A survey-based exploratory analysis on the implementation of Value-Based Healthcare in Dutch hospitals

Thesis to obtain the degree of Master of Science in Science & Business Management

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Executive summary

In 2006, Porter and Teisberg introduced the concept of value-based healthcare. Value-based healthcare is a relatively new patient-centric approach towards the organization and management of healthcare that focusses on improving outcomes that matter to the patient. The concept of value-based healthcare is very broad and encompasses many different aspects within a healthcare organization, but also beyond. This study looked at the implementation of value-based healthcare in Dutch hospitals and the willingness of these hospitals to implement value-based healthcare. The information obtained from this study can be used by Avertim to gain insight into the market, to support customer acquisition and to tailor its services to customer needs.

To investigate the implementation and willingness to implement value-based healthcare among Dutch hospitals, a survey was created. The survey uses a Likert scale and 5 indicators (10 questions) to measure the implementation of value-based healthcare, and two additional questions to measure the willingness to implement value-based healthcare. The survey was sent to the boards of all hospital groups in the Netherlands. After responses were collected and the raw data was prepared, the following analyses were performed:

1. Comparison of mean scores between different types of hospitals
2. Correlation analysis
3. Ranking of questions and hospitals based on scores
4. Filtering data to select hospitals most suitable for customer acquisition

The results of this study show that there is a significant difference between the implementation of some fundamental aspects related to value-based healthcare between different hospital types. In addition, the results show that there is a significant difference in the willingness of different hospital types to implement value-based healthcare. Top clinical hospitals were found to score best with regard to the indicators used to assess the implementation of value-based healthcare and the willingness to implement value-based healthcare. Also, the data revealed that the use of specialized software for the analysis of patient data is significantly higher in top clinical hospitals compared to general hospitals ($p=0.020$). In addition, transparent comparison of patient outcomes among healthcare providers is more common in top clinical hospitals compared to University Medical Centers (UMCs) ($p=0.026$). Moreover, UMCs were found to answer 'neutral' on average when asked if in the hospital patient outcomes are transparently compared among care providers. A revealing result since all UMCs in the Netherlands are included in this study. Also, top clinical hospitals were found to be more willing to invest in value-based healthcare compared to UMCs ($p=0.026$), and general hospitals ($p=0.043$). Finally, top clinical hospitals were found to assign a higher priority to the implementation of value-based healthcare ($p=0.002$).

In addition, 16 different significant correlations were found between the survey questions. The strongest correlation was found between the questions "The hospital has mapped the minimum set of costs involved in treating a specific condition" and "The hospital has mapped the minimum set of treatments involved in treating a condition", $r=0.660$, $p<0.0001$. The next strongest correlation was found between the questions "The hospital is willing to invest to facilitate the transition towards value-based healthcare" and "In the hospital, patient health outcomes are transparently compared across care providers", $r=0.646$, $p<0.0001$. The remaining 14 correlations can be described as: $0.351 \leq r \leq 0.525$.

Also, the data shows that hospitals are most advanced in facilitating education on value-based healthcare compared to other questions in the survey. In addition, it was found that the willingness to invest in the implementation of value-based healthcare is high on average among hospitals. The data also shows that the use of financial incentives based on patient outcomes is unusual in Dutch hospitals, and that it is uncommon for Dutch hospitals to have contracts with health insurers that reimburse a full cycle of care needed to treat a specific condition.

Finally, a total of nine hospitals have been identified that, based on willingness and implementation measures, are potentially interesting for customer acquisition. Four hospitals were identified that have a high willingness score to implement value-based healthcare but score low ((strongly)disagree) on four (Isala hospital, and OLVG Amsterdam) or five (St. Antonius hospital, and Koningin Beatrix hospital) out of the ten questions related to implementation. Seven hospitals were identified with a high willingness score but a relatively low score on cultural implementation of value-based healthcare. Since Avertim has extensive experience in change management, these hospitals might be interesting for customer acquisition.

From this study it can be concluded that top clinical hospitals have a better IT infrastructure to facilitate the analysis of patient data than general hospitals. Also, outcome transparency is more common in top clinical hospitals compared to UMCs. UMCs answered 'neutral' on average when asked if in the hospital patient outcomes are transparently compared among care providers. Considering that all UMCs in the Netherlands are included in this study, it can be concluded that UMCs in the Netherlands can generally improve in the field of outcome transparency. Additionally, top clinical hospitals are more willing to invest in value-based healthcare than do general hospitals or UMCs. Besides, top clinical hospitals also give the implementation of value-based healthcare a higher priority than do UMCs.

No concluding remarks can be made about the correlations that were found. Additional research is needed to determine the cause (if any) of these correlations.

Also, this study shows that hospitals, in general, have a high willingness to invest in value-based healthcare, most hospitals take initiatives to facilitate education regarding value-based healthcare, and most hospitals use patient outcomes to improve health outcomes rather than to judge care providers. In contrast, financial incentives based on patient outcomes, collaborations with insurance companies that insure a total cycle of care, and the use of value-based procurement metrics are uncommon among Dutch hospitals. Finally, it can be concluded that 9 different hospitals out of a total of 40 different respondents could be interesting for customer acquisition. This conclusion is based on two assumptions, i.e., (i) hospitals that are less advanced in the implementation of value-based healthcare are more interesting than hospitals that are more advanced, and (ii) hospitals that are more willing to invest and assign a higher priority to the implementation of value-based healthcare are more interesting than hospitals that do so to a lesser extent.

Table of content

Chapter 1: Company profile

1.1 History and service

Avertim is an innovation and management consultancy firm that originated from Belgium. The company was founded in 2007 in Brussels by its current CEO Hervé Lefébure. Due to its success Avertim has been able to expand to France (Paris) in 2012. In 2017, Avertim opened its offices in Frankfurt and Amsterdam. The company is active in 5 different sectors i.e. banking & insurance, energy & utilities, life sciences & chemicals, telecommunication & media and transport & mobility[1]. The headquarter in Brussels provides service within all five of these sectors. In France, Avertim focuses exclusively on the banking & insurance sector. Paris is the financial hub of France and it is therefore no coincidence that Avertim's French office focuses exclusively on the banking & insurance sector. Avertim's Frankfurt-based office focuses on two out of five sectors that Avertim is active in i.e. life sciences & chemicals, and banking & insurance. Frankfurt is home to a great number of banks including many of the largest banks in the world e.g. the China Construction Bank Corporation, JPmorgan Chase, The Bank of China and the Industrial and Commercial Bank of China. The pharmaceutical industry also plays a prominent role in Frankfurt's business ecosystem. The German city has over 100.000 people working in the pharmaceutical industry. Frankfurt thus provides many opportunities for consultancy in life sciences and banking. In 2017, the decision was made to move the European Medicine Agency (EMA) to Amsterdam following the Brexit. The eventual arrival of the EMA in Amsterdam in 2019 makes the city very interesting for pharmaceutical companies. Amsterdam can now be seen as the pharmaceutical hub of the Netherlands and the life science & health hub of Europe. Therefore, the Amsterdam-based office focuses exclusively on the Life Science & Chemicals sector for its services.

Avertim states its mission as "bridging the gap between strategy and operations". In practice this means that Avertim's service is not limited to providing strategic solutions, but also ensures implementation of these solutions on an operational level. After implementation, outcomes are analysed to measure whether the desired result has been achieved. Avertim categorizes its services in three distinctive service lines i.e., increase performance, drive innovation, and leverage compliance, supported by ten commonly used methodologies (Fig. 1).

The rapidly growing interest in value-based healthcare provides an opportunity for Avertim to leverage relevant knowledge from other sectors and enter the healthcare sector. Entering a new sector does not only strengthen the competitive position but also provides additional revenue streams and new knowledge.

Figure 1. Avertim's service lines and methodologies

[1] https://www.avertim.com/

1.2 Organizational structure of Avertim

Avertim is governed by a board of directors headed by CEO and founder Hervé Lefébure. Within the business management department, one can start at Avertim as a junior on the function of business engineer. Business managers and business engineers are both responsible for the recruitment of new consultants. The consultants they hire on their team will report to them. As shown in Figure 2, a business engineer can report both to the business manager supervising him and to his senior manager. A business manager reports directly to the country lead (senior manager). The senior manager, in turn, reports directly to the board of directors. The department heads of the delivery, sales, marketing, solution, finance, legal, and administration departments report directly to the board of director.

When a Business Engineer manages a team of at least 10 consultants, provides valuable input, has a strong drive, ambitions, and management skills he/she can be promoted to business manager. From here it is possible to advance to senior manager and eventually director.

