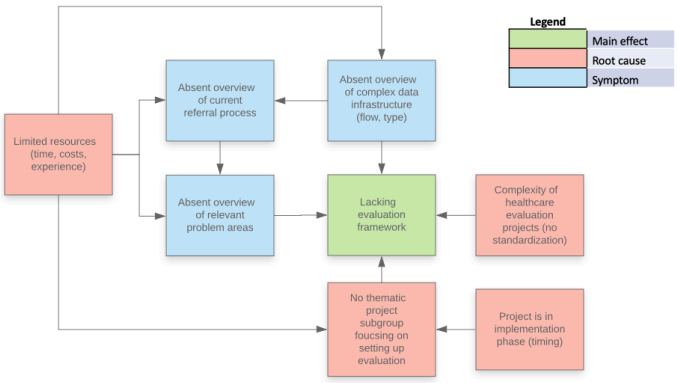

Figure 6 - Cause and effect diagram

3. Research questions

As mentioned in the previous sections, the Beweeghuis project is a patient-centred, value-based healthcare initiative. Patient experience, employee experience, population health and costs are used to evaluate the effectiveness of this project (Berwick et al., 2008; Bodenheimer & Sinsky, 2014). In order to oversee the current referral process, to identify relevant problem areas, and to establish an evaluation framework based on quadruple aim, the following research questions have been established.

Main research question:
How can the Beweeghuis project group improve and evaluate aspects of the current orthopaedic referral process based on quadruple aim?

Sub research questions (for description of phases, see section 4: Methodology):
Phase 1: Literature study and case analysis

- What is quadruple aim and how can it be used to evaluate the Beweeghuis project?
- What evaluation methodology is used in similar value-based healthcare projects to evaluate quadruple aim?

Phase 2: Process analysis and problem analysis

- What main processes are involved in the current orthopaedic referral process?
- What main problems can be identified in the current orthopaedic referral process?

Phase 3: Recommendations

- What can mainly be improved in the current orthopaedic referral process?
- What aspects of quadruple aim can be used to evaluate identified problems?

4. Methodology

The research methodology for this project is based on the Problem-Solving Cycle by van Aken, Berends, & van der Bij (2012). The cycle starts with (1) a problem mess from which the main problem is defined. Next, (2) the problem is analysed and (3) a solution is designed. Lastly, (4) the intervention is implemented and (5) the evaluation takes place. This thesis covers the first three steps of Problem-Solving Cycle (van Aken et al., 2012). The implementation phase and evaluation phase are not included in this project.

Based on the Problem-Solving Cycle (van Aken et al., 2012), the research methodology can be divided into three phases (see figure 7). During the first phase (problem mess), the basis for a generic evaluation framework based on quadruple aim is established by examining literature and by conducting a case analysis on a similar evaluation practice. In the second phase (problem analysis), a specific problem framework is established by conducting a process analysis and problem analysis. In the third phase (solution design), an evaluation framework is established based on results of the case analysis, literature study, process analysis and problem framework. Recommendations for improving the referral process are also presented in the third phase.

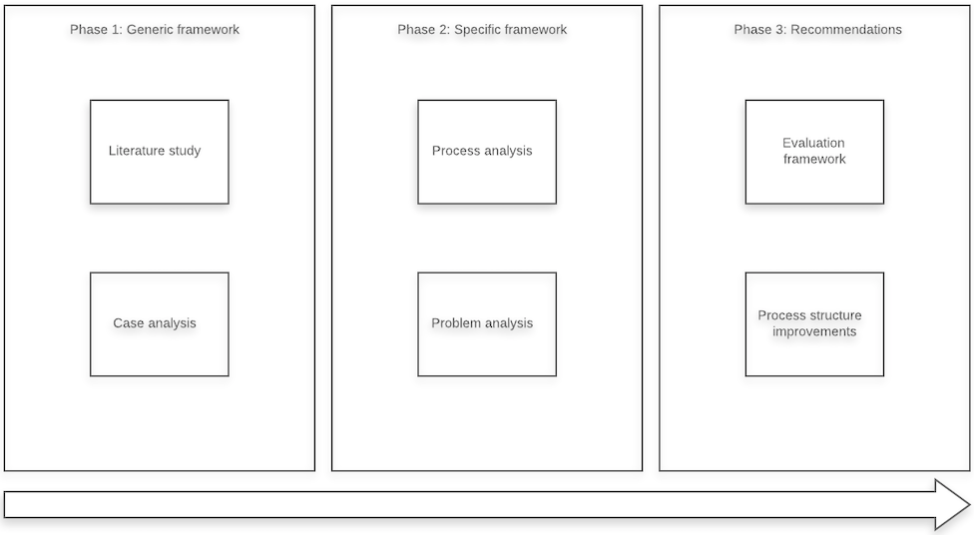

Figure 7 - Research methodology framework

4.1 Phase 1: Generic framework

4.1.1 Literature study

An explorative literature study is conducted in order to gain insights into quadruple aim components and relevant evaluation methodology, value-based healthcare efforts, the patient

journey, and business process redesign methodology. The literature study is one of the two methods used for establishing a general framework for evaluation. In the literature study, each quadruple aim element is explored. This exploration can be used for determining the scope of quadruple aim, identifying key performance indicators and identifying relevant measurement methodology. The literature study is to be conducted by using a five-phase model consisting of a planning, identification, screening, selecting and finally reporting phase (Baumeister, 2013; Lipsey & Wilson, 2001; Siddaway, 2014).

Planning

During the planning phase, relevant key terms and concepts are identified and formulated. Synonyms, abbreviations and variants of these terms are noted down (Appendix A, table 2). Finally, accessibility and content criteria are established (Appendix A, table 3) for selecting literature (e.g., full-text available, English etc.).

Identification (literature searching)

After the identification of relevant search terms, the actual search for literature is performed. Several databases are used to find a larger variety of articles, in this case ABI Complete and Google Scholar. Filters based on the defined criteria in the planning phase (e.g., full-text available) and Boolean operators (AND, OR and NOT) are used to narrow down search results. See Appendix A, table 4 for the used search queries.

Screening

During the screening phase, abstracts of the found literature are read. After reading each abstract it is determined if the article is to be included. If an article gets the status 'include', the full-text version of it has to be examined during the selecting phase.

Selecting and extracting information

The selecting phase is dependent on the screening phase. The full text of the articles that were marked as eligible is examined. The pool of articles is eventually narrowed down to the articles of which the full text is relevant. Relevant information (results, type of research etc.) is extracted from the articles and noted down.

Reporting

During the reporting phase, the extracted information from the articles is integrated and structured to answer the research questions.

4.1.2 Case study analysis

Next to the literature study, a relevant case is examined for establishing a generic overview of how to use quadruple aim for evaluation purposes. In the case analysis, an evaluation report on Blauwe Zorg provided by ZIO is examined. In the report by van den Bogaart et al. (2019), the first stage of the establishment of the value-based Blauwe Zorg movement is evaluated by using quadruple aim. The case focuses on evaluating the introduction of 1.5th line care (Stadspoli). The usage of quadruple aim to evaluate this care type makes the selected case relevant. Since Beweeghuis is part of the Blauwe Zorg movement, this best-practice case is of great importance. Analysing the case can contribute towards establishing a useful, similar quadruple aim evaluation framework.

The aim of the case analysis is to learn how other quadruple aim evaluations efforts have been conducted. An important goal of conducting this analysis is to identify relevant (standardized) evaluation tools. According to Dani et al. (2006), useful best-practice elements must be identified and structured in order to effectively reuse them. In order to effectively perform the case analysis, the case is summarized (structured), after which relevant results are presented clearly and comprehensively.

4.2 Phase 2: Specific framework

4.2.1 Empirical analysis: Interviews & Focus groups

Qualitative research in the form of semi-structured interviews and focus groups (multidisciplinary meetings) is conducted in order to map current referral processes and to identify relevant problems (Layton et al., 1998). Dutch is used instead of English to present results, such as the process model and the problem framework. All employees of the Beweeghuis project group and other interviewed participants were native Dutch employees. By modelling in English, it could be bothersome for some employees to discuss and evaluate the process model and problem framework.

Semi-structured interviews consist of broad open-ended questions on key topics (Baumbusch, 2010). It is a suitable interview approach for obtaining comprehensive descriptions on

participant perspectives (e.g. of the referral process) and experiences on certain topics, since the interviewer is not bound to a set of questions from which cannot be deterred (DiCicco-Bloom & Crabtree, 2006; Lambert & Loiselle, 2008). In total, fifteen semi-structured interviews have been conducted.

Multidisciplinary meetings in the form of focus groups are used to model the current process and to identify relevant problems. Focus groups are useful for gaining insight into different perceptions of processes, problems and can be used for gathering information on/for evaluation, discovery, bench marking, verifying, perceptions, feelings, opinions and thoughts (Welch & Patton, 1992). In total, three multidisciplinary meetings have taken place.

Each of the participants receives a unique participant ID for privacy reasons. The semi-structured interviews and multidisciplinary meetings receive a unique meeting ID. By noting down participant and meeting IDs, privacy of the candidates is treasured whilst simultaneously guaranteeing integrity of the collected data (Brock, den Ouden, Langerak, & Podoynitsyna, 2020). Meetings have been recorded for validation purposes.

4.2.2 Process analysis

Process analysis is one of the methods used for creating a more specific evaluation framework. Process modelling is used for mapping the patient referral process in order to identify problematic (non-value adding) activities (Layton et al., 1998). The referral process spans from the first consult at the general practitioner until the first consult at Stadspoli.

Business process modelling notation, also known as BPMN 2.0, is used to model the patient referral process. BPMN 2.0 is a graphical notation for business process design and implementation (Raedts et al., 2007). It supports modelling control flow, data flow and resource allocation (Netjes, Mans, Reijers, Van Der Aalst, & Vanwersch, 2010). In order for business process modelling to be effective, correctness of the process model is of key importance.

For establishing the AS IS business process model (BPM), semi-structured interviews, multidisciplinary meetings (focus groups) are used for mapping the current referral process (David Rasmusson, 2006; Layton et al., 1998; Welch & Patton, 1992). Multidisciplinary meetings and follow-up interviews are used for validation of the process model. Also,

provided SIPOC models are used as a starting point for setting up the process model. SIPOC modelling is a Lean Six Sigma technique that aims on analysing and optimizing business processes and to reduce 'waste' (Conger, 2010; Rasmusson, 2006). SIPOC is an abbreviation for: suppliers, inputs, process, outputs and customers and is used to map business processes. Details such as actual documents, files, data-bases and actual data are also included in SIPOC models (Rasmusson, 2006). SIPOC models are useful for value-added analysis (VAA), which is a technique that highlights process steps that need to be evaluated for elimination, and which can be used for identifying bottlenecks (Conger, 2010). The SIPOC models can be found in Appendix B.

4.2.3 Problem analysis

The second research component for generating a specific framework is a problem analysis. Problems in the current referral process are mainly identified by the use of semi-structured interviews and multidisciplinary meetings (Layton et al., 1998; Welch & Patton, 1992). Since the referral processes are complex, multiple meetings with stakeholders are needed for identifying all relevant problems that fall within the scope of the project. First, a general set of interview questions is used to identify current general problems in the process. After the first meeting, questions are tailored based on the process model to retrieve in-depth information on problems within specific processes during a next (follow-up) meeting. The identified concrete problems are labelled as 'first order' problems. The first order problems are supplemented by a problem analysis provided by MUMC+ (Appendix C) and by patient satisfaction surveys provided by TIPP and Stadspoli (Appendix A, table 25 and table 26). Next, the first order problems are categorized based on subprocesses (second order problems). By the use of triangulation, a comprehensive problem framework can be established (Rowley, 2002).

4.3 Phase 3: Recommendations

4.3.1 Evaluation framework

In first section of third phase of the project, the established problem framework is linked to quadruple aim. Each first order problem will be examined to determine its influence on the quadruple aim and relevant actors in the referral process. This results in a problem-based evaluation framework that can be used to effectively evaluate/monitor each first order problem in the referral process (van Aken et al., 2012).

4.3.2 Process structure improvements

The identified problem fields are prioritized in order to determine the main problems for which recommendations are needed. The prioritization takes place during a multidisciplinary meeting. This meeting is also used for validation of the identified problems. After the meeting, the resulting main problem fields are examined, and relevant recommendations will be given (Layton et al., 1998; van Aken et al., 2012).

5. Literature study

In this section, results of the literature study are presented. The literature study covers the following topics: value-based healthcare, healthcare projects & risks, mapping the patient journey, and finally definition and evaluation of quadruple aim. This section is key for the understanding of important aspects related to healthcare (lean) project management and process redesign, and forms the basis for defining the quadruple aim elements. Literature on value-based healthcare and associated risks are examined to gain a more complete understanding of the concepts which form the basis of the Beweeghuis project and evaluation of healthcare processes. The patient journey is examined in order to support the process modelling effort. Quadruple aim is finally examined in order to create an overview of factors that must be taken into account when setting up a specific evaluation framework.

5.1 Lean Management & Value-based healthcare

According to Teich & Faddoul (2013), lean management is a management approach that is described by five dimensions: identification of customer value, management of the value stream, developing capabilities of flow production, use of pull mechanisms to support flow of materials at constrained operations, and finally the pursuit for reducing waste to zero.

Value-based healthcare is a lean management approach that can be defined as: “the creation and operation of a health system that explicitly prioritizes health outcomes which matter to patients relative to the cost of achieving this outcome” (Economist, 2016). One of the main characteristics in value-based healthcare is the use of a patient-centred approach instead of a provider-based approach (Porter et al., 2013; Putera, 2017). Most value-based healthcare projects are aimed on reducing ineffective and unnecessary treatments of patients. The concept of value-based, patient-centred healthcare challenges healthcare organizations to redesign inefficient processes (Putera, 2017). As mentioned before, the Beweeghuis initiative is an example of a value-based, patient-centred project. Porter et al. (2013) state that primary

care could greatly contribute to value-based healthcare. By substituting secondary (hospital) care by primary care, the number of patients that consume the capacity of the second line can be reduced (van Hoof et al., 2016). In order to align primary care with value-based healthcare, patients and medical must be grouped, and value must be measured along these groups in order to identify value-adding activities. Among medical staff, multidisciplinary, cross-organizational collaboration is of key importance when striving towards patient-centeredness (Porter et al., 2013; van Hoof et al., 2016).

5.2.1 The Patient Journey

The importance of patient-centeredness emphasized by Porter et al. (2013) is elaborated upon in this section. According to Doyle, Lennox, & Bell (2013) and Coulter, Fitzpatrick, & Cornwell (2009) patient experience is one of the main three pillars of quality in healthcare, next to effectiveness and patient safety. Patient experience is formed when healthcare processes and patients meet, and is positively related to health outcomes, healthcare asset usage and treatment adherence (Doyle et al., 2013).