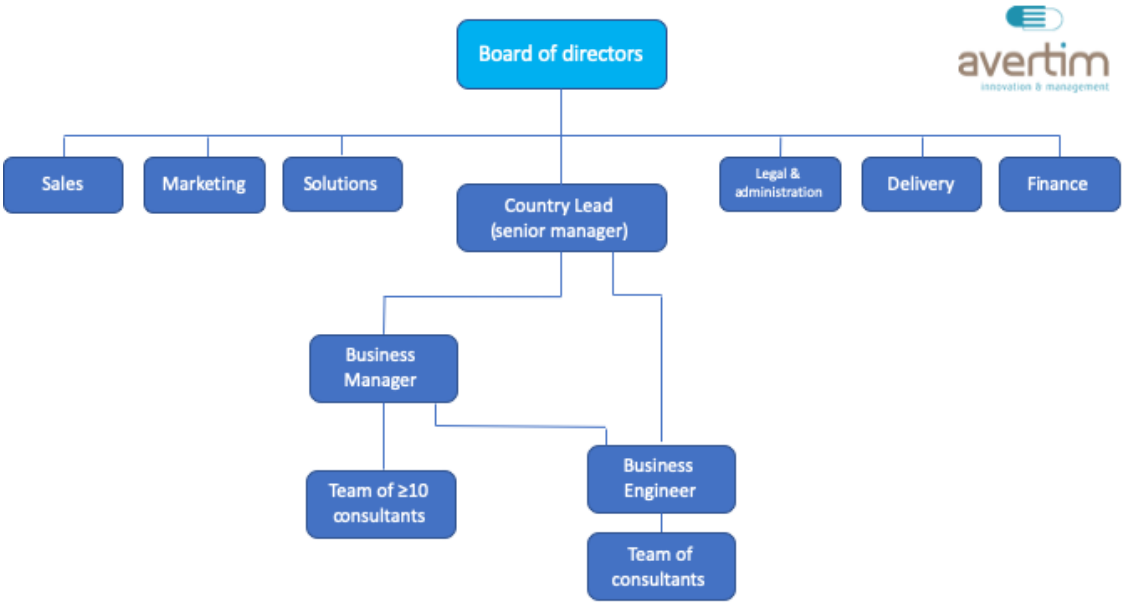

Figure 2. Organizational hierarchy at Avertim

In the Netherlands, consultants often work on projects individually. This isolated form of working can impede the efficiency of a company by hindering the diffusion of knowledge and innovation. To ensure that consultants can share their knowledge and experience, Avertim has created communities. For each sector in which Avertim is active, communities exist. In addition, within each sector, there are also communities specifically aimed at certain types of projects or clients. Consultants get the opportunity to exchange knowledge with consultants working on similar projects. In this way, knowledge is transferred and consultants can help each other to achieve the best possible result. Communities are freely accessible, also for consultants who are not directly involved in the subject of the community. A value-based healthcare community has also been established. In this community all knowledge gathered on value-based healthcare is shared and the possibilities for Avertim to enter this market are evaluated. This structure ensures an open diffusion of knowledge and thus contributes to the development of the company, its consultants, and the optimization of their results.

1.3 SWOT analysis

To analyze the internal and external factors affecting Avertim when entering a new market, i.e., the healthcare market, a SWOT analysis was performed (Fig. 3). Many of the methodologies underlying the services provided by Avertim are strongly applicable within value-based healthcare. For example, Avertim has extensive experience in the field of operational excellence, change management, risk

management, project & program management, and more. In addition, 50% of all services provided by Avertim are focused on the life science sector. Moreover, Avertim services four other sectors and operates in four different countries. This cross-sector and cross-country experience offers the opportunity to leverage knowledge from other countries, sectors, and projects. Avertim also has a high degree of seniority which means that there is a lot of experience and knowledge in-house. Another opportunity for Avertim is the fact that there is an increasing demand for improving the quality and efficiency of healthcare.

However, Avertim is not yet an established name in the Dutch consultancy market. The lack of brand awareness can lead to a lack of trust among potential clients and makes it difficult to acquire new projects and clients. Furthermore, the Dutch team of consultants currently consists of only 9 people. Should clients be aware of the small size of the team, this might also lead to less trust. Moreover, it is difficult to take on large projects that require several consultants. However, the fact that Avertim is located in multiple countries, could offer a solution. It is possible to use consultants from international offices for Dutch projects. Currently, consultants from the Belgian office are already working on projects for Dutch clients.

Another weakness is the fact that Avertim currently has no experience within the healthcare sector. A possible solution could be to hire new consultants with expertise in the healthcare sector. Hiring new consultants with experience in the healthcare sector, could turn this weakness into a strength.

Among the threats that Avertim faces is the intense competition in the consulting market. Avertim has to compete with multinationals such as KPMG, Boston Consulting Group (BCG), and PWC. These companies have extensive experience in the United States. In the US, where value-based healthcare originated, a lot of attention is paid to the implementation of this concept. Avertim is therefore competing with large companies that already have a lot of experience in the field of value-based healthcare. In addition, the demand for improving the efficiency of healthcare is increasing. Consulting firms will want to take advantage of this, possibly leading to an increase in the number of competitors.

To increase experience in value-based healthcare, Avertim could offer value-based healthcare training to its consultants. However, the company faces the risk that consultants resign after receiving training resulting in a loss of investment. Avertim offers a variety of training to its consultants. External training like lean six sigma requires a certain degree of commitment. These trainings are offered only after a year of employment. This commitment serves as risk aversion but does not completely eliminate the threat. Section 8.1 'Recommendations for Avertim' provides provides an overview of the actions that Avertim could take to counter the identified threats and weaknesses.

Internal Forces	
Strengths (+)	**Weaknesses (-)**

• Strong experience in relevant fields e.g.
  ○ Operational Excellence
  ○ Change Management,
  ○ Project/Program Management
• High level of seniority
• Cross-country expertise (4 countries)
• Cross-sector expertise (5 sectorts)
• Life Science expertise
	• Not an established name in the Dutch consultancy market
	• No in-house expertise in health care
	• Small Dutch team of consultants

External Forces	
Opportunities (+)	**Threats (-)**
• Leverage knowledge from other sectors/projects, fields of expertise, and countries • Increasing demand for improving the efficiency of healthcare delivery	• Large competitors (e.g. KPMG, BCG, and PWC) with experience in the USA • Resigning of employees after following VBHC training (loss of investment) • Companies want to take advantage of the increasing demand leading to an increase in the number of competitors

Figure 3. SWOT analysis of Avertim. The SWOT analysis refers to the strengths, weaknesses, opportunities and threats for Avertim when entering the healthcare market. Specifically, when providing services in the field of value-based healthcare.

1.4 Competitor analysis

To gain insight into how Avertim positions itself relative to competitors in the market, a competitor analysis was performed. Figure 4 shows the positioning of Avertim with respect to staffing, outsourcing and consulting companies. A distinction is made between the extent to which the company provides services on an operational or strategic level. Avertim aims to bridge te gap between strategy and operations and hence positions itself in the middle of these two (Fig 4.)

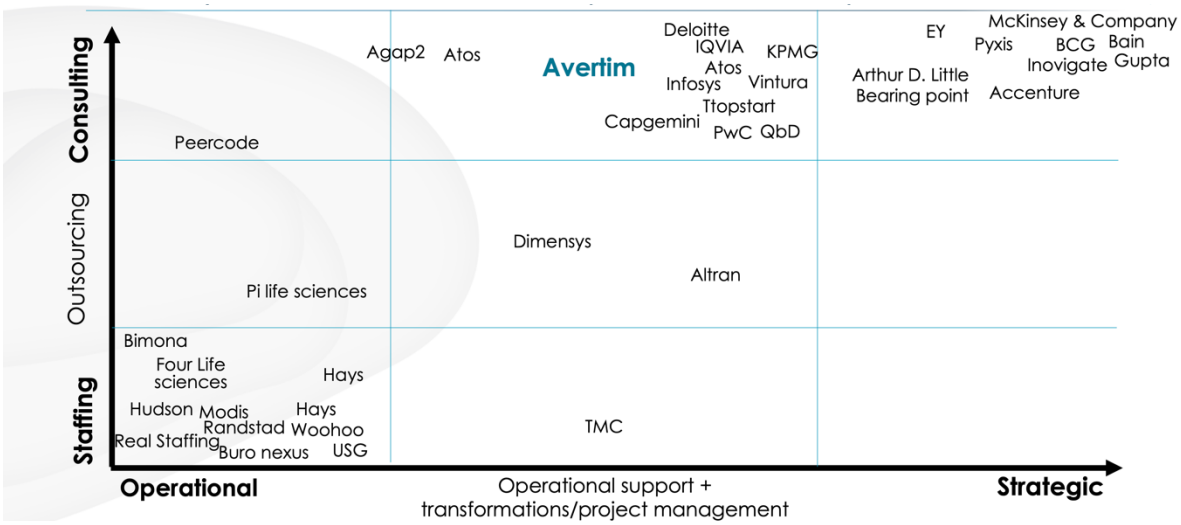

Figure 4. Visualization of the value-based healthcare competitor landscape. On the Y-axis, a distinction is made between staffing, outsourcing and consulting companies. On the X-axis, a distinction is made between the degree to which the different companies provide service on an operational or strategic level.