A means to gain insight into a referral process is by the usage of patient journey maps (Trebble & Hydes, 2011; Trebble, Hansi, Hydes, Smith, & Baker, 2010). A patient journey map models the specific process a patient goes through and shows touch points where patient and service meet, which ultimately forms the patient experience (Bate & Robert, 2006; Bessant & Maher, 2009; Zomerdijk & Voss, 2010). The patient journey consists of the physical (functional aspect of patient experience) and the emotional (rational aspect of patient experience) journey of a patient. A patient journey map provides a dynamic, ubiquitous overview of the relation between the customer and the healthcare service (Zomerdijk & Voss, 2010). Knowledge is externalized and insights are gained in the field of patient experience, thus promoting empathy towards patient groups. The map itself consists of three main areas: patient persona, medical timeline and medical pathway (McCarthy et al., 2016). Patient persona is the characterization of a patient group. Medical pathway is the care pathway that the patient goes through; it consists of encounters, tasks, goals, constrains, actors, emotional journey, physical journey and device touch points. Each encounter is subdivided into tasks, which is subdivided into actors, constraints and goals. Encounters are linked to the emotional journey, physical journey and device touch points (McCarthy et al., 2016). See figure 8 and figure 9 for visualizations of the framework by McCarthy et al. (2016). One major

disadvantage of patient journey maps is the high complexity that is associated with healthcare processes, making it hard to model a clear and comprehensive patient journey map of – for example – a complex referral process (McCarthy et al., 2016).

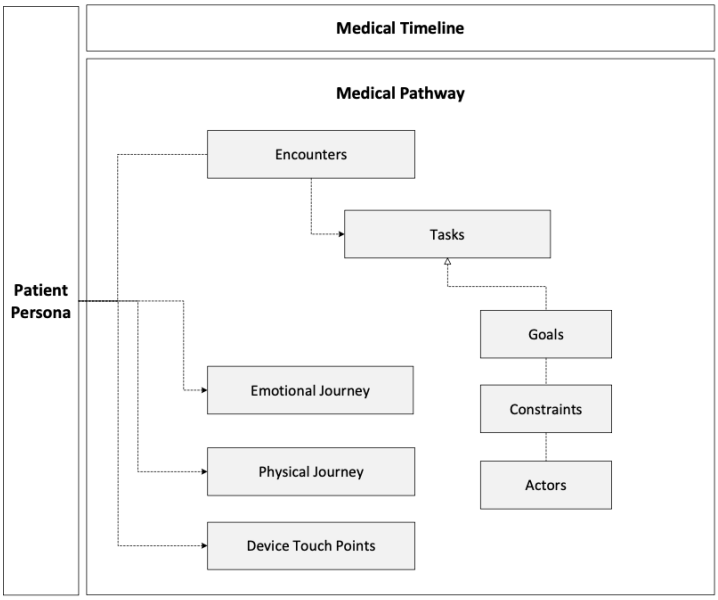

Figure 8 – Patient journey map ontology (McCarthy et al., 2016)

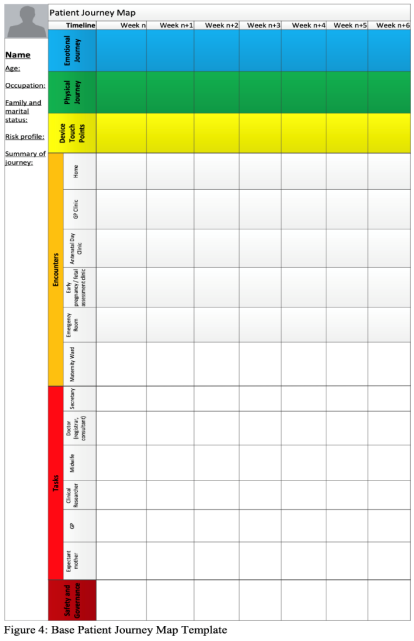

Figure 9 – Base patient journey map template (McCarthy et al., 2016)

5.2.2 Process Mapping the Patient Journey

According to Trebble, Hansi, Hydes, Smith & Baker (2010), reviewing the patient journey is always beneficial. Process mapping the patient journey makes it possible to understand the patient experience by dividing a particular healthcare pathway into series of consecutive steps or events (Kim, Spahlinger, Kin & Billi, 2006). The sequence in which these steps are undertaken is called the patient pathway or process of care (Layton et al., 1998). In order to improve the patient pathway, multidisciplinary collaboration is needed to maximize efficacy, efficiency, effectiveness and to minimize unnecessary care (Trebble et al., 2010). By mapping the patient journey in a process map, data can be obtained which can be used to redesign the patient care path in order to improve quality, efficiency (Layton et al., 1998; NHS Institute, 2007). Process mapping the patient journey can be considered as a lean management redesign approach, also known as lean thinking transformation (Conger, 2010; Kim et al., 2006). Process mapping makes it possible to identify the steps that add value and steps that do not to the patient journey. According to Layton et al. (1998), process mapping has several benefits such as creating a culture of shared responsibility, aid to plan changes, collecting ideas from staff who rarely contribute to change, engaging staff, creating an end product that is easy to

understand, providing a starting point for improvement, and finally understanding a process from a patient perspective.

In order to map the patient process, several steps have to be undertaken (Layton et al., 1998). See figure 10 for an overview of the steps involved in a process mapping exercise. The first step is to select a process requiring pathway redesign. After the identification of the pathway, aims of the project and the evidence base must be agreed upon. Consequently, team members must decide on roles, methods, time frame and locations. The data collection can now be started, which can be done in several ways: using multi-disciplinary meetings, by walking the journey (one-to-one interviews), by direct observation (following patient in real life) or by using patients' self-reported experience (Trebble et al., 2010). After a method is selected and data is collected accordingly, the collected information can be mapped. The first map can now be established (e.g., on paper). Missing data is collected from staff in meetings, or interviews with relevant stakeholders. The map is then finalized, and all activities can be examined from a lean perspective: all activities must add value to the process and must be as simple as possible (Conger, 2010; Kim et al., 2006). After identifying the non-value adding activities, the pathway is redesigned, and a protocol is developed for implementation. Finally, the pathway is implemented, and the process mapping exercise is repeated (before/after mapping). Patient-centredness and patient satisfaction must be monitored when implementing/redesigning the process (Trebble et al., 2010).

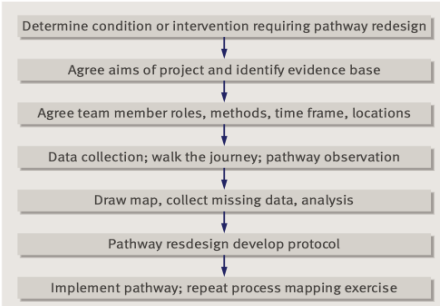

Figure 10 - Steps involved in a process mapping exercise (Trebble et al., 2010)

5.3 Healthcare BPR projects - implementation & risk management

Pursuing lean, value-based healthcare involves the redesign of healthcare processes (Conger, 2010; Kim et al., 2006; Layton et al., 1998). Business process redesign (BPR) within healthcare organizations is in great demand these days; there is more social demand for

structural cost reductions in healthcare (Jansen-Vullers & Reijers, 2005). Business process redesign is an approach which can drastically improve healthcare process performance and process conformance (Awad, Grosskopf, Meyer, & Weske, 2009). Currently, there is a lack of reliable methodology leading to risks involving BPR, meaning that outcomes of BPR projects are hard to predict (Netjes et al., 2010). Healthcare BPR implementation projects are prone to fail because of four factors: lack of cooperation from staff (job cutting), lack of sufficient staff training and skill development related to BPR, buy-in from medical staff, and poor planning (Ho, Chan, & Kidwell, 1999). To be more specific, a study conducted by van Hoof et al. (2016) on Blauwe Zorg identified several factors that need to be clear and in place when substituting secondary care by primary care: general arrangements (legal), IT-systems, participation and involvement of all care providers, profiles of medical specialist, referral patterns, communication between general practitioners and medical specialists, and arrangements regarding diagnostic procedures.

A common methodology which is used to perform BPR project implementations is based on three areas: the customer (patient), the products and the information flow. These dimensions can be used to evaluate the effectiveness and to monitor identified risks of the BPR effort (Mansar & Reijers, 2007). Change management is key for achieving the successful implementation of the changes suggested by a BPR effort. Both social and technical factors could pose threats to the effectiveness of a project (Grover & Malhotra, 1997).

To evaluate general BPR project efforts in general, a methodology based on best practices lists four dimensions which are essential for determining a BPR's effectiveness: cost, time, quality and flexibility; also known as the devil's quadrangle (Mansar & Reijers, 2007). Many BPR projects lack a quantitative evaluation of these factors in order to determine the effectiveness of the redesign (Netjes et al., 2010). In the case of the Beweeghuis project, quadruple aim is selected for evaluation, which includes both qualitative and quantitative elements (Berwick et al., 2008; Bodenheimer & Sinsky, 2014).

5.4 Quadruple aim

Quadruple aim (Bodenheimer & Sinsky, 2014) is an extension of the triple aim framework introduced by Berwick et al. (2008). The triple aim framework consists of patient experience, population health and healthcare costs. Nowadays, large groups of physicians and other

medical staff report burnout related issues and dissatisfaction. Burnout is related to lower patient satisfaction, reduced health outcomes and possible increase of costs (Bodenheimer & Sinsky, 2014). As a result, a fourth aim was added to the Triple Aim framework by Bodenheimer & Sinsky (2014): employee experience. Including this factor is of great importance since it also makes sure that employee experience is taken into account in relevant evaluations. Taking into account employee experience threatens patient-centredness but simultaneously improves patient satisfaction (Bodenheimer & Sinsky, 2014; Porter et al., 2013).

In order to use quadruple aim for setting up an evaluation methodology, each of the broad quadruple aim components must be defined based on the scope of the project. In the end, relevant key performance indicators (KPIs) can be selected to measure each dimension of quadruple aim. A set of four measurement principles has been defined to evaluate triple aim: the need for a defined population; the need for data over time; the need to distinguish between outcome and process measures and between population and project measures, and the value of benchmark or comparison data (Stiefel & Nolan, 2012).

5.4.1 Experience of care

The first quadruple aim element that will be defined is experience of care; a distinction is made between two perspectives: care experience from the patient perspective and patient care experience from the perspective of the care provider.

Wolf, Niederhauser, Marshburn, & Lavela (2014) define patient care experience as "the sum of all interactions, shaped by an organization's culture, that influence patient perceptions, across the continuum of care". Supporting themes include integrated nature (a single experience, not distinct activities) and person-centeredness, which make sure patients feel more connected with the caregiver. A third supporting factor which is key to care experience is patient-family partnership and engagement (Wolf et al., 2014). Dimensions of patient experience can be defined based on the usage of total quality service (TQS) in the healthcare sector (Duggirala, Rajendran, & Anantharaman, 2008a). Seven dimensions of patient experience were defined based on TQS: infrastructure, personnel quality, the process of clinical care, administrative procedures, safety indicators, experience of medical care received, and finally social responsibility.

A specified framework for measuring patient care experience from the perspective of caregivers has been established by Stiefel & Nolan (2012) of the Institute for Healthcare Improvement (IHH) based on a publication by Baker (2001), who established six drivers for excellent experience of care, namely: safety, effectivity, timeliness, patient-centeredness, equitability, and efficiency (see figure 11). Suitable, specific measures can be selected to measure each driver.

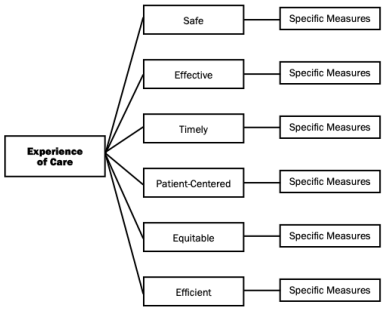

Figure 11 - Drivers of Excellent Experience of Care Based on IOM Six Aims for Improvement (Stiefel & Nolan, 2012)

5.4.2 Population health

Population health is a broad term that can be defined as 'health outcomes of a group of individuals, including the distribution of such outcomes within the group' (Kindig & Stoddart, 2003). Groups of individuals can be formed based on a large variety of selection criteria: geography, ethnicity, tasks (employee groups) or diagnostics (patient groups) (Obucina et al., 2018).

A framework provided by Stiefel & Nolan (2012) based on research on determinants and outcomes of population health by Evans & Stoddart (1990) includes upstream social and physical environmental factors, individual factors, intermediate outcomes, health outcomes and well-being (see figure 12). Population health can be split into prevention and healthcare promotion and actual medical care. Determinants of population health have been subdivided into upstream factors and individual factors. Outcomes for measuring population health have been categorized into intermediate outcomes and health outcomes. Factors that influence population health can be divided into upstream factors and individual factors. Upstream factors consist of socioeconomic factors and the physical environment. Individual factors include genetic endowment, spirituality, resilience, physiological factors and behavioural factors; intermediate factors include disease burden and injury; health outcomes consist of health and function and mortality. The final outcome is quality of life, which is based on the level of well-being.

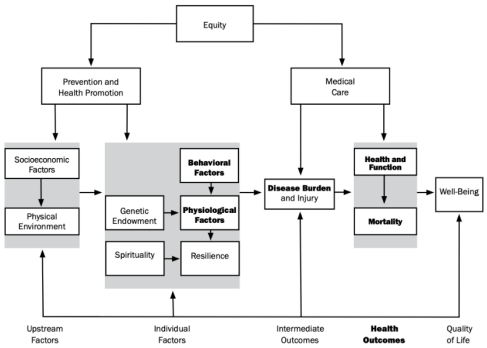

Figure 12 - A Model of Population Health (Stiefel & Nolan, 2012)

5.4.3 Healthcare costs

The third quadruple aim element that will be examined is healthcare costs. The economic definition of cost according to Health Economics Information Resources (2020) is as follows: "the value of opportunity forgone, strictly the best opportunity forgone, as a result of engaging resources in an activity". According to Obucina et al. (2018), healthcare costs can be defined based on overall costs or cost per capita. Using cost per capita is preferable over total expenditure measures, since it involves common monetary units that can be easily aggregated or disaggregated. Defining a population and determining total healthcare costs for calculating the eventual cost per capita is complex, since it is often unclear which individuals to include into a population and to what extent certain cost factors are taken into account (Stiefel & Nolan, 2012).

A specific framework for measuring per capita cost has been established by Stiefel & Nolan (2012) of the Institute for Healthcare Improvement (see figure 13). According to this model, healthcare costs consist of three categories of actors: suppliers (healthcare provider), intermediaries/integrators, and demand (consumers, public/private payers, community).

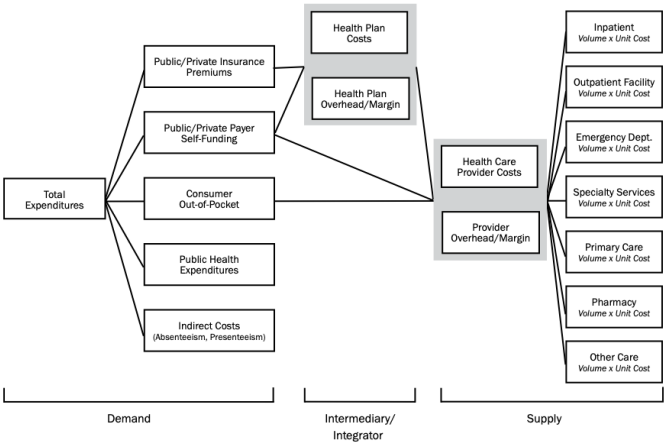

Figure 13 - A Framework for Measuring Per Capita Cost (Stiefel & Nolan, 2012)

5.4.4 Employee experience

The final quadruple aim component that will be examined is employee experience. A common model to define employee experience is the Job Characteristics Model (JCM), which is based on skill variety, task identity, feedback, responsible autonomy and choice autonomy (Hackman and Oldham, 1974). These five characteristics lead to three different psychological states: experienced meaningfulness of work, experienced responsibility for outcomes of work and knowledge of results. Job satisfaction, intrinsic motivation, work effectiveness, reduced absence and reduced turnover are the result of the three critical psychological states. A moderator that influences these outcomes is growth need strength, which is the extent to which people want to develop and grow psychologically (Hackman & Oldham, 1976). See figure 14 for the Job Characteristics Model (Hackman & Oldham, 1976).

In value-based BPR efforts – such as the Beweeghuis project – employee experience could be affected as the result of the introduction of more teamwork and decentralization of authority. Lean management efforts also have an influence on the roles, responsibilities and job characteristics of employees, thus affecting employee experience (Drotz & Poksinska, 2014).

According to Duggirala, Rajendran, & Anantharaman (2008), perceived quality of healthcare (TQM) by employees influences the performance of hospitals. Fourteen distinct dimensions of TQM have been identified based on the perception (experience) of medical staff, that could affect hospital performance. The most relevant provider-perceived dimensions are in this case patient focus, employee focus, hospital information systems, service culture and process

management. Process management is a key component, since the Beweeghuis is a BPR effort; it consists of five dimensions: ease of access to hospital (admission/referral), administrative services, administrative/clinical processes, exit and clinical outcomes of medical care (Duggirala et al., 2008b).

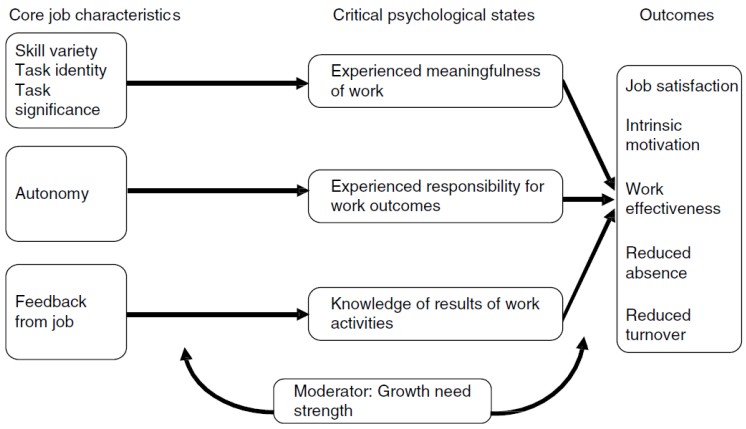

Figure 14 - The Job Characteristics Model (Hackman and Oldham, 1976)

5.5 Conclusion of literature study

Process mapping the patient journey makes it possible to understand the patient experience by dividing a particular healthcare pathway into series of consecutive steps or events (Kim, Spahlinger, Kin & Billi, 2006). By mapping the patient journey in a process map, data can be obtained which can be used to redesign the patient care path in order to improve quality, efficiency (Layton et al., 1998; NHS Institute, 2007). According to Layton et al. (1998), process mapping has several benefits such as the creation of a culture of shared responsibility.

Quadruple aim (Bodenheimer & Sinsky, 2014) is an extension of the triple aim framework introduced by Berwick et al. (2008). The quadruple aim framework consists of patient experience, population health, healthcare costs and employee experience. Patient experience could be determined by measuring six drivers for excellent experience of care, who established six drivers for excellent experience of care, namely: safety, effectivity, timeliness, patient-centeredness, equitability, and efficiency (Baker, 2001). Population health can be determined by measuring perceived health and functioning, disease burden, resilience and wellbeing (Evans & Stoddart, 1990; Stiefel & Nolan, 2012). Healthcare costs can be determined by measuring cost per patient, based on total healthcare provider costs and provider overhead/margin (Stiefel & Nolan, 2012). Employee experience can be measured by

determining skill variety, task identity, task significance, autonomy and feedback within a work setting. Job satisfaction and work effectiveness can be important outcome measures that provide an indication for employee experience (Hackman & Oldham, 1976).

6. Case analysis

In this section, a previous quadruple aim evaluation practice performed by van den Bogaart et al. (2019) is examined, in which Blauwe Zorg is evaluated in its initial (start-up) phase. First, a short description of the case is given. Next, the conducted research methodology for evaluating quadruple aim is examined. The goal of the case analysis is to identify and present useful dimensions and measurement tools for using quadruple aim as an evaluation framework for the Beweeghuis project group.

6.1 Case description & relevance

An increase of collective care expenses during the past years threatens the accessibility, quality, affordability and thus the sustainability of care in the Netherlands. As a result, a set of arrangements has been established to make sure that first line care will substitute second line care in order to reduce costs (Ministerie van Volksgezondheid Welzijn en Sport (VWS), 2013). Blauwe Zorg is one of the regional initiatives that aims on realizing this substitution of healthcare. The movement involved the introduction of 1.5th line care in the region by establishing Stadspoli. To determine the effectiveness of the Blauwe Zorg initiative, quadruple aim has been used as an evaluation framework (Berwick et al., 2008; Bodenheimer & Sinsky, 2014). Since the evaluation methodology in this case aims specifically on measuring the regional impact/effectiveness of the introduction of Stadspoli (1.0) by using quadruple aim, this case is similar and therefore relevant for future regional evaluation of 1.5th line care (Stadspoli 2.0).

6.2 Quadruple aim evaluation methodology

6.2.1 Research methodology

The research methodology of the case can be characterized as longitudinal and observational. Qualitative research in the form of questionnaires has been conducted to determine health of population, patient experience, employee experience and to map the demographics of the intervention and control group. On three different occasions, patients received questionnaires

on population health and patient experience (quality of care): before consult at Stadspoli (T0), directly after the consult at Stadspoli (T1) and three months after the consult at Stadspoli (T2). Experience of healthcare personnel was measured on a yearly basis. Quantitative analysis was conducted on data such as patient volumes, referral decisions and costs. Data was provided by Stadspoli, MUMC+ and insurance companies, and was mainly used for determining healthcare costs. In all cases, data on demographics of participants is collected and used to correct for possible statistical differences. A general overview of the used outcome measures (dimensions) and data sources can be found in figure 15; a process flow diagram of the research procedure patients can be found in Appendix A (figure 23).

Tabel 2.3.1 Demografische kenmerken en uitkomstmaten evaluatie anderhalvelijnszorg

Dimensie	Demografische kenmerken/ uitkomstmaten	Bron	Meetmomenten [a]			
			T0	T1	T2	2014 t/m 2018
Demografische kenmerken	O.a. leeftijd, geslacht, geboorteland en opleidingsniveau	Vragenlijst patiënten, data anderhalvelijnscentra, ziekenhuizen en verzekeraars	x			
Gezondheid van de populatie	Gezondheidsstatus, gezondheidsgerelateerde kwaliteit van leven	Vragenlijst patiënten: EQ-5D-5L	x	x	x	
		Vragenlijst patiënten: EQ-VAS	x	x	x	
		Vragenlijst patiënten: SF-12	x		x	
Ervaren kwaliteit van zorg door patiënten	Kwaliteit van de zorg	Vragenlijst patiënten: CQ-index [b]		x		
	Tijdigheid: aantal dagen tussen verwijzing huisarts en eerste consult met de specialist	*Blauwe Zorg*: vragenlijst patiënten, verwijsdata en data anderhalvelijnscentrum en ziekenhuis		x		x
		MijnZorg: vragenlijst patiënten		x		
Ervaring zorgprofessionals	Ervaringen en tevredenheid van zorgprofessionals met 1,5e lijn	Vragenlijst zorgprofessionals (huisartsen en specialisten)				x
Zorgkosten	Volume in de 1,5e lijn: aantal patiënten en consulten	Data anderhalvelijnscentra, ziekenhuizen en verzekeraars				x
	Verwijsbeslissingen: % patiënten verwezen naar 2e lijn na consult in 1,5e lijn	Data anderhalvelijnscentra en ziekenhuizen				x
	Zorgkosten per patiënt in de 1,5e en 2e lijn	Data anderhalvelijnscentra en ziekenhuizen				x
	Trends in de regio in de 1,5e en 2e lijn	Data anderhalvelijnscentra[c], ziekenhuis[c] en zorgverzekeraars [b]				x

[a] T0 = vóór het eerste consult, T1 = direct na eerste consult, T2 = 3 maanden na eerste consult, 2014-2018 = overige dataverzameling gedurende het onderzoek naar anderhalvelijnszorg
[b] Voor zowel Blauwe Zorg als MijnZorg
[c] Voor Blauwe Zorg

Figure 15 - Demographical features and outcome measurements for evaluation of 1.5th line care (van den Bogaart et al., 2019)

6.2.2 Dimensions and measurement tools

By examining figure 15 and the used tools for measuring quadruple aim in the case, a set of dimensions per quadruple aim element can be identified. An overview of the measured dimensions per aim can be found in table 1.

Patient-reported outcome measures (PROMs) are standardized validated instruments (question sets) to measure patients' perceptions of their health status (impairment), functional status (disability) and health-related quality of life (well-being) (Coulter et al., 2009). Health of population is measured by determining health and functioning, disease burden and wellbeing among patients. In this case, EQ-5D-5L, EQ-VAS, SF-12 are the used standardized, validated measurement tools for measuring population health. Questionnaires EQ-5D-5L and SF-12 are used for determining health condition and functioning (Mols et al., 2009; Versteegh et al., 2016). Functioning is measured by determining mobility, self-care, daily activities, pain/unease, and anxiety/depression. Perceived health condition is determined

by physical functioning, role restriction, social functioning and emotional role restriction. EQ-VAS is selected for determining patient wellbeing and is included in questionnaire EQ-5D-5L. Wellbeing is measured by determining mental health, vitality and pain.

Patient-reported experience measurements (PREMs) can be used for assessing patient experience (de Boer, Bos & Triemstra, 2020). PREMs consist of standardized questionnaires which are shorter and more generic. The Consumer Quality Index (CQ-index) is a collection of questionnaires for measuring perceived healthcare quality/patient experience (de Boer, Bos & Triemstra, 2020). Patient experience is determined by measuring effectiveness, timeliness, patient-centeredness and efficiency by measuring the CQ-index and items on collaboration between GP and specialist, general sentiment (grade), and the degree of recommendation to family/friends. Timeliness is measured by asking the time from the first primary line consult until the first consult takes place at Stadspoli.

Experience of care professional has been measured by established questionnaires with items on timeliness, work effectiveness and job satisfaction with regards to the introduction of Stadspoli. Care professionals also indicate general perceived effects of Blauwe Zorg by rating knowledge enhancement, quality of care, efficiency (timeliness), healthcare costs and the number of referrals to the second line. The conducted questionnaires differed between GPs and specialists.

Healthcare costs have been determined by a multivariate multilevel analysis on provided datasets on (total) healthcare costs and patient/consult volumes. Cost per capita has been computed based on costs within/outside specialism. Referral decisions are mapped to determine the percentage of patients that is referred to the second line after the first consult at Stadspoli.

Table 1 - Case measurements

Quadruple aim	Outcome measures used in research methodology
Health of population	**Functioning**: mobility, self-care, daily activities, pain/unease, anxiety/depression **Perceived health condition:** physical functioning, role restriction, social functioning, emotional role restriction

	Wellbeing: mental health, vitality, pain
Quality of care perceived by patients	Effectiveness, timeliness, patient-centeredness and efficiency
Experience of care professionals	Timeliness, work effectiveness, job satisfaction, knowledge enhancement, quality of care, efficiency, healthcare costs and referral frequency.
Healthcare costs	Average cost per capita. Number of referrals, costs within/outside specialism.

7. Process analysis

In the process analysis, the patient referral process is mapped in BPMN 2.0 in order to get an overview of the steps involved from the first contact with the patient at the GP until the first appointment at Stadspoli (Kim et al., 2006; Layton et al., 1998). The current (AS IS) referral process has been modelled. For establishing the AS IS BPM, SIPOC models, protocols (TIPP), semi-structured interviews and multidisciplinary meetings were used (Conger, 2010; David Rasmusson, 2006; Welch & Patton, 1992).

Two SIPOC models (Appendix C) have been provided by ZIO: one which maps a general referral process via TIPP (referral application). The other model maps the referral process to the Stadspoli/MUMC+. Combined, these models provide a basic understanding for modelling the patient journey from the first consult at a GP/specialist until the actual appointment at Stadspoli in BPMN 2.0 (Kim et al., 2006).

A log of the semi-structured interviews, multidisciplinary meetings and other data sources used for constructing the AS IS BPM can be found in Appendix A, table 5.

7.1 AS IS Process model

The extensive BPM based on the SIPOC models, protocols, multidisciplinary meetings and semi-structured interviews can be found in Appendix D. The model provides overview of the patient journey as well as the administrative processes in the referral process. The BPM also includes the used IT-systems and objects used in each step. The process model has been mapped in one lane to provide overview. In total, about 150 activities have been mapped, of

which some are duplicated in order to separate flows of referrals. Colours are used to indicate actions of specific organizations based on location. Several groups of small sequential tasks have been grouped into subtasks in order to summarize and simplify the complete BPM (see Appendix A, table 27 for contractions). The resulting, smaller comprehensive process model can be found in figure 16.

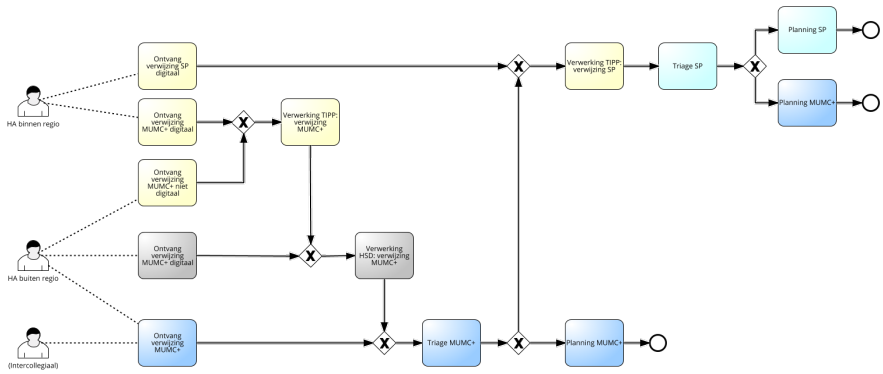

Figure 16 - AS IS process model (simplified)

7.2 Identified processes

By examining the extensive process mode in Appendix D, the following main processes have been identified.

Sending referrals

The referral process includes three different types of referrals which can finally end up at the Stadspoli (via TIPP): referrals sent by GPs within region (TIPP partners), referrals sent by external GPs (non-TIPP partners), and intercollegiate referrals from other departments of MUMC+.

Appointments at Stadspoli can only be planned via TIPP. The three main types of referrals can be divided into two main streams of referrals: referrals directly sent to TIPP and referrals which are indirectly sent to TIPP. Direct referrals to TIPP consist of 1.5th line and second line referrals by GPs using the TIPP application and by letters/mails directly sent to TIPP by non-TIPP partners. TIPP can only plan the 1.5th line appointments for orthopaedics, meaning that all second line referrals to TIPP are processed/digitalised and sent to the second line (GP service desk, HSD). Indirect referrals to TIPP consist of second line referrals sent to MUMC+ by GPs and other caregivers/medical specialists (intercollegiate). Referrals to MUMC+ can be sent to the poli directly or to the HSD. In both cases, all referrals are processed, digitalised and completed by administrative staff. In the case of the HSD, the referrals all end up digitally

at Zorgmail (TWMS system) after which they are completed and sent to the poli. At the poli of orthopaedics, administrative staff triages cases to MUMC+ or Stadspoli. The complex cases/intercollegiate cases are examined by specialists and returned to Stadspoli. All cases that are suitable for Stadspoli are sent to TIPP.