Appendix A offers a visualization of how competitors position themselves with respect to different trends within the healthcare and life science sector. In addition to the different trends, the figure also shows on which service lines the different companies mainly focus.

In the Netherlands, Vintura is one of the companies with the strongest focus on the implementation of Value-Based Healthcare in hospitals. Vintura's approach to implementing value-based healthcare is defined as follows:

1. *Define medical condition*: Decide for which medical condition you want to implement value-based healthcare
2. *Define scope:* Determine at what part of the patient journey you want to focus. Define the stakeholders. Collaborate with all stakeholders on defining the ambition of the project.
3. *Define outcome:* Specify what outcomes you want to focus on. If possible, use previously defined outcome measures for example from ICHOM.
4. *Collaborate with stakeholders for lasting adoption:* Involve IT specialists for data analysis and make sure that the goal of outcome measurement is clear to everyone in order to motivate stakeholders.
5. *Safeguard outcome improvements:* Introduce a culture of continuous learning and improvement in which outcomes are transparently compared with each other. Make sure that within this culture the focus is on improving value for the patient and not on judging results.

Figure 5 visualizes how Vintura aims to steer from care based on volume to an integrated care path with all partner organizations based on patient relevant outcomes through change management.

Vintura focuses mainly on change management, PMO/Portfolio management, product and service management and, project and program management. These are fields of expertise in which Avertim

also has extensive experience, although not yet within the healthcare sector. Avertim distinguishes itself from Vintura by also having experience in the fields of digitalization, operational excellence, risk management, business process management, corporate agility, and innovation management Avertim could leverage this experience to gain a competitive advantage over Vintura.

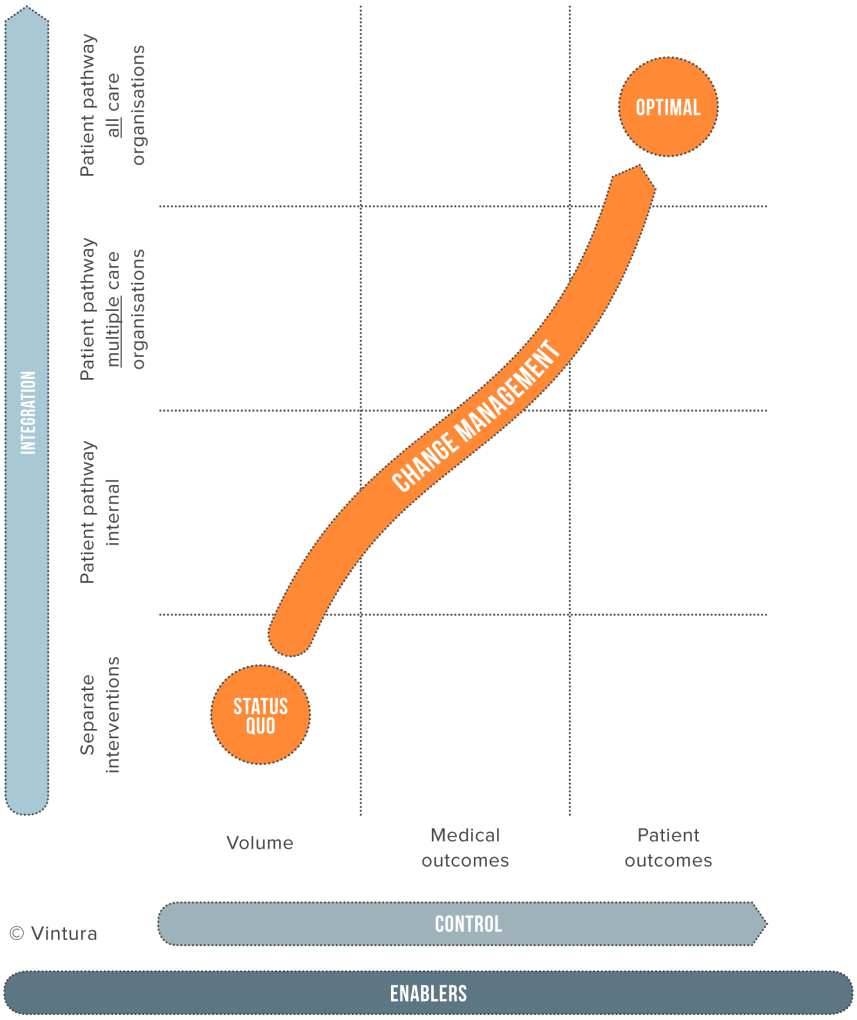

Figure 5. Vintura's value-based healthcare growthtrack Adapted from https://www.vintura.com/value-based-healthcare/implement-value-based-healthcare/ (n.d.) Copyright Vintura.

Chapter 2: Introduction

Avertim is an innovation and management consulting company based in Brussels, Frankfurt, Paris and Amsterdam. The company offers services within five different sectors, i.e., banking & insurance, energy & utilities, life sciences & chemicals, telecommunication & media, and transport & mobility, with over half of its activity within the life science sector. Avertim aims to enter a sixth sector, the healthcare sector, by providing services in the area of value-based healthcare.

Value-based healthcare is a concept that was first introduced by Micheal Porter and Elizabeth Teisberg in 2006. The concept challenges the current organization and management of healthcare. In value-based healthcare, the patient is the central focus and all actions taken should have the same goal, which is to maximize value for the patient. Within value-based healthcare, value is defined as the outcomes that matter to the patient divided by the total cost to achieve these outcomes (Fig. 6). Thus, the goal of value-based healthcare is to achieve better health outcomes and an overall better patient experience at the same or lower cost. To improve patient experience, it's essential that physicians actively involve patients in decision-making. For example, a terminally ill patient may choose not to take any more palliative treatment to ensure a higher quality of life. In doing so, the lifespan is shortened but the quality of life is increased. In this case, there is no gain in the health outcome of the patient as he/she is likely to pass away earlier, but there is a gain in the patient experience because the quality of life is improved in this shorter period of life. However, value-based healthcare is not just about shared decision-making. There are many processes that can be adapted within organizations to make them more value-based, both internally and externally. Internally, one could think of continuous improvement and learning by transparently comparing outcomes among healthcare providers. Externally, one can think of collaborations with health insurers to reimburse care based on outcome rather than per service.

$$\text{Value} = \frac{\text{Health outcomes that matter to the patient}}{\text{Total costs to achieve these outcomes}}$$

Figure 6. Value in healthcare as described by Michael Porter and Elizabeth Teisberg (2006)

However, efforts to improve patient health outcomes and experience are hampered by a lack of standardized outcome measures and transparency. In addition, there still seems to be no unanimity on the definition of 'value' which has caused initiatives to improve care to be slow and approaches to be diverse. When using the term value, some refer to the humanistic tenets on which the healthcare system is based (EXPH, 2019). Others view value more from an economic perspective referring to cost and process efficiency (Hurst et al., 2019). Both interpretations of value are important within the healthcare system. However, from a patient-centric perspective improving health outcomes is essential to improving value.

In the current healthcare system, there is a strong focus on process measures for evaluating quality. Despite many initiatives to provide a constant level of quality (e.g. protocols and standardized outcome measures), in practice, there is still a large variation in outcomes among treatments of the same condition (Stowel & Robicsek, 2018). An example is the variation in time until follow-up treatment is required after total hip replacement in Sweden. Patients treated in the lowest-ranked hospitals required follow-up treatment after 2 years. This is up to 6 times faster than patients treated at the best performing clinics in the country (Garrelick et al., 2012). Better and consistent outcomes also reduce healthcare costs and reduce the need for ongoing care. A diabetic patient whose condition worsens and eventually leads to, for example, blindness or kidney failure will require significantly more care and thus cost than a patient in whom the condition is not progressive (Deerberg-Wittram & Lütke, 2016).

Remarkably, few healthcare institutions measure the impact on patient quality from the perspective of the patient themselves. Many institutions tend to look at inputs and outputs. That is, they look at outcome measures such as life expectancy, but ignore outcomes that matter to the patient such as pain, recovery time, and quality of life. This can be partially explained by the lack of efficient metrics to measure these outcome measures. Another, perhaps less obvious, influence on variation in patient outcomes is payment models. The fee-for-service model, in which health care providers are paid per service they provide encourages quantity rather than quality of care. A possible consequence of this is over-medicalization and the incurrence of unnecessary costs (WHO, 2010). It is estimated by WHO and OECD that about 30% of the resources spent on delivering care are wasted on complications that could have been avoided, unnecessary treatments, or through ineffective administrative processes (WHO, 2010; OECD, 2017).