Processing referrals and planning consults

After the referrals have arrived at TIPP, they are processed, digitalized and completed if needed. Next, the patient is called for planning a consult at Stadspoli. A scan must be present for each orthopaedic consult at Stadspoli. If there is no photo/scan present in the referral document, patients must first go the GP and MUMC+ consecutively to take photos. The appointment at Stadspoli can still be planned, but only in timeslots two weeks later. In the case that timeslots are not open in SAP, TIPP contacts Stadspoli, and the patient is instructed to wait until the timeslots are opened by Stadspoli.

Triage (Stadspoli)

When the appointment has been planned on a timeslot, the referral is automatically sent to Stadspoli via the mail address of Brugpoli to be examined for eligibility. If a patient is eligible, he/she can visit Stadspoli for a consult with a specialist. If a patient is not eligible, the patient is referred to the second line and the consult must be cancelled. During the consult at Stadspoli, the specialist determines if the patient needs an extra follow-up consult, telephonic consult, or second line consult.

Support processes

Several processes have been identified that support the main process. The first main support process is the planning process. A patient can only be planned at Stadspoli when working schedules of the orthopaedic department are delivered on time to Stadspoli. If Stadspoli receives the working schedules, timeslots are opened after which TIPP is notified that slots for a certain period are open. Patients can now be planned in these timeslots. The second support process is the monitoring process. Multiple reports to monitor – for example – patient volumes and waiting times are produced separately by ZIO, MUMC+, Stadspoli and TIPP. Finally, smaller support tasks/processes such as the processing of phone calls by patients and GPs to TIPP (cancellation, follow-up, questions), cancellation/alteration of consults by orthopaedic specialists at Stadspoli, and checks on the planning of appointments in the second line have been integrated into the process model.

8. Problem analysis

In this section of the project, identified problems are mapped. Next, six main problem fields are identified based on a multidisciplinary meeting and by examiniation of the process model.

8.1 Problem framework

In this section of the project, problems occurring in the current referral process are identified based on the semi-structured interviews, multidisciplinary meetings and the AS IS process model, and are comprehensively mapped. The identified problems are categorized and supplemented by a previous problem analysis on the Beweeghuis project provided by MUMC+ (Probleemdefinitie SW, 2020). This problem analysis has been included in Appendix B. Results of patient satisfaction surveys provided by TIPP and Stadspoli have also been integrated into the identified problem areas (Appendix A, table 25 and 26). During each interview and multidisciplinary meeting, concrete problems in the referral process were noted down (see Appendix A, Table 7-24). Next, the identified problems were triangulated into first-order problems. By using the unique index allocated to each of the interviews, multidisciplinary meetings and used files, problems could be linked indirectly to participant IDs/sources (Rowley, 2002). Next, the first-order problems have been categorized based on identified subprocesses in the AS IS process model. The resulting first order and second order problems are structured and presented in a comprehensive problem framework (see figure 17). The problem framework forms the basis for establishing a problem-based evaluation framework.

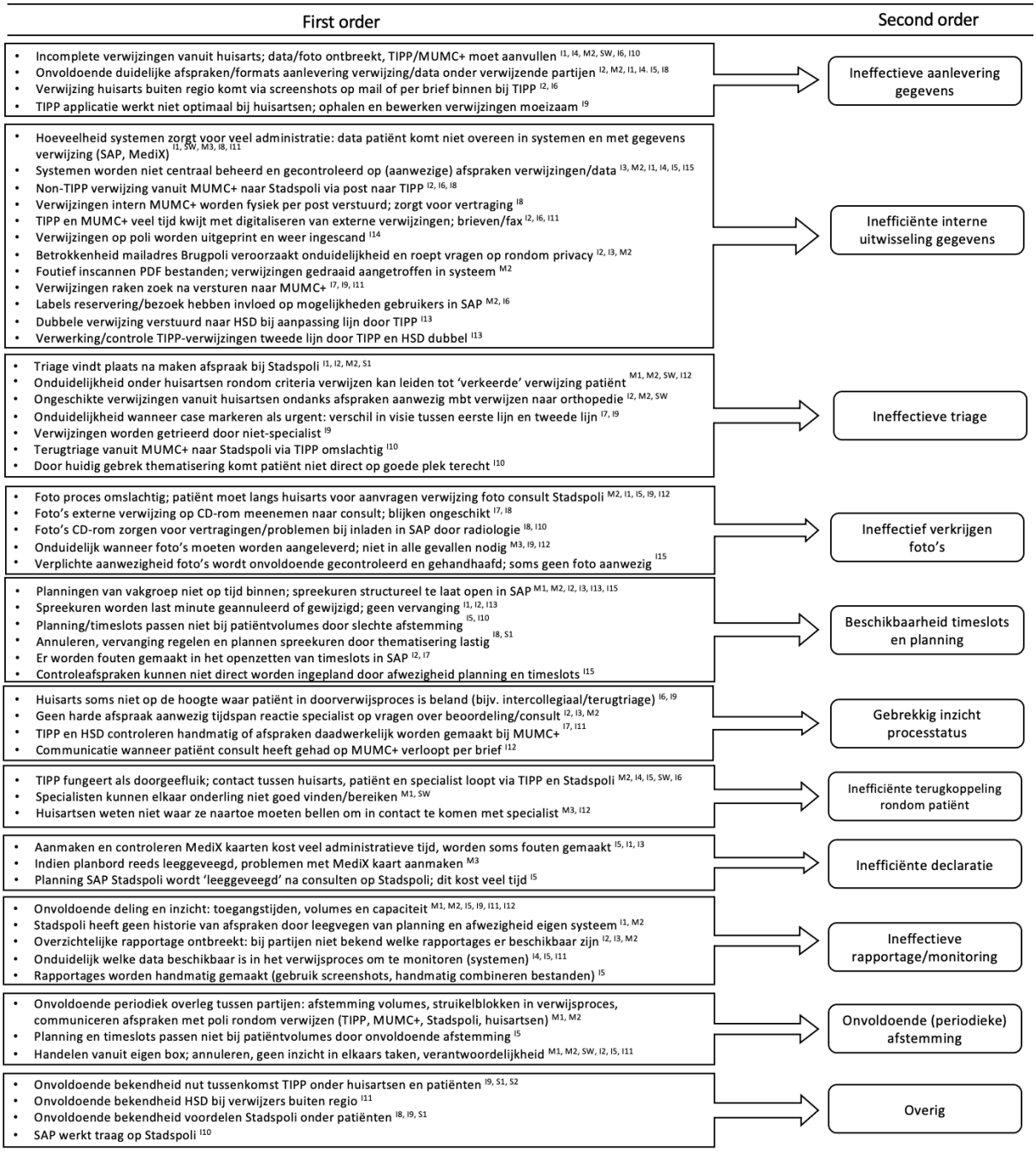

Figure 17 - Problem framework

8.2 Identified main problems

Six main problem areas are discussed in this section. The third multidisciplinary meeting was used for determining the main problems in the referral process, next to individual assessment and examination of the comprehensive process model.

The first main problem is the placement of the triage in the process. In the current referral process, triage takes place after a consult at Stadspoli has been planned on a timeslot by TIPP. This results in the following set of problems. First of all, appointments are planned for patients at Stadspoli, despite the fact that they are not eligible for a consult at Stadspoli. This implicates that the consult of a patient can be cancelled, and that the patient has to start a new care trajectory to secondary care (MUMC+), thus increasing waiting time. TIPP receives negative comments by patients as the result of the cancellations, because patients anticipate that they had planned a consult at Stadspoli. This influence of timeliness on patient satisfaction is confirmed by (Bleustein et al., 2014). The unnecessary consumption of vacant timeslots in SAP can also affect waiting time of future patients. Moreover, TIPP loses time by processing referrals that should have gone directly to MUMC+.

The second main problem involves the processing of direct second line TIPP referrals from GPs. In the current situation, TIPP directly receives 2nd line referrals, which TIPP cannot plan. Patients are called by TIPP to inform the patient that TIPP cannot plan a consult at MUMC+. After informing the patient, the referral is sent to the HSD (GP service desk) at MUMC+, which checks the referral and sends it to the department of orthopaedics, where it is processed. Both TIPP and HSD check if an appointment has been made in the second line. In short, this process involves double administrative work and double manual checks on the second line planning process. It also confuses patients who do not understand the involvement of TIPP in this process.

The third main problem involves the process with regards to scans/photos. Since the triage takes place after making the appointment, the patient only has two weeks to visit the GP, and to go to the radiology department at MUMC+ for a photo/scan. These photos/scans are obligatory for each consult to take place; however, photos/scans are not necessary in all cases. Also, photos are often missing or not useable when taken externally. Finally, photos are sometimes missing when a consult takes place. To summarize, three elements are problematic in the current process with regards to photos/scans: lacking indication when a photo is needed, cumbersome referral for a photo/scan via TIPP and GP, and the absence of checks for presence of photos/scans before consults.

The fourth main problem involves the presence of timeslots in SAP. Often, timeslots are not open on time, which results in a long waiting time for patients (cannot be planned). In some

cases, patients have to wait on the opening of timeslots and are then notified that they are not suitable for Stadspoli. Sometimes, consults are cancelled late by medical staff of MUMC+, which results in extra administrative time (call and alter consult for each patient). The main cause of this issue is the absence of clear arrangements regarding the delivery of working schedules by the poli of orthopaedics to Stadspoli.

The fifth main problem is that several parties in the referral process independently monitor data and make reports on patient volumes, consults, costs and waiting times. The reports are not shared and discussed among parties in the referral process. It is also unclear which specific data is available in the referral process (systems). Moreover, reports are often made by hand. As a result, parties cannot optimally adapt to patient volumes and waiting times, which results in timeslots at Stadspoli that do not match patient quantities. Another noteworthy problem is that Stadspoli itself has no independent information system, since it uses the SAP IT-system of MUMC+. As a result, weekly schedules containing crucial patient data are wiped from the system to support the declaration process.

The sixth main problem is that data is not transferred efficiently in the current referral process. For example, GPs from outside (non-TIPP) send their referrals by using screenshots and data in formats based on the information systems that they use. These referrals are collected at MUMC+ and then sent to TIPP via email or mail. Often, patient data is missing or incorrect. As a result, TIPP/MUMC+ loses a lot of time only by digitalizing these referrals. The most recent patient data (address, phone number etc.) is not synchronized along the systems used in the referral process. Sometimes, TIPP/MUMC+ has to call or email with parties to retrieve correct patient data, which is also time consuming. MUMC+ only notices if patient data is incorrect if a patient does not show up at a consult (no-show), indicating that the patient did not receive a call-up via (e)mail. Lee et al. (2017) confirm that data in electronic medical records (EMR) is often incomplete due to irregular, long term data collection. In short, there are no clear formats or guidelines present for referring to MUMC+/TIPP: both the content of the referral as well as the criteria for referral to a careline are not clearly communicated to the referring parties.

9. Evaluation framework

In this section, the results from the literature study and case study are combined with the insights gained from the process and problem analysis. The process-based problem framework provides the basis for a solution-based evaluation framework that helps evaluating and prioritizing issues in the current referral process (van Aken et al., 2012).

The influence of the grouped first problems on both quadruple aim and actors in the process is presented in the framework (figure 18). The established evaluation framework can be used for identifying and tackling the problems whilst taking into account the stakeholders who are involved in and/or affected by evaluating/solving a particular first order problem. A brief description of the link between each first order problem and quadruple aim can be found in Appendix A, table 28.

Second order	First order	Quadruple aim				Actors							
		Population health	Patient Experience	Employee Experience	Healthcare costs	Patient	GP	Specialist	TIPP	Stadspoli	Poli	HSD	Brugpoli
Ineffectieve aanlevering gegevens	Incomplete verwijzingen vanuit huisarts; data/foto ontbreekt, TIPP/MUMC+ moet aanvullen [I1, I4, M2, SW, I6, I10]			x	x				x		x	x	
	Onvoldoende duidelijke afspraken/formats aanlevering verwijzing/data onder verwijzende partijen [I2, M2, I1, I4, I5, I8]			x	x		x		x		x	x	
	Verwijzing huisarts buiten regio komt via screenshots op mail of per brief binnen bij TIPP [I2, I6]			x	x		x		x		x	x	
	TIPP applicatie werkt niet optimaal bij huisartsen; ophalen en bewerken verwijzingen moeizaam [I9]			x	x		x		x				
Inefficiënte interne uitwisseling gegevens	Hoeveelheid systemen zorgt voor veel administratie: data patiënt komt niet overeen in systemen en met gegevens verwijzing (SAP, MediX) [I1, SW, M3, I8, I11]		x	x	x	x			x	x	x	x	
	Systemen worden niet centraal beheerd en gecontroleerd op (aanwezige) afspraken verwijzingen/data [I3, M2, I1, I4, I5, I13]		x	x	x		x		x		x	x	
	Non-TIPP verwijzing vanuit MUMC+ naar Stadspoli via post naar TIPP [I2, I6, I8]			x	x				x		x		
	Verwijzingen intern MUMC+ worden fysiek per post verstuurd; zorgt voor vertraging [I8]			x	x			x					
	TIPP en MUMC+ veel tijd kwijt met digitaliseren van externe verwijzingen; brieven/fax [I2, I6, I11]			x	x				x		x		
	Verwijzingen op poli worden uitgeprint en weer ingescand [I14]			x	x						x		
	Betrokkenheid mailadres Brugpoli veroorzaakt onduidelijkheid en roept vragen op rondom privacy [I2, I3, M2]			x					x	x			x
	Foutief inscannen PDF bestanden; verwijzingen gedraaid aangetroffen in systeem [M2]			x				x			x		
	Verwijzingen raken zoek na versturen naar MUMC+ [I7, I9, I11]		x	x	x						x		
	Labels reservering/bezoek hebben invloed op mogelijkheden gebruikers in SAP [M2, I6]			x	x			x		x			
	Dubbele verwijzing verstuurd naar HSD bij aanpassing lijn door TIPP [I13]			x					x			x	
	Verwerking/controle TIPP-verwijzingen tweede lijn door TIPP en HSD dubbel [I13]			x	x				x			x	
Ineffectieve triage	Triage vindt plaats na maken afspraak bij Stadspoli [I1, I2, M2, S1]		x	x	x	x			x	x			
	Onduidelijkheid onder huisartsen rondom criteria verwijzen kan leiden tot 'verkeerde' verwijzing patiënt [M1, M2, SW, I12]		x	x		x	x				x		
	Ongeschikte verwijzingen vanuit huisartsen ondanks afspraken aanwezig mbt verwijzen naar orthopedie [I2, M2, SW]		x	x	x		x				x		
	Onduidelijkheid wanneer case markeren als urgent: verschil in visie tussen eerste lijn en tweede lijn [I7, I9]		x	x			x	x			x		
	Verwijzingen worden getrieerd door niet-specialist [I9]			x						x	x		
	Terugtriage vanuit MUMC+ naar Stadspoli via TIPP omslachtig [I10]		x		x	x		x	x	x			
	Door huidig gebrek thematisering komt patiënt niet direct op goede plek terecht [I10]	x	x		x	x	x			x	x		
Ineffectief verkrijgen foto's	Foto proces omslachtig; patiënt moet langs huisarts voor aanvragen verwijzing foto consult Stadspoli [M2, I1, I5, I9, I12]		x		x	x	x		x	x			
	Foto's externe verwijzing op CD-rom meenemen naar consult; blijken ongeschikt [I7, I8]	x	x	x	x	x		x		x			
	Foto's CD-rom zorgen voor vertragingen/problemen bij inladen in SAP door radiologie [I8, I10]			x	x						x		
	Onduidelijk wanneer foto's moeten worden aangeleverd; niet in alle gevallen nodig [M3, I9, I12]		x	x	x		x						
	Verplichte aanwezigheid foto's wordt onvoldoende gecontroleerd en gehandhaafd; soms geen foto aanwezig [I15]		x	x	x	x	x	x		x			
Beschikbaarheid timeslots en planning	Planningen van vakgroep niet op tijd binnen; spreekuren structureel te laat open in SAP [M1, M2, I2, I3, I13, I15]	x	x	x	x	x			x	x	x		
	Spreekuren worden last minute geannuleerd of gewijzigd; geen vervanging [I1, I2, I13]	x	x	x	x	x		x	x	x			
	Planning/timeslots passen niet bij patiëntvolumes door slechte afstemming [I5, I10]	x	x	x	x	x		x	x	x			
	Annuleren, vervanging regelen en plannen spreekuren door thematisering lastig [I8, S1]			x	x			x					
	Er worden fouten gemaakt in het openzetten van timeslots in SAP [I2, I7]	x	x	x	x				x	x			
	Controleafspraken kunnen niet direct worden ingepland door afwezigheid planning en timeslots [I15]	x	x		x					x	x		
Gebrekkig inzicht processtatus	Huisarts soms niet op de hoogte waar patiënt in doorverwijsproces is beland (bijv. intercollegiaal/terugtriage) [I6, I9]			x			x				x		
	Geen harde afspraak aanwezig tijdspan reactie specialist op vragen over beoordeling/consult [I2, I3, M2]			x				x		x			
	TIPP en HSD controleren handmatig of afspraken daadwerkelijk worden gemaakt bij MUMC+ [I7, I11]			x	x	x			x		x	x	
	Communicatie wanneer patiënt consult heeft gehad op MUMC+ verloopt per brief [I12]			x			x				x		
Inefficiënte terugkoppeling rondom patiënt	TIPP fungeert als doorgeefluik; contact tussen huisarts, patiënt en specialist loopt via TIPP en Stadspoli [M2, I4, I5, SW, I6]		x	x	x	x	x		x	x	x		
	Specialisten kunnen elkaar onderling niet goed vinden/bereiken [M1, SW]			x				x			x		
	Huisartsen weten niet waar ze naartoe moeten bellen om in contact te komen met specialist [M3, I12]			x			x				x		
Inefficiënte declaratie	Aanmaken en controleren MediX kaarten kost veel administratieve tijd, worden soms fouten gemaakt [I5, I1, I3]		x	x	x	x				x			x
	Indien planbord reeds leeggeveegd, problemen met MediX kaart aanmaken [M3]			x						x			x
	Planning SAP Stadspoli wordt 'leeggeveegd' na consulten op Stadspoli; dit kost veel tijd [I1]			x	x					x			x
Ineffectieve rapportage/monitoring	Onvoldoende deling en inzicht: toegangstijden, volumes en capaciteit [M1, M2, I5, I9, I11, I12]	x	x	x	x	x	x	x	x	x	x	x	
	Stadspoli heeft geen historie van afspraken door leegvegen van planning en afwezigheid eigen systeem [I1, M2]			x	x					x			x
	Overzichtelijke rapportage ontbreekt: bij partijen niet bekend welke rapportages er beschikbaar zijn [I2, I3, M2]			x	x		x	x	x	x	x	x	
	Onduidelijk welke data beschikbaar is in het verwijsproces om te monitoren (systemen) [I4, I5, I11]			x	x		x	x	x	x	x	x	
	Rapportages worden handmatig gemaakt (gebruik screenshots, handmatig combineren bestanden) [I5]			x	x		x	x	x	x	x	x	x
Onvoldoende (periodieke) afstemming	Onvoldoende periodiek overleg tussen partijen: afstemming volumes, struikelblokken in verwijsproces, communiceren afspraken met poli rondom verwijzen (TIPP, MUMC+, Stadspoli, huisartsen) [M1, M2]			x	x		x	x	x	x	x		
	Planning en timeslots passen niet bij patiëntvolumes door onvoldoende afstemming [I5]		x	x	x	x		x	x	x	x		
	Handelen vanuit eigen box; annuleren, geen inzicht in elkaars taken, verantwoordelijkheid [M1, M2, SW, I2, I5, I11]			x			x	x	x	x	x	x	x
Overig	Onvoldoende bekendheid nut tussenkomst TIPP onder huisartsen en patiënten [I9, S1, S2]		x	x		x	x		x				
	Onvoldoende bekendheid HSD bij verwijzers buiten regio [I11]			x	x		x					x	
	Onvoldoende bekendheid voordelen Stadspoli onder patiënten [I8, I9, S1]		x	x		x	x			x			
	SAP werkt traag op Stadspoli [I10]			x				x		x			

Figure 18 - Problem-based evaluation framework

10. Conclusion & Recommendations

In this section, the main research question is answered based on the conclusions based on the sub research questions. Recommendations are also included in this section of the report.

10.1 Conclusions

What is quadruple aim and how can it be used to evaluate the Beweeghuis project?

Quadruple aim (Bodenheimer & Sinsky, 2014) is an evaluation framework for healthcare projects that consists of four dimensions: patient experience, health of population, healthcare costs and employee experience. Quadruple aim can be used for healthcare project evaluation by identifying suitable dimensions and outcome measurements for each of the aims. With regards to this project, useful determinants, dimensions and several relevant outcome measurement tools can be found in section 5 and 6.

What evaluation methodology is used in similar value-based healthcare projects to evaluate quadruple aim?

By conducting a case analysis performed on a previous quadruple aim evaluation effort on Blauwe Zorg, insights were obtained in how quadruple aim can be effectively used for evaluating similar healthcare projects. The methodology section in the case provides a step-by-step guide in how to set up the evaluation methodology. The most relevant dimensions per quadruple aim component must be identified based on the project. Consequently, these dimensions can be evaluated/monitored based on selected outcome measurement methods. Standardized, validated questionnaires/items such as CQ-index, SF-12, EQ-VAS and EQ-5D-5L are be used for measuring the selected subdimensions (Mols et al., 2009; Versteegh et al., 2016). Data on volumes and total healthcare costs is used for measuring quantitative dimensions such as cost per capita. Finally, population demographics of both patients and employees, data sources and test moments are selected based on the measurement tools selected for the to be measured dimensions. A summary of the case can be found in section 6, figure 15.

What main processes are involved in the current orthopaedic referral process?

Several main processes can be identified by examining the established process model. A summarized process model can be found see section 7, figure 16.

- *Sending referrals*
    - *GP within TIPP region directly refers to Stadspoli via TIPP*
    - *GP within TIPP region refers to second line via TIPP*
    - *GP outside of TIPP region refers to TIPP, HSD or poli*
    - *Intercollegiate consults resulting in referral to Stadspoli*

- *Processing referrals (TIPP)*
- *Triage (Stadspoli):* selecting cases suitable for the second line occurs before a consult at Stadspoli (by support staff) and during the consult at Stadspoli (by medical specialist).
- *Processing referrals (HSD)*
- *Triage (MUMC+)*: administrative employee/medical specialist assigns case to 1.5th line care or to second line care.
- *Support processes*
    - *Making work schedules and opening timeslots in SAP*
    - *Monitoring data (e.g., patient volumes and waiting times)*
    - *Processing calls (e.g., cancellation/alteration of consults, planning follow-up appointments)*

What main problems can be identified in the current orthopaedic referral process?
Based on semi-structured interviews and multidisciplinary meetings with ZIO, TIPP, Stadspoli, GPs, and medical and administrative staff of MUMC+, in addition to examining patient satisfaction research conducted by Stadspoli and TIPP, a complete overview of relevant problems occurring in the current referral process has been formed. The triangulated first-order problems can be structured into second-order problems based on the mapped referral processes. This contributes towards establishing clear, process-based solution directions (Rowley, 2002; van Aken et al., 2012). Six main problems were identified and selected during the third multidisciplinary meeting with ZIO, TIPP, Stadspoli and MUMC+, and after individual examination of the process model. The main problems are: placement of triage in the referral process, processing of second line referrals by TIPP, unclarity with regards to cumbersome photo/scan process, planning consults in SAP, data monitoring, and finally transferring data.

What aspects of quadruple aim can be used to evaluate identified problems?
Based on the results of the literature study and the case analysis, relevant dimensions have been identified for each of the quadruple aim elements (see section 7). Each identified first order problem is examined to determine its effect on the quadruple aim and corresponding actors in the process. This is useful for the Beweeghuis project group for tracking and evaluating the specific problems in/along the referral process. The resulting problem-based evaluation framework can be found in section 9, figure 18. The research methodology

conducted in the analysed case can be used as a useful guide for setting up the eventual evaluation methodology.

After examining the conclusions, the main research question '*How can the Beweeghuis project group improve and evaluate aspects of the current orthopaedic referral process based on quadruple aim?'* can be answered as follows. By creating overview over both the referral process and present problems, the location of each problem can be traced in the current process. The problems can be evaluated by using relevant measurement methods based on the selected dimensions per quadruple aim element. Consequently, collected data can be used for improving and determining the effectiveness of structural changes in the referral process.

10.2 Recommendations

What can mainly be improved in the current orthopaedic referral process?

Recommendations with regards to the current referral process are based on the six main problem areas.

The first main recommendation is to place the triage before planning an appointment at Stadspoli (see figure 19). Patients do not have to wait on the check for eligibility, thus decreasing waiting time. By supporting GPs with clear referral guidelines to MUMC+ or Stadspoli, the patient is directly referred to the most suitable caregiver. These triage guidelines should include referral criteria and the format in which referrals must be communicated. This solution could reduce waiting time of patients, next to administrative processing time of referrals. A reduction in waiting time can lead to higher levels of patient satisfaction (Bleustein et al., 2014). The guidelines could be established by orthopaedic specialists of MUMC+. Triage will take place at the GP instead of Stadspoli. This triage can be integrated in the TIPP application which is used by the GP.

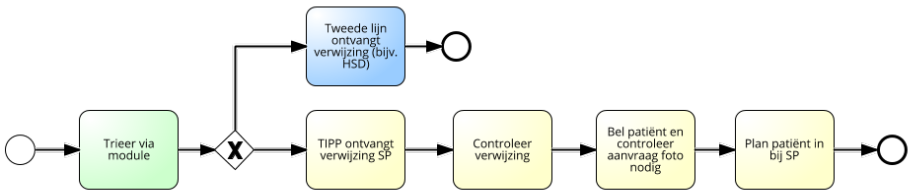

Figure 19 - Solution design 1

The second recommendation is to redesign the flow of direct second line TIPP referrals (see figure 20). The TIPP referrals cannot be planned and must therefore be sent directly to the second line. All regional second line referrals should be sent to the HSD. This can be adjusted in the TIPP application at the GP.

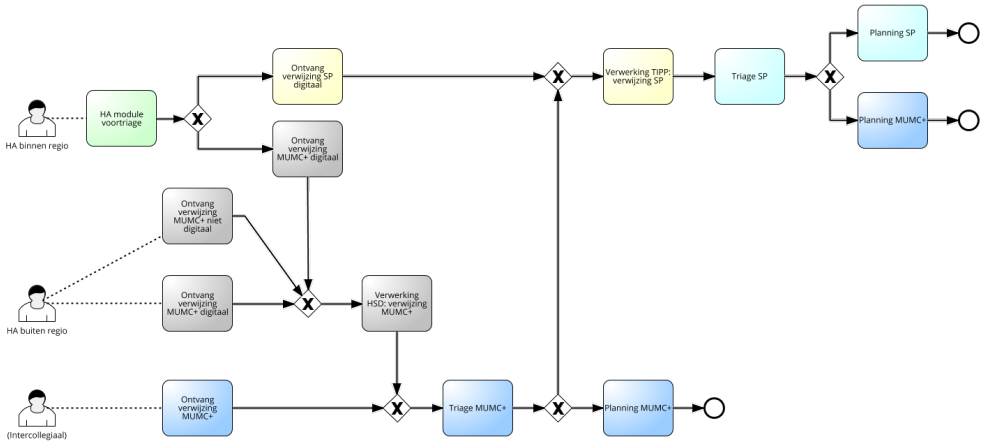

Figure 20 - Solution design 2

The third recommendation is to redesign the photo/scan process (figure 21). By communicating and following a set of well-established guidelines, it is clear among GPs/specialists when to include photos, and when to refer a patient to a certain specialism (GP). Also, scans must only be performed in cases in which it is necessary. To summarize, it must be determined when to include a photo, who makes the photo/scan appointment, and who checks the availability of photos/scans prior to the consult.

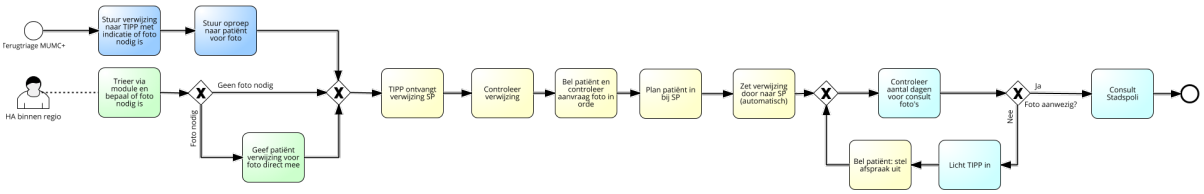

Figure 21 - Solution design 3

The fourth recommendation is to create overview of current data reporting, and to check which useful data is included in each of the reports. Lee et al. (2017) state that data integration helps providing users a unified view. By having a clear overview of the data available, reports could be merged into one insightful report/dashboard, which shows key data about the referral process (KPIs). Parties can discuss in multidisciplinary meetings which data

is the most crucial for monitoring. Determining all stakeholders needs and requirements are key towards system redesign efforts (Keshavjee et al., 2006). It must be investigated which specific data can be (automatically) obtained from systems like SAP. By discussing the resulting insightful report(s) in multidisciplinary meetings, a better balance could be achieved in matching demand and supply of movement related care, thus reducing healthcare costs and contributing towards lower waiting times for patients. Finally, Stadspoli should be enabled to store and monitor its own data. This can be achieved by redesigning the (digital) declaration process. See figure 22 for a step by step guide for setting up the monitoring process.

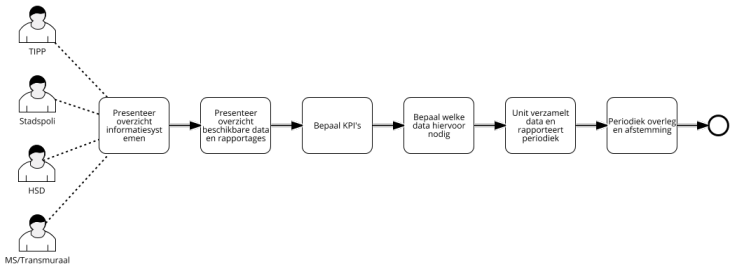

Figure 22 - Setting up a monitoring system

The fifth recommendation is that clear arrangements must be made regarding the delivery of the working schedules by the poli of orthopaedics to Stadspoli, in order to reduce waiting times for patients processed by TIPP. The arrangements make sure that patients can be planned directly. Administrative time at TIPP is saved as a result.