To safeguard and enhance the quality of care, the interests of the patient, not the provider, should be the central focus. To evaluate the quality of care, value must be measured from the patient's perspective. Only then can one improve the quality of care for the patient. By centering care around patients with similar medical conditions, the expertise of medical professionals can be maximized. Patient-centered care stimulates the relationship between the patient and the care provider and ensures more effective care and potentially a reduction in costs (Porter, 2008).

The interest in and demand for value-based healthcare is growing. This can be partially explained by the rising cost of care and the fact that there is an increasing demand for care in general. The increasing demand for care can largely be explained by the aging population. In 2021, the population of people aged 65+ consists of 3.46 million individuals. Of these individuals, 840,000 are over the age of 80. By 2050, the number of people aged 65+ is expected to rise to 4.84 million, a rise of almost 40%. The number of people aged 80+ is expected to rise to nearly 2 million, an increase of about 137%[2]. The prevalence of chronic diseases among the elderly is very high, and the increasing number of elderly people is causing an increase in the demand for efficient healthcare.

The increasing demand for healthcare and the rising popularity of value-based healthcare makes it an interesting topic for a consultancy company to provide service. However, Avertim has no previous experience within the healthcare sector and little insight into the market. It is unknown which (types of) hospitals are interested in value-based healthcare, in which area hospitals have already advanced in the implementation of value-based healthcare, and which area they could benefit from support. Hence, the aim of this study is to gain insight into the market by investigating which hospitals are interested in value-based healthcare, how advanced they are in implementing this concept and in which area they could benefit from support.

To answer the above described questions, a survey was prepared and distributed among Dutch hospitals. The survey uses 5 indicators rated on a Likert scale to measure how advanced hospitals are in the implementation of value-based healthcare. The indicators are data measurement, IT infrastructure, culture, continuous improvement, and external collaborations. In addition, hospitals' willingness to implement the concept was also measured by assessing the willingness to invest, and the priority level hospitals assign to implementation. The survey also asks for the type of hospital so that a comparison can be made between the different types of hospitals.

To address the research questions from the survey data, a number of steps were taken. The average answers of the different hospital types were compared and tested for significance to analyze if there is a difference in the answers of the different types of hospitals. Next, a ranking was made of all respondents based on their total score. The ranking provides insight into which hospitals are most advanced in the implementation of value-based healthcare and which hospitals are least advanced (based on the indicators used in the survey). In addition, a ranking was also made for the questions in the survey. This ranking shows on which subject hospitals score best and on which subject they score worst. The ranking of the questions provides a general idea of the area in which hospitals can improve the most. In order to make a selection of hospitals from the data set that might be interesting for customer

[2] https://www.cbs.nl/nl-nl/nieuws/2020/51/prognose-bevolking-blijft-komende-50-jaar-groeien

acquisition, the data was filtered. First, the data is filtered on hospitals that show a high willingness to implement the concept, but (strongly) disagree to many questions. A selection of 4 hospitals was made with a high willingness to implement the concept but that (strongly) disagreed with either 40% or 50% of the questions. Since Avertim has extensive experience in change management, the data was also filtered on hospitals that scored relatively low on questions regarding the hospital culture, which resulted in a selection of 7 hospitals.

The data collected in this study is relevant to Avertim because it provides insight into the field in which hospitals are advanced and less advanced with respect to value-based healthcare. This information can be used to determine in which areas hospitals might benefit from support. In addition, the data can be used to support the selection of potentially interesting hospitals for customer acquisition.

This introduction will be followed by a literature review (Chapter 3) in which a number of fundamental aspects for the successful implementation of value-based healthcare will be discussed. This chapter discusses for each topic how this topic can become more value-driven, what the effects of implementation are, and what the most common challenges are. Chapter 4 discusses in detail the research methods used to answer the research questions. Next, Chapter 5 provides an overview of the results found in this study and Chapter 6 discusses the conclusions that can be drawn from these results. Finally, Chapter 7 discusses the limitations of this research.

Chapter 3: Foundations for the implementation of Value-Based Healthcare

Value-based healthcare is a rather new and very broad concept. Hence, no predefined roadmap of how to implement this concept exists. A thorough analysis of resources and culture is required to define a tailor-made solution for the implementation of value-based care delivery. Making a transition towards value-based care delivery is a complex and time-consuming process and there are many obstacles to overcome. This section focuses on the fundamental elements that one should consider for successful implementation of value-based healthcare in developed countries.

Chapter 3.1 Data

3.1.1 Measuring outcomes

Availability of data is essential to be able to determine what practice maximizes value for a patient. Data should provide insight into how available resources should be deployed to optimize their effectiveness (Hurst et al., 2019). To increase value to the patient, it is important to measure health indicators that actually matter to the patient. Clinician-Reported Outcome Measures (CROMs) such as figures on tumor markers, mortality, cholesterol, or blood pressure are often scientific and obscure to patients. Information of interest to the patient comes from the patient themselves through so-called Patient-Reported Outcome Measures (PROMs) and Patient Reported Experience Measures (PREMs). PREMs are not true outcome measures; rather, they describe how a patient has experienced the course of care, e.g., the treatment facility and contact with the physician. Hence, PREMs can't be used to assess the effectiveness of treatment. PROMs are surveys that are used to map objective health indicators that are important to the patient and cannot be captured using CROMs and clinical evaluation, e.g., the degree of pain, the ability to perform daily tasks, and fatigue (Kluzek *et al*., 2021). PROMs are often measured before, during, and after treatment or during a particular course of care and can be used to assess the effectiveness of treatment. The measured indicators can be used by the patient and caregiver to:

1. Set goals together
2. Stimulate shared decision making with regards to the treatment (Jacobs *et al.,* 2020)
3. Monitor the course of treatment
4. Evaluate treatment goals

Healthcare providers can use PROMs to compare outcomes with colleagues and thus improve the quality of the care they provide. Patients can use data from PROMs to decide at which healthcare institution they prefer to be treated. Health insurers can use the data to guide their procurement policy[3]. Also, the use of PROMs enhances patient-care provider communication resulting in higher patient satisfaction (Chen & Hollis, 2013) and improved adherence to treatment plans (Wartolowksa, 2019). PROMS are very useful in that they convert qualitative data ("are you in pain?") into quantitative data ("how much pain do you have?") (Katz et al., 2020). However, they are also prone to bias as they use objective data to evaluate the effect of treatment. Hence, the outcome can be influenced by factors such as emotional state, expectations, socio-economic background, and how patients experience the interaction with their physician (Kluzek et al., 2021). Thus, one must take into account that such factors, over which a physician has little to no control, can influence the outcome of a PROM. To ensure reliability, PROMs should be risk-adjusted. One way to adjust for the risk of external factors influencing the outcome is by developing a case-mix (cohort) of patients. By assigning patients to groups with similar characteristics, variation within these groups is expected to be minimal. The variation between the different groups can be statistically corrected thereby facilitating a fair relative comparison of the effectiveness of treatment (Lezzoni, 2009). Additionally, PROMs can be risk-adjusted by adding an element of objectivity e.g., biomarker levels, and imaging. (Allik & Smedje, 2006; EMA, 2016) A potential barrier to successfully measuring outcomes is the IT infrastructure of a healthcare institution. Hospitals will need to invest in tablets (for digital question taking) and existing IT systems

[3] https://www.zorginzicht.nl/ondersteuning/prom-wijzer/1.-wat-zijn-proms

must be compatible with the platform on which the data is collected. In addition, the collection of additional data also creates an extra administrative burden. Tablets need to be handed out and patients may need help in completing and submitting the questions (Katzan *et al.,* 2011). PROMs are becoming increasingly accepted and implemented to improve the effectiveness of medical practices and increase patient satisfaction. Therefore, the number of PROMs in use is increasing as many healthcare facilities and physicians compile their own PROMs. However, for the effective use of PROMs, PROMs for specific conditions should be identical. It is practically impossible to judge the relative effectiveness of a treatment when treatments are assessed using different measures (questions). It is therefore important that PROMs for specific conditions become universally standardized (Kaplan *et al.,* 2020). One institution dedicated to providing standard outcome measures for medical conditions is ICHOM. ICHOM provides an online database of medical conditions for which a standard set of outcome measures (pain, fatigue, etc.) has been defined as well as the recommended tools to measure these variables. All healthcare facilities using ICHOM's standard sets can effectively compare outcomes for specific medical conditions. A standard set of outcome measures contributes to shared decision-making between a physician and a patient. In addition, a standard set provides qualitative information to healthcare providers and institutions, increases transparency, stimulates improvement, and allows for comparative research on the effectiveness of treatments (ICHOM, n.d.).