The sixth recommendation is the introduction of clear guidelines and formats for referrals to MUMC+ and Stadspoli from parties involved in the referral process. This solution could bring down the number of incomplete referrals sent to MUMC+/TIPP, thus saving administrative time. Moreover, as mentioned in the second recommendation, HSD should receive all regional second line referrals. If electronic medical records are used effectively, workflow can be facilitated by reducing administrative time (Keshavjee et al., 2006). Physical referral letters could be digitalized in a format that is directly useable for the party that receives it (e.g. copy-paste). Notes could be included in the referral document including recent and complete patient data. An authority could be appointed to monitor the referral process, to intervene with parties that do not deliver data in the correct format and to communicate the guidelines and formats clearly to referring parties. In addition, a useful solution for this problem could be the introduction of a central/integrated database across the

organizations in the referral process, so that patient data is altered consistently and available among involved parties. This database already exists in the form of the GBA (Gemeente Basis Administratie), which is used by the HSD.

11. Contribution & limitations

11.1 Contribution

The outcomes of this thesis project directly contribute towards optimizing the current patient referral process in the context of the Beweeghuis project (Stadspoli 2.0). An overview of the patient and referral flows has been provided which was currently lacking. As a result, parties gain more insights into how certain choices can affect work of other stakeholders in the process. Moreover, inefficiencies have been identified in the process and can be optimized/fixed. By independently identifying and presenting an overview of the problems occurring in the referral process, involved parties could be more willing to solve organizational, process related issues. The problem-based evaluation framework could be used as a starting point for monitoring the effectiveness of the Beweeghuis project group optimization effort by using quadruple aim.

The results of the conducted research show the importance of support staff and data infrastructure in referral processes. Existing literature mainly focuses on employee experience which is narrowed down to medical staff. The importance and potential of including all stakeholders in process redesign must be emphasized (Keshavjee et al., 2006). Future research should be conducted on how improvement of employee experience among support staff can improve employee experience among medical staff.

11.2 Limitations

Several limitations have been identified when conducting the research, which could be useful to take into account when conducting future research.

First of all, only one case was examined in the case analysis. In future efforts, several cases could be analysed to gain more insights in applicable evaluation methods based on quadruple aim.

The complexity and size of the to be mapped process led to a second limitation. The scope of the process model was changed throughout the modelling process due to the continuous discovery of new referral paths which could be relevant for creating an overview of the current referral process. Due to the large number of referrals in the region, a lot of different referral routings exist. The main processes have been modelled and examined. A similar situation occurred for the problem framework; out of the large number of problem fields, recommendations were only written for the main problem fields. Limited meeting possibilities (e.g., group size, digital only), restricted the modelling of processes and group discussions.

A third limitation that could have implications for future research involves the provided measurement tools for evaluating the quadruple aim. More explorative research can be conducted to identify additional measurement tools, which can be used to evaluate more specific problems and subparts of the quadruple aim.

A fourth limitation that inhibits contribution towards literature is the use of language. By using Dutch instead of English as the modelling language, the published models cannot directly contribute to literature.

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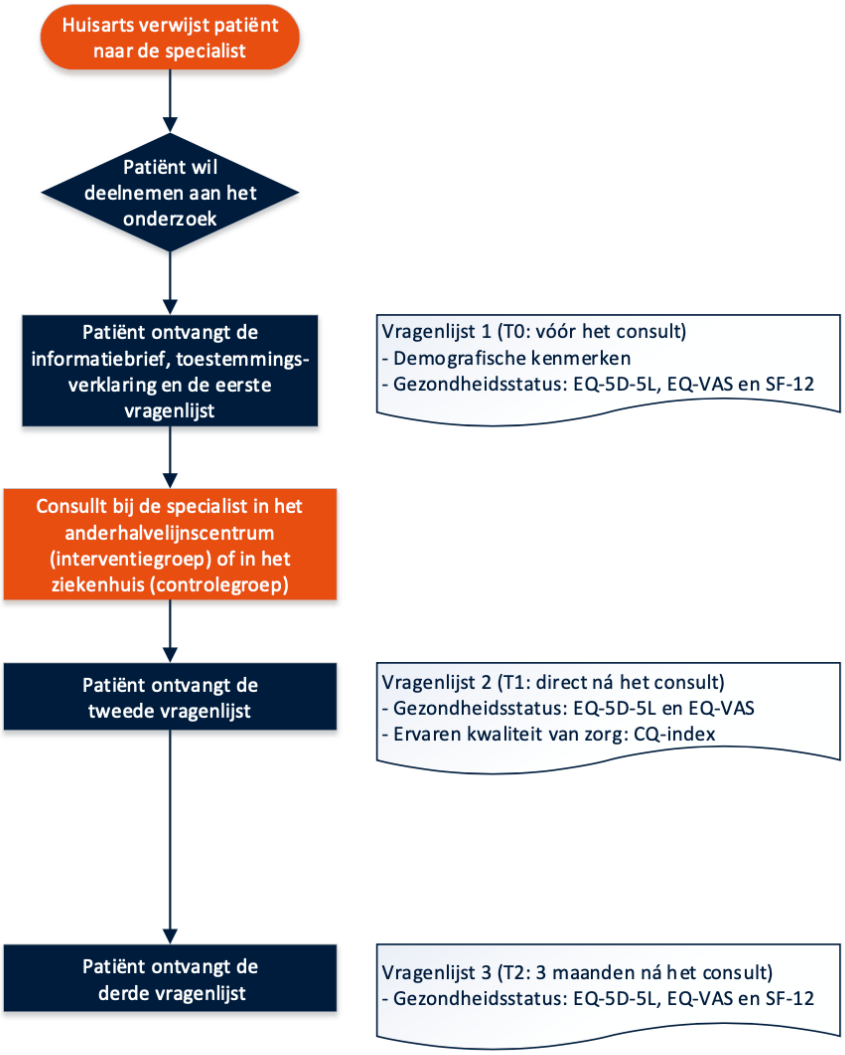
Appendix A – Figures & tables

Figures



Figuur 2.3.1 Flowchart vragenlijstonderzoek anderhalvelijnszorg: metingen gezondheid en ervaren kwaliteit van zorg door patiënten

Figure 23 – Flowchart of research method (van den Bogaart et al., 2019)

Tables

Table 2 – Relevant search term synonyms

Keyword	Synonyms, abbreviations, variations
Costs	Amount, price, value
Efficiency	Performance, ability
Employee	Medical staff, specialist, GP, physiotherapist
Evaluation	Assessment
Experience	Contact, practice, journey
Healthcare	-
Hospital	Care provider, clinic, institution, healthcare organization
Indicator	Measurement
Value-based	Lean, patient-centered
Medical	Orthopedic, rheumatologic
Orthopaedics	-
Patient	Sick person, case
Process	Operation
Project	Setup, program, design
Quadruple aim	Triple aim
Quality	-
Redesign	Remodel
Satisfaction	-
Substitution	Replacement
Treatment	-
Triage	Sort, prioritize, referral
Waiting time	Interval, throughput time

Table 3 - Paper selection criteria

Criteria category	Criteria
Accessibility criteria	- Academic paper or book - Access to complete text - The paper is published in a peer-reviewed academic journal. - The paper must be cited by authors of other academic papers. - The paper is written in English. - Relevant search terms need to be present in the title, abstract or keywords of the paper or book.
Content criteria	- Healthcare lean management is the field of research. - Literature must be applicable to evaluation of projects, quadruple aim or patient journey. - Literature must be from period 1950-2020; more recent articles are preferred (new insights). - Literature must have a clear structure and is preferably supported by figures

Table 4 - Search queries

Search engine	Search queries	Used filters
ABI complete	(“team performance”) AND (“indicator” OR “measurement” OR “organization”)	Sort by relevance, include scholarly journal articles only, full-text, peer-reviewed

Google scholar	(“team performance”) AND (“indicator” OR “measurement” OR “organization”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“quadruple” OR “triple”) AND (“aim”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“quadruple aim”) AND (“evaluation” OR “framework”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“patient experience”) AND (“definition” OR “patient journey”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“employee experience”) AND (“dimensions”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“quality” AND “healthcare”) AND (“dimension” OR “definition”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“healthcare” AND “evaluation”) AND (“lean” OR “value-based”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“patient journey”) AND (“process mapping” OR “modeling”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“business process modeling” OR “process analysis”) AND (“healthcare”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“semi-structured interview” AND “focus group”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“business process redesign”) AND (“healthcare” OR “evaluation”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“healthcare project”) AND (“risk management”) OR (“business process redesign”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“patient centered” OR “lean” OR “value-based”) AND (“healthcare”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“waiting time”) AND (“patient satisfaction”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“quadruple aim” OR “triple aim”) AND (“patient satisfaction” OR “evaluation”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“communication” OR “information provision”) AND (“triage” OR “referral”) AND (“effectiveness”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“patient satisfaction”) AND (“dimensions” OR “framework” OR “definition”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“medical”) AND (“employee” OR “staff” OR “specialist” OR “GP”) AND (“experience”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“referral” OR “triage”) AND (“best practices”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“value-based” OR “lean”) AND (“healthcare management”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“stakeholders” AND “healthcare”) AND (“lean” OR “value-based”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“primary” OR “secondary”) AND (“care”) AND (“substitution”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“orthopedic” OR “rheumatologic”) AND (“treatment” OR “triage” OR “referral” OR “evaluation”) AND (“lean” or “value-based”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“healthcare costs”) AND (“dimensions” OR “definition” OR “framework”)	Sort by relevance, no patents, no citations, journal articles only
Google scholar	(“lean” OR “value-based”) AND (“employee” OR “patient”) AND (“experience)	Sort by relevance, no patents, no citations, journal articles only

Table 5 - Overview of interviews, multidisciplinary meetings and data sources

Meeting ID	Category	Date	Time	Participants	Finding category
[M1]	Multidisciplinary meeting	06-10-2020	16:15-17:00	MUMC+, ZIO, Stadspoli, TIPP	Process AS IS Process TO BE Problem areas
[I1]	Semi-structured interview	19-10-2020	16:00-17:30	Stadspoli	Process AS IS Problem areas
[I2]	Semi-structured interview	29-10-2020	10:00-11:45	TIPP	Process AS IS Problem areas
[I3]	Semi-structured interview	30-10-2020	10:00-11:00	Stadspoli	Process AS IS Problem areas
[I4]	Semi-structured interview	02-11-2020	10:00-12:00	ZIO	Process AS IS
[M2]	Multidisciplinary meeting	05-11-2020	10:00-13:00	MUMC+, ZIO, Stadspoli, TIPP	Process AS IS Process TO BE Problem areas
[I5]	Semi-structured interview	12-11-2020	11.30-12.30	MUMC+ (Brugpoli)	Process AS IS
[I6]	Semi-structured interview	13-11-2020	10.00-12.00	TIPP	Process AS IS
[I7]	Semi-structured interview	25-11-2020	10.00-12.00	TIPP	Process AS IS
[M3]	Multidisciplinary meeting	26-11-2020	10:00-13:00	MUMC+, ZIO, Stadspoli, TIPP	Problems AS IS
[I8]	Semi-structured interview	01-12-2020	10.00-12.00	MUMC+	Process AS IS Problems AS IS
[I9]	Semi-structured interview	02-12-2020	16.30-17.30	GP	Process AS IS Problems AS IS
[I10]	Semi-structured interview (mail)	03-12-2020	10.20	MUMC+	Problems AS IS
[I11]	Semi-structured interview	07-12-2020	11.00-12.00	MUMC+ (HSD)	Process AS IS Problems AS IS
[I12]	Semi-structured interview	10-12-2020	9.00-9.30	GP	Problems AS IS
[I13]	Semi-structured interview	17-12-2020	10.00-12.00	TIPP	Process AS IS
[I14]	Semi-structured interview	29-12-2020	10.00-11.00	MUMC+	Process AS IS
[I15]	Semi-structured interview	04-01-2021	16.00-17.00	Stadspoli	Process AS IS
[S1]	Patient satisfaction survey	2020	-	Patients, TIPP	Problems AS IS
[S2]	Patient satisfaction survey	2019	-	Patients, Stadspoli	Problems AS IS
[SW]	Problem analysis	2020	-	All stakeholders	Problems AS IS

Table 6 - Participant IDs

Participant ID	Organization	Function
[P1]	MUMC+	Manager

[P2]	ZIO	Manager
[P3]	ZIO	Secretary
[P4]	TIPP	Manager
[P5]	TIPP	Manager
[P6]	Stadspoli	Manager
[P7]	MUMC+	Orthopaedic surgeon
[P8]	MUMC+	Orthopaedic surgeon
[P9]	ZIO	Manager
[P10]	Brugpoli	Manager
[P11]	MUMC+	Manager
[P12]	ZIO	GP
[P13]	MUMC+	Manager
[P14]	MUMC+	Administrative employee
[P15]	ZIO	GP
[P16]	ZIO	Manager
[P17]	MUMC+	Orthopaedic nurse

Table 7 - Interview data – M1 (P1, P2, P4, P6, P7, P8)

Situation	Problems
AS IS	1. Partijen werken gescheiden van elkaar 2. Huisartsen nog niet bekend met nieuwe portal/systeem 3. Wat te doen met percentage overgebleven patiënten 4. Stadspoli kwetsbaar mbt bezetting; capaciteit snel gevuld door gebruik meerdere partijen 5. Planning afhankelijk van afspraken met vakgroep 6. TIPP kan niet plannen als timeslots niet op tijd openstaan 7. Data wordt onvoldoende gedeeld; geen overzicht toegangstijden, capaciteit, volumes 8. Wie neemt verantwoordelijkheid financieel risico bij verschil aanbod productie 9. Indelen op halve dagen Stadspoli ineffectief 10. Rekening houden met lagere capaciteit in het begin (opstarten poli) 11. Missende eenduidigheid implementatie; stappenplan 12. Geen duidelijke datum wanneer implementatie gaat plaatsvinden (planning hiervan afhankelijk) 13. Huisartsen nog niet op de hoogte over mogelijkheden Beweeghuis 14. Rol Maastricht Sport, reumatologie, fysiotherapie nog onduidelijk in Beweeghuis 15. Specialisten kunnen elkaar nu niet vinden

Table 8 - Interview data – I1 (P6)

Situation	Problems
AS IS	1. Hoeveelheid systemen (SAP, MediX, Tetra) a. Integratie systemen (omzetten data kost veel tijd) b. Fouten data invoering (10.000 MediX kaarten per jaar) c. Huisartsen vergeten vaak foto's mee te sturen 2. Afhankelijkheid (Stadspoli) a. Toegankelijkheid systemen; nieuwe werknemers inwerken kost extra tijd b. Geen historie aanwezig om te monitoren 3. Indeling proces a. Triage na maken afspraak

Table 9 – Interview data – I2 (P5)

Situation	Problems
AS IS	1. Triage op verkeerde plek (na maken afspraak) 2. Planbord gevoelig a. Volumes worden niet afgestemd: partijen monitoren eenzijdig b. Moeizame communicatie: te laat spreekuren open c. AD-hoc annuleringen d. Iedereen handelt vanuit eigen "winkel" e. Fouten in openzetten slots 3. Onduidelijk hoe verwijzing via omweg terechtkomt bij Stadspoli 4. Verwijzingen van buitenaf via doordrukpapier/fax 5. Onduidelijk wat kan/mag op gebied verwijzing huisarts

Table 10 – Interview data – I3 (P6)

Situation	Problems
AS IS	1. Data van partijen wordt niet uitgewisseld en afgestemd 2. Operationeel en strategisch gescheiden (geen zicht op financiën) 3. Verantwoordelijkheid data infrastructuur en datamanagement in proces ontbreekt 4. Overzichtelijke rapportage ontbreekt 5. Onduidelijkheid waarom Brugpoli is betrokken in verwijsproces 6. Briefjes voor afhandeling kunnen niet worden gedigitaliseerd 7. Afspraken rondom tijdspan advies specialist

Table 11 – Interview data – I4 (P2, P3)

Situation	Problems
AS IS	1. Vragen komen terecht bij TIPP van zowel patiënt als huisarts 2. Onduidelijkheid welke data beschikbaar in SAP voor partijen 3. Data voor verwijzing niet compleet o Missende foto's o Incorrecte patiëntgegevens

Table 12 – Interview data – M2 (P2, P3, P5, P6, P9)

Situation	Problems

AS IS	1. TIPP is doorgeefluik voor vragen patiënt en huisarts 2. Onvoldoende gebruik van huisarts service desk 3. Iedereen opereert uit eigen belang 4. Inzicht specialisten/huisartsen rondom cases is anders 5. Specialisten hebben geen notie van invloed keuzes rondom annulering 6. Triage vindt plaats na planning consult 7. Labeling reservering/bezoek brengt gevolgen met zich mee rondom inzien data in SAP 8. Data wordt onvoldoende gedeeld om te kunnen monitoren 9. Gebruik van veel verschillende informatiesystemen, met name SAP zorgt voor veel onhandigheden rondom datadeling 10. TIPP moet nalatigheid huisarts oplossen: incorrecte patiëntgegevens en missende foto's 11. Foto's maken is een proces dat voor veel vertraging zorgt 12. Stadspoli kan geen historie bijhouden van consulten (wie wanneer op consult is geweest) 13. Er worden printscreens gemaakt van planningen om historie bij te houden 14. Planningen worden soms niet op tijd aangeleverd aan TIPP/Stadspoli 15. Gebruik fax/doordruk formulieren bij verwijzingen 16. Foutief inscannen PDF-bestanden in SAP 17. Digitalisering gebruik briefjes stadspoli is lastig door SAP 18. Huisartsen komen afspraken niet na rondom triage 19. Geen afspraken rondom reactiesnelheid specialisten specifieke vragen/cases 20. Functie Brugpoli in verwijsproces is onduidelijk 21. Privacyvraagstuk rondom inkijken verwijzingen (schakel Brugpoli) 22. Niemand verantwoordelijk voor data infrastructuur en doorvoeren wijzigingen hierin

Table 13 – Interview data – I5 (P10)

Situation	Problems
AS IS	1. Handmatig rapporten maken van data 2. Losse afspraak nodig via huisarts voor maken foto's consult Stadspoli 3. Verschillende systemen die niet zijn geïntegreerd (TIPP/SAP/MediX); gegevens kloppen niet of komen niet overeen 4. Locatie Stadspoli niet centraal 5. TIPP fungeert als doorgeefluik voor vragen 6. Er is geen overzicht wie wat precies doet in het verwijsproces 7. Geen zicht op wachttijd door onvoldoende deling data 8. Planning leegvegen om declaratie te voorkomen kost veel tijd

Table 14 – Interview data – I6 (P5)

Situation	Problems
AS IS	1. Informatiesystemen niet op elkaar afgestemd (data komt niet overeen) 2. Labeling zorgt voor vertragingen in proces (minder functies beschikbaar in SAP) 3. Aanlevering verwijzingen en verwerking handmatig; kost veel tijd 4. TIPP fungeert als doorgeefluik voor vragen patiënt en huisarts 5. TIPP vult verwijzingen die niet compleet zijn aan (werk van huisarts opvangen)

Table 15 – Interview data – I7 (P5)

Situation	Problems
AS IS	1. CD-rom foto's niet geschikt, patiënt moet opnieuw afspraak maken 2. Verkeerde timeslots staan open in SAP 3. Afbakening verantwoordelijkheid TIPP/Stadspoli (wie belt/wie mailt) 4. Geen duidelijk format voor aanlevering verwijzingen extern 5. Soms onduidelijk wanneer patiënt urgent is (huisarts/specialist)

Table 16 – Interview data – M3 (P1, P2, P3, P5, P6, P9)

Situation	Problems
AS IS	1. Iedere specialist oordeelt anders of foto bij consult nodig is 2. Voor huisartsen onduidelijk waar welke vragen te stellen 3. Data uit systemen komt niet overeen (SAP/TIPP) 4. Problemen MediX kaart aanmaken als planbord is leeggeveegd

Table 17 – Interview data – I8 (P11)

Situation	Problems
AS IS	1. Annuleren spreekuren door thematisering lastig 2. Door thematisering neemt wachttijd toe 3. Incorrecte gegevens aanwezig (patiënt ontvangt geen verwijzing) 4. Geen format voor aanlevering verwijzingen 5. CD-roms zorgen voor vertraging (te veel foto's aanwezig) 6. Verwijzingen intern worden met de post gestuurd naar poli 7. Digitalisering verwijzing met carbonpapier 8. Patiënten vinden Stadspoli onprettig

Table 18 – Interview data – I9 (P12)

Situation	Problems
AS IS	1. Knippen en plakken in TIPP onhandig en kost daardoor veel tijd 2. Administratief medewerker opgeleid om te triëren ipv alle triages door specialist 3. Verwijzing TIPP niet kunnen inzien 4. Zonder foto geen afspraak, onnodig foto's 5. Foto's via huisarts 6. TIPP bekendheid bij huisartsen en fysiotherapeuten 7. Documenten toevoegen TIPP 8. Verwijzingen raken kwijt 9. 2de lijn moet nog steeds goed worden benut ondanks zoveel mogelijk naar anderhalvelijnszorg 10. Toegangstijden TIPP en MUMC+ onbekend 11. Patiënten moeten lang wachten, folder TIPP klopt niet (3 werkdagen)

Table 19 – Interview data – I10 (P7)

Situation	Problems
AS IS	1. Foto's niet aanwezig in verwijzing 2. Incomplete verwijsbrief 3. SAP werkt traag op Stadspoli 4. Vinden van verwijsbrief omslachtig 5. Foto's niet aanwezig indien elders gemaakt 6. Behoefte aan blokken spreekuurplanning; vaak niet gevuld (te druk/te spaarzaam) 7. Tijd tussen verwijzing huisarts en Stadspoli langer door administratieve procedures 8. Terugtriage vanuit MUMC+ via TIPP werkt omslachtig en arbeidsintensief 9. Thematisering ontbreekt zodat patiënt niet direct op juiste plek terechtkomt 10. Wachttijd te lang door checken gegevens patiënt en foto

Table 20 – Interview data – I11 (P13, P14)

Situation	Problems

AS IS	1. Data uit patiëntsystemen komt niet overeen (TWMS) 2. Monitoring lastig en gebeurt onvoldoende 3. Verwijzingen raken kwijt 4. Geen volgsysteem, handmatig in de gaten houden consult gepland 5. Soms niet op de hoogte van afspraken die er op poli worden gemaakt rondom verwijzingen

Table 21 – Interview data – I12 (P15)

Situation	Problems
AS IS	1. Voor alle foto's consult nodig terwijl niet nodig 2. Wachttijd TIPP te lang 3. Triage MUMC+ duurt te lang 4. Geen inzicht in wachttijden MUMC+, Stadspoli, TIPP 5. Onduidelijk waar naartoe bellen om een specialist te spreken 6. Concept Stadspoli en foto's los nemen bij MUMC+ soms moeilijk uit te leggen 7. Contact met 1.5/2de lijn loopt via brieven 8. Opties Stadspoli onduidelijk voor huisartsen

Table 22 - Interview data - I13 (P5, P16)

Situation	Problems
AS IS	1. Planning niet op tijd binnen, timeslots te laat open 2. Dubbele verwijzing naar HSD bij terugtriage

Table 23 – Interview data – I14 (P11, P17)

Situation	Problems
AS IS	1. Verwijzingen worden uitgeprint en opnieuw ingescand

Table 24 - Interview data – I15 (P6)

Situation	Problems
AS IS	1. Geen harde afspraak rondom aanwezigheid foto's 2. Planning staat soms nog niet open tot ver genoeg

Table 25 - Customer satisfaction survey data TIPP Zorgnavigator (n=632), 2020 – S1

Situation	Problems
AS IS	1. Onbegrip waarom TIPP een tussenschakel is 2. Wachttijd telefoonlijn (tijd/aantal personen) 3. Lange wachttijd voor afspraak bij ziekenhuis 4. Nieuwe verwijzing nodig 5. TIPP luistert niet naar wensen patiënt 6. Vergoeding onduidelijk 7. Onduidelijk waarom niet gemarkeerd als urgent 8. Triage op verkeerde plek, deze vindt pas plaats na maken afspraak 9. Niet teruggebeld door TIPP 10. Onduidelijk mogelijkheden patiënt tijdens gesprek TIPP 11. Tijdstip niet wenselijk 12. Onbekend met Zorgnavigator

Table 26 - Customer satisfaction survey data Stadspoli (n=161), 2019 – S2

Situation	Problems
AS IS	1. Slechte ervaring met inplannen afspraak via TIPP 2. Niet geholpen kunnen worden door specialist 3. Wachttijd was te lang

Table 27 - Process model contractions

Main process	Process description
Huisarts binnen regio	Patiënt komt op consult bij huisarts die aangesloten is bij TIPP-netwerk. Huisarts verwijst patiënt naar Stadspoli/MUMC+ via TIPP-applicatie. Indien huisarts niet gebruik maakt van TIPP wordt de verwijzing verstuurd naar de HSD. Na triage kan patiënt worden gezien op Stadspoli via TIPP.
Huisarts buiten regio	Patiënt komt op consult bij huisarts die niet aangesloten is bij TIPP-netwerk. Huisarts stuurt verwijzing naar HSD, TIPP of poli direct. Verwijzingen worden getrieerd en gedigitaliseerd, patiënt kan naar Stadspoli via TIPP.
Intercollegiaal consult	Patiënt wordt in de tweede lijn via een ander specialisme verwezen naar orthopedie. Na triage kan patiënt worden gezien op Stadspoli via TIPP.
Planning & timeslots Stadspoli (support)	1. Vakgroep MUMC+ maakt planning en mailt deze naar Stadspoli 2. Medewerker Stadspoli verwerkt planning in timeslots 3. Als timeslots openstaan in SAP wordt TIPP ingelicht dat timeslots open zijn
TIPP verwerkt verwijzing	1. Controleer en digitaliseer verwijzing 2. Zoek gegevens patiënt (SAP) en bel patiënt 3. Controleer of foto's zijn gemaakt, zo niet, laat patiënt afspraak maken bij MUMC+ via huisarts. 4. Noteer soort bezoek (reservering) en paraaf (TIPP) 5. Maak reservering aan (SAP) 6. Selecteer tijdslot (incl. locatie) (SAP) 7. Verstuur verwijzing (TIPP)
Stadspoli triage	1. Beoordeel compleetheid verwijzing (gegevens/foto's) 2. Doktersassistent neemt patiëntprofielen erbij en vergelijkt deze met verwijzing. 3. Doktersassistent maakt beoordeling, bij twijfel contacteer specialist. 4. Patiënt komt naar Stadspoli consult, of wordt verwezen naar 2de lijn via TIPP. 5. Patiënten die naar Stadspoli komen krijgen een digitale MediX kaart voor in goede banen leiden van declaratie.
Stadspoli consult	Patiënt komt op consult Stadspoli, kan erna in aanmerking komen voor telefonisch consult, controleafspraak of verwijzing naar 2de lijn. Indicatie einde behandeling is ook een optie. Na behandeling wordt planning leeg gemaakt om verkeerde declaraties te voorkomen. Vervolg van patiënt wordt vastgelegd in SAP met directe verbinding met HIS.

Table 28 – Brief explanation per first order problem

First order problem	Quadruple aim relevance
Incomplete verwijzingen vanuit huisarts; data/foto ontbreekt, TIPP/MUMC+ moet aanvullen [I1, I4, M2, SW, I6, I10]	Incomplete referrals result in more administrative time, thus affecting employee experience and healthcare costs.

Onvoldoende duidelijke afspraken/formats aanlevering verwijzing/data onder verwijzende partijen [I2, M2, I1, I4. I5, I8]	Unclarity among referring parties what format is the most useable for the processing parties, this affects administrative time, and thus employee experience and healthcare costs.
Verwijzing huisarts buiten regio komt via screenshots op mail of per brief binnen bij TIPP [I2, I6]	Referalls consisting of data which cannot be copied results in more administrative time, thus affecting employee experience and healthcare costs.
TIPP applicatie werkt niet optimaal voor huisartsen; ophalen en bewerken verwijzingen moeizaam [I9]	Results in incomplete referrals, which affects administrative time and employee experience. If the processing party has to correct the refferal more time is needed, thus increasing healthcare costs.
Hoeveelheid systemen zorgt voor veel administratie: data patiënt komt niet overeen in systemen en met gegevens verwijzing (SAP, MediX) [I1, SW, M3, I8, I11]	Patient data has to be retrieved, this costs administrative time, thus affecting employee experience and healthcare costs.
Systemen worden niet centraal beheerd en gecontroleerd op (aanwezige) afspraken verwijzingen/data [I3, M2, I1, I4, I5]	Appointments made regarding referrals are violated and unclear, resulting in incorrect referrals which affects employee experience and patient experience. Leads to extra administrative time, which leads to higher healthcare costs.
Terugtriage intercollegiaal/non-TIPP verwijzing vanuit MUMC+ naar Stadspoli eerst via post naar TIPP [I2, I6, I8]	Referrals sent physically via mail increases waiting time, affects patient experience. Also increases administrative time, thus affecting employee experience and healthcare costs.
Verwijzingen intern MUMC+ worden per post verstuurd; zorgt voor vertraging [I8]	Referrals sent physically via mail increases waiting time, affects patient experience. Also increases administrative time, thus affecting employee experience and healthcare costs.
TIPP en MUMC+ veel tijd kwijt met digitaliseren van verwijzingen; brieven/fax [I2, I6, I11]	Digitalising referrals costs extra administrative time, thus affecting employee experience and healthcare costs.
Betrokkenheid mailadres Brugpoli veroorzaakt onduidelijkheid en roept vragen op rondom privacy [I2, I3, M2]	It can be confusing that the referral sent by TIPP is not directly sent to Stadspoli. This could affect employee experience.
Foutief inscannen PDF bestanden; verwijzingen gedraaid aangetroffen in systeem [M2]	Referrals are difficult to use, thus affecting employee experience. Fixing this could lead to extra administrative time, thus affecting healthcare costs.
Verwijzingen raken zoek na versturen naar MUMC+ [I7, I9, I11]	Referrals are lost in the process. Patients have to wait longer. This affects patient experience and population health. Time is lost by searching these referrals, thus affecting healthcare costs.
Labels reservering/bezoek hebben invloed op mogelijkheden gebruikers in SAP [M2, I6]	Users of SAP cannot access patient/referral details due to restrictions; this affects employee experience. Some activities could be cumbersome, thus resulting in extra administrative time and healthcare costs.
Dubbele verwijzing verstuurd naar HSD bij aanpassing lijn door TIPP [I13]	An extra referral is automatically sent to HSD, this can be bothersome for employees, thus affecting employee experience
Verwerking/controle TIPP-verwijzingen tweede lijn door TIPP en HSD dubbel [I13]	Referrals are checked twice, which results in extra administrative time. This affects employee experience and healthcare costs.
Triage vindt plaats na maken afspraak bij Stadspoli [I1, I2, M2, S1]	Patients have to wait longer and can be referred to MUMC+, thus affecting patient experience. It also affects employee experience and healthcare costs for the unnecessary cases that have been treated.
Onduidelijkheid onder huisartsen rondom criteria verwijzen kan leiden tot ‘verkeerde’ verwijzing patiënt [M1, M2, SW, I12]	Results in ’wrong’ referrals, thus increasing waiting time and affecting patient experience.