3.1.2 Measuring costs

The Netherlands is spending an increasing amount of money on healthcare. In 2018, national healthcare expenses amounted to 77.2 billion euros and in 2019 this amount grew to 80.9 billion euros, an increase of 5.2%. In both years this amounts to about 10% of the gross domestic product (10% and 10.2% respectively) (CBS, 2021). The increasing costs are partly explained by the fact that there is still little understanding of what care actually costs. Healthcare providers, healthcare institutions and payers often have little understanding of what it actually costs to provide patient care. As a result, healthcare providers are unable to link costs to process improvements and health outcomes, and are therefore unable to sustainably reduce costs on a systemic level.

Accurately measuring health care costs is very difficult given the complexity of the system. Treating a patient requires a wide variety of resources, e.g., personnel of varying expertise, medical devices, treatment rooms, and laboratories. Each component of a care path has its own costs and capabilities. The care pathway of a patient starts when he/she enters the hospital and registers at the reception desk. The rest of the care path and thus the resources that will be needed for treatment depend on the reason for which the patient is in the hospital. The complexity of a care pathway is further increased by the fragmentation of care delivery. Patients are often referred for treatment to alternative clinics that operate independently. In addition, patients with the same condition are often treated differently, either in different clinics or by different physicians who have their own way of working. This lack of standardization makes it even more difficult to assess the costs of treating a medical condition.

The most widely described and accepted method for effectively measuring costs within healthcare is time driven activity-based costing. How this method works is described in section 3.1.4 Time Driven Activity-Based Costing.

3.1.3 Mapping the care process

To measure the cost of a care pathway, mapping of the individual processes, resources and time used is essential. By mapping the different processes that a patient goes through during their treatment, a patient's experience is visualized and can be optimized. Mapping the exact patient journey enables one to assess, for each activity in the care process, to what extent this activity contributes to the goal of the process, i.e. maximizing value for the patient. Mapping of a patient's journey allows for constructive reorganization of healthcare. Activities that do not or barely contribute to the goal of maximizing value for the patient can be eliminated in order to optimize the process.

Process mapping can be performed following a series of steps. First of all, a team needs to be assembled to perform the process mapping and a schedule needs to be created. It can be helpful to have someone on the team who has previous experience with this way of lean working and thinking. Next, data needs to be collected. One must first map all the processes and resources involved in the care pathway i.e. staff, equipment, spaces, and the time that each of these resources is used. All the equipment (e.g. syringes, medicines, and catheters) that is required for each process should be identified. Next, at each step in the process, an estimation is made of the time that each resource or care provider spends with the patient (Kaplan & Porter, 2011). It is recommended that standard times be used for easy to predict, low-cost, and short processes. For longer processes whose costs are difficult to predict, such as surgery or complex examinations, one does need to calculate the exact times.

There are several ways to collect data for process mapping. Data can be collected through multi-disciplinary meetings. In this case, all physicians involved in a care pathway collaborate on data collection. The disadvantage is that the care path is not directly observed but is estimated based on input from physicians. Another way of data collection is to go through the care pathway directly. An employee will proceed through the care path as the patient normally does and will engage in all interactions with the relevant care providers. An advantage of this method is that it provides information from the patient's perspective and thus is as close to reality as possible. A disadvantage is that this process is very time-consuming and is influenced by the daily variation in the clinical environment and patient selection. Another approach to data collection from the patient's perspective is when the patient personally reports on his/her experience. Again, an advantage of this method is that it provides insight from the patient's perspective. A disadvantage is that the information is dependent on the patient and what the expectations are for this patient.

After the data is collected it can be visualized in a process map. Creating a process map can be done on a large piece of paper, a white board, using post-it notes, or digitally with software such as Adobe illustrator. After visualizing the data in a process map the process can be analyzed and optimized. Some questions can be helpful to analyze the process, for example: How many processes are there that do not add value? How long does the total process take? When are there queues and how long do they take on average?

Finally, the patient journey can be reorganized and optimized. Processes that do not add value can be eliminated or merged, the impact of bottlenecks can be minimized, and the entire process can be made more patient-centric (Trebble *et al.,* 2010*)*.

3.1.4 Time-Driven Activity-Based Costing

Time-Driven Activity-Based Costing (TDABC) is a method that can be applied to calculate the cost of care along a care pathway by measuring the cost of resources and processes and the time spent using each resource (Kaplan & Anderson, 2003; Kaplan & Porter, 2011).

After having mapped all the processes, resources, and time spent using these resources within a cycle of care the individual costs of all these elements can be determined. Overhead costs (e.g. rent and information technology) should be attributed to treating a condition by measuring the amount of time a patient requires the use of the resources associated with these costs (fig 7A). The costs for a resource to be available for patient care per unit of time (e.g. per hour) are called capacity costs. Capacity costs can be calculated using the following equation:

$$Capacity\ Cost\ Rate\ for\ Resource\ x\ = \frac{Expenses\ Attributable\ to\ Resource\ x}{Available\ Capacity\ of\ Resource\ x}$$

So, to calculate the capacity cost for a nurse one should first calculate all the costs an institution incurs to employ that person per unit of time (Expenses Attributable to Resource x) (fig 7A.). Next, the total available capacity is determined (fig 7A.) and the variables are filled into the equation. Fig 7B. tells us that Nurse X is available 121 hours per month (6.5 hours per day * 18.6 days per month). Filled into the equation we find that the capacity costs equal:

$$Capacity\ costs\ Nurse\ X\ (per\ hour) = \frac{Monthly\ total\ costs\ of\ Nurse\ X}{Avaiable\ hours\ per\ month\ Nurse\ X} = \frac{7.380}{121} = €61\ per\ hour$$

A.

Annual compensation	**€65.000**
Supervision costs	**€9.000**
(10% of nursing supervisor's full costs)	
Occupancy	**€12.000**
(10m² space, €1200/m²/year)	
Technology and support	**€2.560**
Annual total cost of Nurse X	**€88.560**
Monthly total cost of Nurse X	**€7.380**

B.

Start with	**365 days per year**
Less weekend days	104
Less vacation days	20
Less holidays	13
Less sick days	5
223 available days per year	
	18.6 days per month

Start with	**8 hours per day**
Less scheduled break (hours)	**0.5**
Less meeting, training, education	**1.0**
Available clinical hours	**6.5 hours per day**

Figure 7. Calculation example for Expenses Attributable to Resource x and Available Capacity of Resource x

The calculation example in Figure 7 shows how to use the TDABC method to calculate costs for individual components within a care cycle. When it is possible to clearly map out a patient's care path, the TDABC method can be used to make a relatively accurate estimation of costs. The method has been applied in practice and has resulted in significant cost reductions and process improvement in inpatient and outpatient settings (Martin *et al.,* 2018; Demeere *et al.,* 2009). TDABC is considered by many to be an effective method for accurately mapping costs during a cycle of care. To map costs, identifying all processes, resources, and associated costs in a care pathway is a good basis. However, it appears in practice that TDABC is not readily applicable to all institutions. Large institutions indicate that applying the method is very complex, resource-intensive (Keel *et al.,* 2017), labor-intensive, and difficult to scale, especially when patients require complex or diverse care (Katz *et al.*, 2019, p14). There has yet to be a generally accepted way to effectively measure costs within the healthcare system. The TDABC method offers a promising possibility although in practice it proves to be complex. Additional research is required to improve the applicability of this model in complex settings.

3.2 Information Technology in healthcare

Patient data such as administrative data, costs, PROMs, CROMs, treatments, diagnoses, and medication use are often scattered across multiple (data management) systems. As a result, it is difficult to develop a holistic understanding of a patient's health and the care he or she has received (World Economic Forum, 2018). An appropriate IT infrastructure is needed to ensure that healthcare providers have access to the right information during all processes of a healthcare pathway and can compare this information with each other in order to improve their services. A value-based IT health system should be centrally accessible to all health care providers involved in treating a patient during a cycle of care while ensuring a high level of privacy and security. The system should allow for easy capturing and sharing of stakeholder data, e.g., Patient Reported Outcome Measures (PROMs), Clinician Reported Outcome

Measures (CROMs), patient journey, diagnosis, costs, and treatments. Additionally, it should be compatible with most data extensions found within the healthcare industry so that data delivered from other systems can be integrated (World Economic Forum, 2018). To improve routine monitoring of PROMs and CROMs, the system should contain a benchmark data set such as the ICHOM standard sets or standard sets for biomarker levels in certain disorders. When patient data (PROMs or CROMs) is entered into the system, data analysts can immediately see if the data deviates from the set standards (Katz *et al.,* 2020).

Improving data management in healthcare to ensure improved access to relevant and recent data is one of four goals set in a €70 million national initiative by the Dutch government to stimulate value-based healthcare. An example of one of the government-sponsored initiatives is "MedMij". MedMij is a well-secured online health platform where patients have full control over their own health data. Patients themselves determine what they want to add to the platform and can, for example, upload data from wearable medical devices. The aim of the platform is to improve data management and become the new standard for exchanging medical data between patients and healthcare providers (Ministerie van Volksgezondheid, Welzijn en Sport, 2018).

For institutions wishing to develop their own platform, the question arises as to whether such a platform should be developed internally or whether its development should be outsourced. Both options have their advantages and disadvantages. Developing a data platform in-house is a time-consuming and expensive process. However, it allows for the development of a tailor-made platform without having to pay a license fee. The use of an already existing data platform could on one hand be a relatively cheap solution for small hospitals and clinics (Katz et al., 2020). On the other hand, outsourcing development may incur the risk of becoming reliant on vendors for customization of the platform and analysis of data that is ultimately used for decision making (Huesch & Mosher, 2017).

Introducing new IT systems is generally a substantial change. Employees will have to be trained to work with the new systems, which costs a considerable amount of time and money. Work processes may be delayed because employees need training and will have to get used to using a new system. It is therefore important that the introduction of a new system is well organized and that it is introduced gradually to minimize costs and delays in work processes.

3.3 Remuneration models in healthcare

3.3.1 Fee-for-Service (FFS)

A commonly used payment model in healthcare systems is the fee-for-service model. As the name implies, the volume of services delivered by a care provider is a determinant for the overall pay of this individual. Care providers are paid per service that they provide. Thus, this model incentivizes care providers to increase the quantity of services that they provide. As a result, the fee-for-service model commonly results in over-medicalization, over-charging, and service price inflation (The Fox Group, 2019). Also, healthcare bills tend to be difficult to comprehend as these often include all products ordered, and services provided by care providers. Consequently, these invoices are susceptible to billing errors (DECO, 2021). As unnecessary treatments (over-medicalization) do not always induce additional complications they can remain undetected. These treatments add no value to the patient's health outcome but reduce quality of life (Katz *et al.,* 2020*;* Jordi Varela, 2019). With creating value for the patient as the overarching goal of VBHC, reimbursement models should switch from a fee-for-service to a value-based model.

3.3.2 Value-based reimbursement

Value-based reimbursement[4], also known as outcome-based reimbursement or Pay-for-Performance (P4P), rewards healthcare providers based on the health outcome of their patients and efficient use of resources. This relatively new health care payment model is gaining popularity, thanks in large part to its data-driven quality care and resource allocation methods (The Fox Group, 2019). In contrast to the fee-for-service model, in which overall pay is determined by the quantity of services provided, care providers are paid based on the quality of care that they deliver. As a result, unnecessary treatments, overcharging and service price inflation are minimized. The model also includes financial incentives and performance indicators used to analyze physician performance. Additionally, the individual care provider will carry greater responsibility for providing high-quality care for their patients. The term value-based reimbursement is actually an umbrella term that is used to refer to many different payment models aiming to increase the quality of care, including bonus/malus per service, bundled payments, shared savings, shared risk, and capitation (DECO, 2021; The Fox Group, 2020). Bundled payment is currently the most commonly accepted and implemented model among value-based payments models.

3.3.3 Bundled payment

In bundled payment care providers are given a fixed amount for their services per cycle of care. Meaning that they receive a fixed amount to provide a patient with all necessary treatments. The amount remains the same even when multiple care providers are involved in treating a patient. In case the cost of treatments involved in a cycle of care is lower than the amount received, the care provider may keep the remainder. So, in bundled payment, a budget is determined to treat a specific condition as a whole and patients receive reimbursement for an entire path of care needed to treat a condition (Porter & Kaplan, 2016). The model uses case-mix variables (e.g. age, gender, medical background, level of education etc.) to create a case-mix[5] to prevent care providers from avoiding patients that require complex treatment. The price of a bundle of care is determined by the case-mix. The goal of bundled payment is to stimulate collaboration between care providers and reduce unnecessary testing, treatment, and diagnosis. The model is not limited to a single care institution but takes into account the possible necessity of multiple care institutions per care path. Meaning that the contract and budget are not limited to a single care institution but also take into account e.g. the physiotherapist and rehabilitation center. In bundled payment the entire care team involved in treating a patient's condition is compensated as a whole. In practice this means that after the bill (which is the compensation for the entire team) is paid, the payment will be divided among the different care providers involved in the care path (Katz *et al.* 2020). As a result, health care bills are drastically simplified and more comprehensible. Also, innovation is stimulated as care providers are incentivized to deliver care more efficiently, patient outcomes are improved and over-medicalization and overcharging is halted. Care providers incur some risk as the price per care bundle (and thus the bundled payment) is determined by historical or average costs of the service. Thus, the bundled payment is not determined by the costs of the actual episode of care (DECO, 2021). However, the risk drives innovation by stimulating care providers to look for more efficient ways of care delivery (Porter & Kaplan, 2016).

Some argue that bundled payments result in cherry picking of patients by care providers. Physicians will tend to choose only the healthiest and lowest risk patients. The costs of treating a patient and their expected health outcome differs for every individual. Age, health status, social and living conditions are all factors that influence the expected health outcome and costs of treating a patient. Therefore, these risk factors, called case-mix variables, should be compensated for in the bundled payment model (Katz *et al.,* 2020). Care providers taking on patients with lower expected health outcomes and higher

[4] Value-based reimbursement is a term that can be used to refer to payment of care providers based on patient outcome or health insurers reimbursing care for their clients based on outcome, depending on the context in which it is used.

[5] A case-mix is a group of patients that have been classified based on factors including age, gender, medical background, level of education. The use of a case-mix allows for more accurate determination of expected health care cost. Health care costs of patients within a case-mix are expected to be less scattered.

expected costs should be rewarded for taking on hard cases to counteract the risk of cherry picking (Porter & Kaplan, 2016).

3.3.4 Diagnosis Treatment Combination

In the Netherlands, care provided in hospitals is billed through so-called diagnosis treatment combinations (DTC)[6]. A DTC (or DBC, diagnose behandel combinatie in Dutch) is a form of bundled payment that comprises all the steps needed to treat a condition or illness, from the initial consultation up to and including the final check-up. A bundle of services included in a DTC is called a DTC healthcare product, and can include e.g. surgery, diagnostic scans and outpatient visit(s). It includes all treatments necessary to treat a specific condition such as, for example a broken leg. When a DTC is initiated it has a maximum duration of 90 days. If a treatment lasts longer or the patient needs to be monitored, this period must be extended. A new DTC must then be opened, with a maximum duration of 120 days. The price of a DTC is determined by the average price for the complete treatment (care path) of a certain condition. One does not pay for individual treatments, but for treatment of a condition as a whole. The type of DTC care product is determined by factors such as the need for surgery, number of visits to the outpatient clinic and need for inpatient stay. The type of DTC care product that best fits the care path provided is determined after the complete treatment has been carried out[7]. DTC health care products are expressed in 14-digit codes that include all the information about the care path (Table 1).

Table 1. ***Performance code 01110005540031 in the DTC system***

Performance code	Explanation	Translation
01 - . . - . . - . . . . -	Specialty	Opthalmology
. . - 11 - . . - . . . . -	Type of care	Regular care
. . - . . - 00 - . . . . -	Demand for care	No defined demand for care
. . - . . - . . - 0554 -	Diagnosis	Cataract
. . - . . - . . - . . . . - 0031	Treatment	Treatment in outpatient department

The use of specific care packages in the DTC system has many perks. The use of detailed care bundles increases the transparency on diagnoses, processes and related costs. This information can be used by hospitals to increase the efficiency and quality of processes, thereby supporting the improvement of the quality of care (Hasaart, 2011). Additionally, the system is designed to stimulate competition in the healthcare market, which in turn drives quality improvement and costs reduction (NZa, 2006). However, the system has also shown to have many flaws.

The complexity of the DTC model has led to uncertainty to medical specialists, hospitals, patients, and insurers. The coding scheme (table 1) knows many different variations, none of them being internationally acknowledged as a classification system. Medically identical treatments that can be performed by different medical specialties are often coded differently among these specialties. As a result, the system actually comprises 24 different DTC structures. Moreover, these different structures cannot be compared because of the different coding they use. Thus, many different code variations for the same treatment can exist leading to uncertainty for medical specialists on what code to use. Additionally, the lack of unanimity and the fact that the classification is not internationally acknowledged troubles international comparison of health data (DBC Onderhoud, 2010 as cited in Hasaart, 2011).

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6 Diagnose Treatment Combinations were first introduced in the Netherlands in 2005. The goal of this new financing system was to encourage competition in the healthcare market. The use of bundled care packages makes it considerably easier to evaluate and compare hospital performance. Additionally, the system aims to incentivize efficient care delivery and stimulate innovation (NZa, 2006).