Ongeschikte verwijzingen vanuit huisartsen ondanks afspraken aanwezig mbt verwijzen naar orthopedie [I2, M2, SW]	Agreements are not met; this affects employee experience. Patient can end up at wrong place; this affects patient experience and healthcare costs.
Onduidelijkheid wanneer case markeren als urgent: verschil in visie tussen eerste lijn en tweede lijn [I7, I9]	Employee experience and patient experience can be affected by the different views on urgent cases.
Verwijzingen worden getrieerd door niet-specialist [I9]	Not all cases are filtered by specialists, this could lead to wrong referral. However, this also relieves specialists. It affects employee experience.
Terugtriage vanuit MUMC+ naar Stadspoli via TIPP omslachtig [I10]	Waiting time increases, thus affecting patient experience. Administrative time also increases, thus affecting healthcare costs.
Door huidig gebrek thematisering komt patiënt niet direct op goede plek terecht [I10]	Unclear where to refer patient to, waiting time increases, thus affecting population health, patient experience and healthcare costs (cumbersome referring).
Foto proces omslachtig; patiënt moet langs huisarts voor aanvragen verwijzing foto consult Stadspoli [M2, I1, I5, I9, I12]	Waiting time of patient increases, thus affecting patient experience. Could increase healthcare costs due to extra referral steps.
Foto's externe verwijzing op CD-rom meenemen naar consult; blijken ongeschikt [I7, I8]	Unusable photos result in longer waiting times thus affecting patient experience and population health. Employee experience is also affected due to the absent photos during a consult.
Foto's CD-rom zorgen voor vertragingen/problemen bij inladen in SAP door radiologie [I8, I10]	Unusable photos result in longer waiting times thus affecting patient experience and population health. Difficulties with photos also affect employee experience.
Onduidelijk wanneer foto's moeten worden aangeleverd; niet in alle gevallen nodig [M3, I9, I12]	Unnecessary photos result in extra waiting time (patient experience) and healthcare costs.
Check aanwezigheid foto's 2 dagen voor consult Stadspoli terwijl foto misschien nog wordt verwerkt kan leiden tot onnodige annulering [I5]	Unnecessary cancellation of consults results in longer waiting times, thus affecting patient experience.
Planningen van vakgroep niet op tijd binnen; spreekuren structureel te laat open in SAP [M1, M2, I2, I3, I13]	Increases waiting time thus affecting patient experience and population health. Employee experience is affected due to negative comments by patients. Extra administrative time leads to higher healthcare costs.
Spreekuren worden last minute geannuleerd of gewijzigd; geen vervanging [I1, I2, I13]	Increases waiting time, thus affecting patient experience and population health. Employee experience is affected due to negative comments by patients. Extra administrative time leads to higher healthcare costs.
Planning/timeslots passen niet bij patiëntvolumes door slechte afstemming [I5, I10]	Affects healthcare costs and waiting time (patient experience and population health). Employee experience is affected due to lack of optimality.
Annuleren, vervanging regelen en plannen spreekuren door thematisering lastig [I8, S1]	Increases waiting time, thus affecting patient experience. Employee experience is affected due to negative comments by patients and efforts for finding replacement. Cancelling patients costs administrative time, thus affecting healthcare costs.
Er worden fouten gemaakt in het openzetten van timeslots in SAP [I2, I7]	Increases waiting time, thus affecting patient experience and population health. Extra administrative time leads to higher healthcare costs.

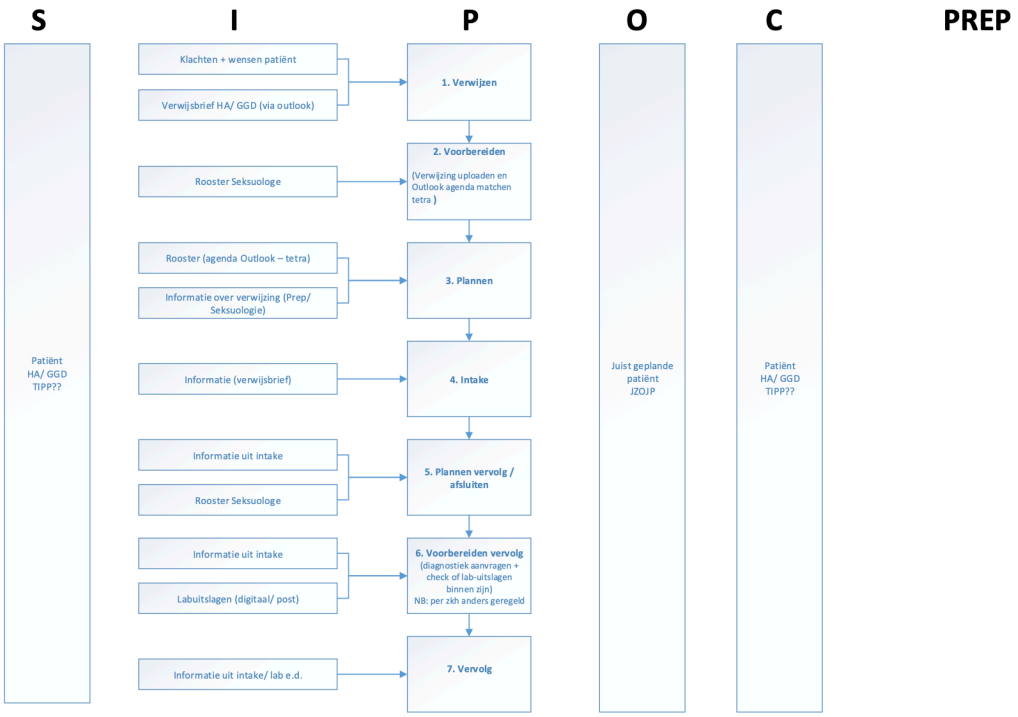
Controleafspraken kunnen niet direct worden ingepland door afwezigheid planning en timeslots [I15]	Increases waiting time, thus affecting patient experience and population health. Extra administrative time leads to higher healthcare costs.
Huisarts soms niet op de hoogte waar patiënt in doorverwijsproces is beland (bijv. intercollegiaal/terugtriage) [I6, I9]	Affects employee experience.
Geen harde afspraak aanwezig tijdspan reactie specialist op vragen over beoordeling/consult [I2, I3, M2]	Can affect administrative waiting time, thus affecting employee experience.
TIPP en HSD controleren handmatig of afspraken daadwerkelijk worden gemaakt bij MUMC+ [I7, I11]	Increases administrative waiting time, thus affecting employee experience and healthcare costs.
Communicatie wanneer patiënt consult heeft gehad op MUMC+ verloopt per brief [I12]	Affects employee experience.
TIPP fungeert als doorgeefluik; contact tussen huisarts, patiënt en specialist loopt via TIPP en SP [M2, I4, I5, SW, I6]	Affects employee experience. Due to extra administrative time it affects healthcare costs.
Specialisten kunnen elkaar onderling niet goed vinden/bereiken [M1, SW]	Affects employee experience.
Huisartsen weten niet waar ze naartoe moeten bellen om in contact te komen met specialist [M3, I12]	Affects employee experience.
Aanmaken en controleren MediX kaarten kost veel administratieve tijd, worden soms fouten gemaakt [I5, I1, I3]	Extra administrative time and mistakes in declaration results in extra healthcare costs.
Indien planbord reeds leeggeveegd, problemen met MediX kaart aanmaken [M3]	Extra administrative time and problems in declaration results in extra healthcare costs. Also affects employee experience of administrative staff.
Planning SAP Stadspoli wordt 'leeggeveegd' na consulten op Stadspoli; dit kost veel tijd [I5]	Extra adminstrative time affects healthcare costs and employee experience
Onvoldoende deling en inzicht: toegangstijden, volumes en capaciteit [M1, M2, I5, I9, I11, I12]	Results in long waiting times (patient experience) and affects healthcare costs (scheduling not optimal)
Stadspoli heeft geen historie van afspraken door leegvegen van planning en afwezigheid eigen systeem [I1, M2]	Affects working schedules, thus affecting healthcare costs
Overzichtelijke rapportage ontbreekt: bij partijen niet bekend welke rapportages er beschikbaar zijn [I2, I3, M2]	Affects working schedules, thus affecting healthcare costs. Due to lack of insight employee experience is affected
Onduidelijk welke data beschikbaar is in het verwijsproces om te monitoren (systemen) [I4, I5, I11]	Results in long waiting times (patient experience) and affects healthcare costs (scheduling not optimal)
Rapportages worden handmatig gemaakt (gebruik screenshots, handmatig combineren bestanden) [I5]	Extra adminstrative time affects healthcare costs and employee experience
Onvoldoende periodiek overleg tussen partijen: afstemming volumes, struikelblokken in verwijsproces, communiceren afspraken met poli rondom verwijzen (TIPP, MUMC+, Stadspoli, huisartsen) [M1, M2]	Affects employee experience. Also affects patients experience (waiting times).
Planning en timeslots passen niet bij patiëntvolumes door onvoldoende afstemming [I5]	Affects patient experience (waiting time) and healthcare costs
Handelen vanuit eigen box; annuleren, geen inzicht in elkaars taken, verantwoordelijkheid [M1, M2, SW, I2, I5, I11]	Affects employee experience.

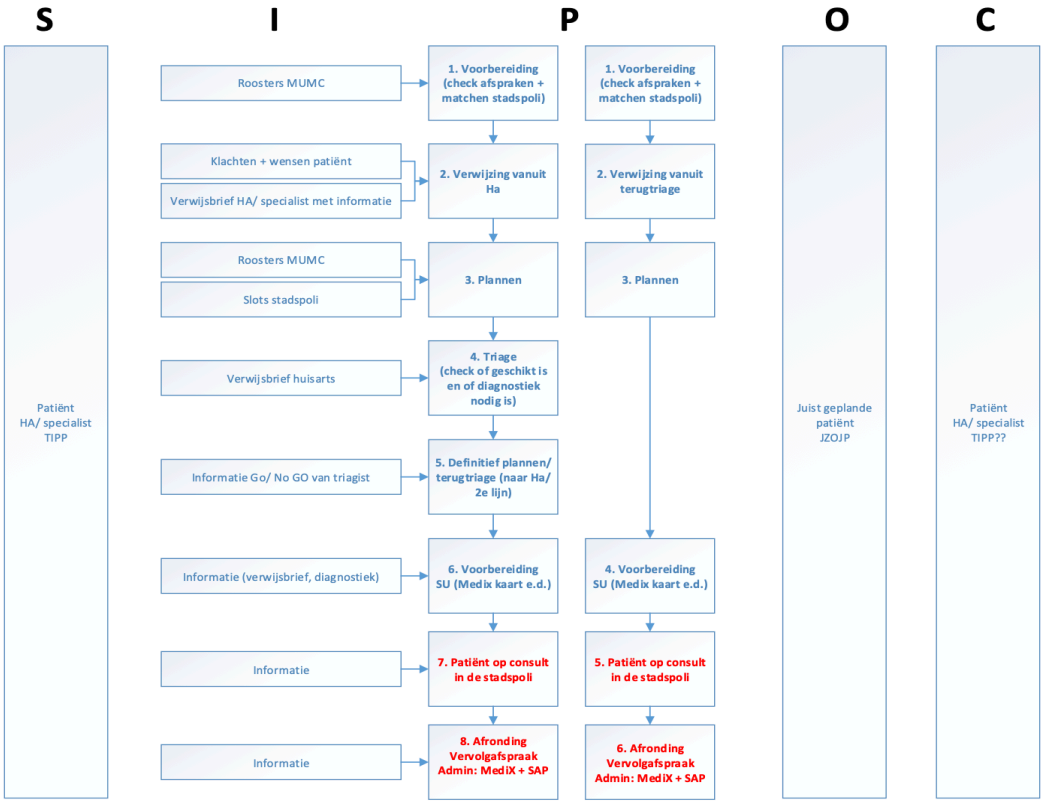
Onvoldoende bekendheid nut tussenkomst TIPP onder huisartsen en patiënten [I9, S1, S2]	Affects patient experience.
Onvoldoende bekendheid HSD bij verwijzingen buiten regio [I11]	Affects employee experience (clarity). Wrong referrals lead to higher healthcare costs.
Onvoldoende bekendheid voordelen Stadspoli onder patiënten [I8, I9, S1]	Affects patient experience.
SAP werkt traag op Stadspoli [I10]	Affects employee experience (administrative time)

Appendix B – Probleemanalyse Suzanne Waterval (2020)

Probleemgebieden	Beschreven probleem
1)Triage medisch specialistische zo	Inefficiente verwijzing: Huisarts is (teveel?) in the lead
	Logistiek: patient komt niet (snel genoeg) op de juiste plaats
	Stroperig proces (bij TIPP?): erg lange wachttijden
	Overconsumptie: teveel overbodige consulten
	Rondpompen' van ptn, zonder goed te worden geholpen
	Via fysio indirecte ingang BH: altijd verwijzing HA nodig!
2) Informatievoorziening	
a) voor patiënten	teveel informatie tegelijk op bepaalde momenten
	Er is teveel informatie: wanneer welke informatie voor patien
	Niet eenduidig! horen van verschillende zorgverleners versc
	ontbreken van algemeen overzicht en opties voor zelfmanag
	niet afgestemd op de verschillende typen patienten (persona
	nuttige informatie komt te laat / wordt pas achteraf aangebod
b) voor zorgverleners	Geen idee wat het BH inhoudt en hou het exact georganisee
	niet op de hoogte zijn van elkaars expertises en belangrijke
	werkwijze andere en/of 'alternatieve' mogelijk te consulteren
	leefstijl coaches zijn niet bekend in de regio
	twijfel over basale kennis bewegingsapparaat van bepaalde
3) Nazorg	niemand heeft overzicht over vervolgstappen na diagnose
	patient verliest controle en weet niet waar hij terecht kan me
	Aspecten die meespelen bijv bij zgn 'vastlopers' (zonder dia
	betrokken discipines werken teveel in eigen hokjes / kolomı
	gedegen follow up ontbreekt (oa tbv wetenschap)
	Conservatieve behandelingen (bijv artrose) matig ingericht
Communicatie	Berichtgeving over status beweeghuis is beperkt
	Contact tussen huisartsen en medisch specialisten; ze vind
	Betrokkenheid van de huisarts laat soms te wensen over?
	Contact tussen zorgverlener(s) en patient is omslachtig
	Contact HA/MS en fysiotherapeuten is matig
	Interoperabiliteit: teveel EPD's die niet met elkaar praten
	Communicatie gaat nu vaak via de patient..
Overigen/Algemeen	Patienten worden teveel 'gestandaardiseerd' behandeld (voe
	Samenwerking en coordinatie laat te wensen over
	Logistiek aangaande toegang gipskamer en orth schoenmak
	Groep niet-verzekerde patienten???
	Zorg is aanbodgestuurd ingericht (teveel 'doctor centered')

Appendix C – SIPOC Analysis





Appendix D – Process model