7 https://www.radboudumc.nl/en/patientenzorg/uw-afspraak/zorgverzekering/foreign-residency-insurance/more-information/explanation-of-healthcare-costs-in-the-netherlands

As mentioned previously, a new DTC can be opened if a patient requires additional or extended care or when a new episode of care is started in parallel (parallel DTC). However, the rules on opening a second DTC for patients that require additional care within the same medical specialty lead to uncertainty and confusion for both care providers and health insurers. If a patient requires additional care within the same medical specialty, the cost of that care must be at least 40% more expensive than the cost in the first episode of care. Alternatively, the additional treatment may cause an increase in the medical specialist's workload of at least 40%. Both cases would in theory allow for the opening of a new DTC. However, in practice, it still remains unclear whether it is allowed to open a parallel DTC when additional costs are below the 40% margin (while the additional workload is >40%). No official governmental decision has been made on this matter yet. The validation process for registering DTCs is neither very strict nor is it nationally uniform. Thus, the system allows for the risk of upcoding[8] (Hasaart, 2011).

In an attempt to improve the DTC system, the DOT (Dtc On their way to Transparency) system was introduced. The DOT system aims to accomplish the original goals of the DTC system i.e. create transparency, facilitate medical recognizability, and stimulate innovation by reducing its complexity. The DOT system relies on three pillars to do so. First, DTC products are identified by algorithms instead of medical specialists, reducing the risk of upcoding. Second, the total amount of DTCs is reduced. The new DTCs will be medically recognizable and uniform to support negotiation between payers (insurers) and providers (hospitals). Lastly, DTC products will be classified using a uniformly accepted coding system (ICD10) to facilitate international exchange of data (Hasaart, 2011).

3.3.5 Capitation

Capitation is a remuneration system in which the healthcare provider receives a fixed amount of money per patient per time period. With this amount, the healthcare provider needs to cover the full cost of care for the patient in question in the agreed time period. A characteristic of this model is that the healthcare provider bears the full financial risk if the agreed amount is exceeded. In other words, if the budget is exceeded, the care provider incurs a loss on this particular patient. However, if the cost of care for a patient is less than the agreed budget, the remaining amount serves as a profit. The capitation model thus rewards care providers for providing more efficient care. The contrasting fee-for-service model encourages high-volume care delivery. Capitation models have emerged with the goal of eliminating redundant services and reducing costs (Miller, 2009; James & Poulsen, 2016; Torrey 2020). The capitation payment model has its benefits and drawbacks. As the model does not incentivize to deliver a high volume of services, it allows for the exploration of more cost-effective treatments. Also, it provides clearer insight into cash flow, saves costs by reducing the need for billing staff, and ensures that care providers do not have to wait for their paychecks. Additionally, the model encourages preventive care as a way to reduce costs. Since physicians bear financial risk, the model also ensures that the number of unnecessary treatments is minimized, eliminating unnecessary costs for the patient (Kenen, 2016). However, not everyone agrees with the aforementioned benefits. Thomas Cox (2011) argues that the model actually leads to an increase in healthcare costs. Additionally, as the amount of money received by health care providers depends on the number of patients they treat, they will tend to take on more patients. As a result, they will spend less time during consultations on each individual patient, threatening the patient-provider relationship.

In the capitation model, the health care provider bears the full financial risk for the treatment of its patients, a risk that normally lies in the hands of the health insurance company (Porter and Kaplan, 2016). The healthcare provider, which in this situation can be considered a small insurer, runs a much higher risk of incurring losses compared to large insurance companies (Cox, 2011).

8 Upcoding is the phenomenon where healthcare providers register more expensive DTCs in order to generate more revenue.

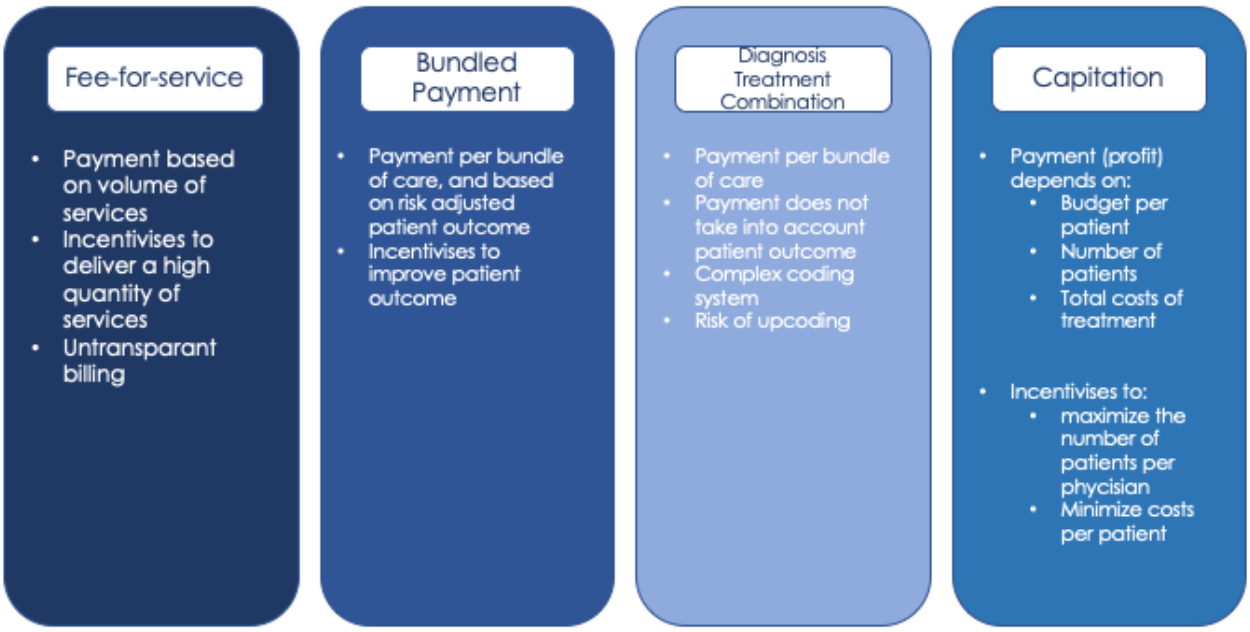

Figure 8. Characteristics of payment models for care provider reimbursement

3.3.6 Barriers to healthcare payment reform

Not all healthcare systems nor the employed physicians are eager to make a transition towards a Pay-for-Performance model. Multiple barriers to healthcare payment reform exist. The goal of Pay-for-Performance is to incentivise care providers to improve quality of care. The traditional fee-for-service model incentivises care providers to provide a high volume of service. Thus, one should consider that making a transition to value-based reimbursement may likely result in a significant decrease in revenue at first. As inpatient stay and, the amount of treatments executed is declining while fixed costs remain unaltered (Henkel & Maryland, 2015). Appendix B provides an overview of barriers to healthcare payment reform and associated solutions as described by Harrold D. Miller (2012).

3.3 Value-based insurance

3.3.1 The Dutch insurance system

The health insurance system in the Netherlands is organized in such a way that it contains both a public and private element. The implementation of the system is directly regulated by the Dutch government. To ensure the social character of the system, the government has established a number of statutory requirements.

- Basic health insurance is mandatory for every citizen. Every citizen has the right to choose his/her own health insurance company.
- Health insurance companies are obliged by law to accept these citizens, regardless of their health status

- Every policyholder pays the same premium irrespective of their health status or socioeconomic background
- Health insurance companies have an obligation to provide care. This means that they must be able to assure that the care that is included in the basic package is available to all insured individuals.
- The care covered by the basic insurance is determined by law

Unlike the implementation and regulation of the system, the government is not involved in its execution. The practical implementation is arranged by the insurance companies, health care providers, and policyholders. By organizing the system in this way, healthcare providers maintain a considerable amount of autonomy. Also, quality and efficiency are promoted by free competition (Ministerie van Volksgezondheid, Welzijn en Sport, 2016).

In the Netherlands, the Dutch Health Authority (NZA, Nederlandse Zorgautoriteit in Dutch) defines the type of care that care providers may claim. Also, the NZA defines the conditions that this care must meet. Healthcare is currently being purchased per individual service. Meaning that every year healthcare providers and healthcare insurers negotiate about the volume and price of services to be purchased and set a budget. Procurement of healthcare per individual service has several major drawbacks (Miller, 2009; Jeurissen *et al.* 2018). First, payment per individual service incentivizes care providers to provide a high volume of services (Ginsburg and Grossman, 2005). Unnecessary services are being provided resulting in overdiagnosis, overtreatment and longer inpatient stay. Also, first-line preventive healthcare is being disincentivized as this might not be defined as claimable by the NZA. Additionally, the system drives fragmentation of health care. As healthcare providers are financially disincentivized to refer a patient to another clinic even though this may be the favorable option for the patient (Tsiachristas, 2015). Finally, innovation and process improvement are inhibited as hospitals are paid less when they perform a lower volume of services. To improve value for patients a different health care procurement strategy seems desirable. A number of value-based (or outcome-based) health care procurement[9] initiatives are currently being implemented and further developed in the Netherlands. Characteristic of this way of purchasing care is that a single fee is paid for a complete care process. In addition, indicators are often used to measure a patient's health outcome. These indicators often determine the height of a financial reward or penalty. Besides the value-based procurement initiatives, the Dutch government is introducing an outcome-based bundled reimbursement system for all mental health and forensic health care as of the 1st of January (Ministerie van Volksgezondheid, Welzijn en Sport, 2021).
Dutch health insurance companies are increasingly experimenting with methods to improve patient health outcomes and experience while reducing costs. Many of these methods have in common the bundled payment for treatment of a condition as a whole. 94% of patients in the Netherlands indicate that they want to be actively involved in the process of deciding what treatment is best for them (Ministerie van Volksgezondheid, Welzijn en Sport, 2018). An advantage of bundled payment for a cycle of care is that it no longer stimulates high-volume care delivery. Thus, there is more room for patients and providers to decide together what a patient needs and moreover what a patient wants. As the patient itself is the one who eventually needs to indicate what he or she decides is true value. The next section describes some of the outcome-based insurance initiatives that are currently being introduced in the Netherlands

3.3.2 Bundled payment for treatment of diabetes type-1

Zilveren Kruis (ZK) signed a bundled payment contract with Diabeter. Diabeter is a group of certified clinics that focuses specifically on providing complete treatment for patients with type 1 diabetes. Patients with type-1 diabetes insured by ZK are referred to a Diabeter clinic where they are provided with the full required treatment for a fixed price, including any additional costs that may come with hospitalization or complications. To assess the performance of clinics, value-based contracts often use performance indicators. At Diabeter, performance is measured using patient glycemic levels. Individual

9 In this thesis the term value-based procurement is used to refer to either the purchasing process of health care by health insurers or the purchasing process of medical equipment or medicines as performed by hospitals.

patients are assigned a score that can range between -2 and +2 depending on their glycemic levels. Financial bonuses or penalties are determined according to these scores. In addition, a financial reward can be earned when the cost of treatment is less than the bundle price, or when the outcome achieved exceeds the predefined target (Katz *et al.,* 2020)

Diabeter has achieved above-average results (i. 3% hospitalisation in Diabeter clinics vs 8% national average ii. 55% of paediatric Diabeter patients are below the glycemic threshold level for avoidable death compared to 28% in alternative clinics) which can be explained by their complete approach towards value-based healthcare that includes the following measures:

- *Diabstore* - a retail store (both digital and physical) that provides direct access to all necessary medical devices and consumables e.g. insulin pumps and pens, and blood glucose monitors. Devices and medicines are fully reimbursed and invoices are sent directly to ZK.
- *Vcare* - an electronic platform that automatically uploads information from a patient's blood glucose monitor or insulin pump to a dashboard where it can be reviewed by care providers within the centre. After review patients can receive an email with trends, follow-up appointments and treatment plans.
- *Care manager* - at Diabeter every patient has its own care manager who is responsible for coordinating care between the patient and the multidisciplinary team that is involved in treating the patient.
- *Stimulating work environment* - Diabeter has created a pleasant work environment to promote employee mood and productivity by reducing administrative burden, stimulating contribution to patient health outcomes, and providing an appealing interior design and facilities.

3.3.3 Bundled payment for cardiac care

Health care insurer Menzis has started with a new bundled payment program that focuses on health outcomes and the effectiveness of cardiac care. The model differs from the old model in that: i. One fixed amount is paid for the entire treatment. ii. Patient outcomes are a determining factor for financial rewards. Improved patient outcomes are rewarded. iii. The price for potential re-treatments is included in the bundled payment and therefore does not constitute an additional source of income. iv. The height of the bundled payment is corrected for the intensity of the care needed by the patient based on case-mix variables. The amount that the hospital pays per bundled payment consists of a standard fee for the treatments, an additional 'guarantee' fee for pre-and post-care, and a variable fee that depends on the case-mix variables. In addition, a bonus or malus is charged over the variable rate, which is determined after a quality evaluation on outcome indicators (Menzis, 2018). The company has started with similar programs for the procurement of hip- and knee replacements, treatment of cataracts, rheumatism, breast cancer, and final-stage kidney failure.

3.3.4 Improving pharmacotherapeutic efficiency

Formulary-Focused Prescribing (or Formularium Gericht Voorschrijven (FGV) in Dutch) is an initiative that is currently being implemented and further developed by various health insurers in the Netherlands. A formulary contains brief advice on the medication to be prescribed for certain diseases or indications. Formularies are used to assist a general practitioner in determining appropriate medication or therapy. Formularies have existed since the 70's (Middelweerd *et al.,* 2020). However, the use of Formulary-Focused Prescribing can be described as a value-based initiative as it was set up to stimulate effective prescription of medicines in general practice and thus improve the quality of general practitioner care. GPs can receive a financial allowance from health insurers for the effective

prescribing of medication. Several large Dutch insurance companies, such as CZ, Menzis, Zilveren Kruis, VGZ, eno, and Zorg en Zekerheid participate in the concept[10].

3.3.5 Value-based insurance design

A model that is currently a topic of great interest and investigation in the United States is the value-based insurance design (VBID) model. The goal of the model is to boost health care effectiveness and reduce costs by selectively encouraging the use of certain treatments. The model encourages the use of high-value services by decreasing copayment and inhibits the use of low-value services by increasing copayment. In doing so, the model considers patient heterogeneity. The rationale for cost-sharing is that people use a service only when they believe the cost outweighs the clinical value the service provides. However, this model assumes that the patient is always able to make the right trade-off between clinical importance and cost. However, practice shows that patients are often unable to make the correct trade-off. Therefore, when a patient is confronted with copayment, this can lead to the underutilization of services. The VBID model supports the patient in making a weighted decision by lowering copayment for treatments with the highest clinical value. For example, lowering copayment on beta-blockers for patients suffering from congestive heart failure can increase their use of this medicine and improve value (Chernew *et al.,* 2007). The effectiveness of the VBID model is still a subject of debate. Some studies argue that the model increases patient value but does not reduce costs (Lee *et al.,* 2013). Others argue that the model does reduce health care costs or break even while increasing patient value (Chernew *et al.,* 2010).

3.4 Value-based procurement

Procurement can be a significant driver of value-based healthcare However, its potential remains largely untapped (MedTech Europe & BCG, 2016). Purchase price is often the most important criterion in healthcare procurement. However, focusing solely on purchasing price neglects the needs of other stakeholders i.e. patients, care providers, and society.

When a tender focuses exclusively on cost, additional costs will emerge that are difficult to identify and quantify in advance. Moreover, the procurement budget does not take these additional costs into account. Low-cost IV catheters have for example shown to break easily, pose safety risks for those who handle them, and require significant time to handle correctly. Identifying such hidden costs requires good communication between clinical and purchasing parties. Besides the fact that focusing on the initial purchase price does not take into account value to the patient and total cost, there are other undesirable consequences. As competition is based on cost price, prices tend to become unsustainably low. As a result, the market becomes unattractive to small companies or they are driven out of the market as large suppliers have appropriated the offering. Because large suppliers have a stronger competitive position, they are more likely to win tenders and thus eliminate options for smaller parties. To achieve a more value-driven and holistic approach to procurement, bidders will need to calculate the total cost of care (including costs for potential complications) (BCG, 2020). Thus, value-based procurement is inextricably linked to measuring outcome indicators and costs. In order to properly identify the total cost of treatment and the average expected outcome per patient group, a considerable amount of data is required. On the one hand, adequate data needs to be measured by medical specialists and, on the other hand, this data needs to be communicated to suppliers. Important pillars for successful value-based procurement are therefore data (measurement), communication (between medical specialists and suppliers), and collaboration (between all stakeholders). To maximize the success of value-based procurement collaboration is critical. A trusted partnership between procurers and suppliers is needed to maximize value for all stakeholders. Collaboration and strong communication between both parties is crucial in order to clarify the objectives and possible solutions at an early stage of the

[10] https://www.lhv.nl/actueel/nieuwsberichten/update-over-formulariumgericht-voorschrijven-fgv/

process. In addition, parties can jointly agree on appropriate outcome criteria and what real-life measures can be used as indicators for these criteria (Gerecke et al., 2020).

Emerging value-driven procurement initiatives are in compliance with Directive 2014/24/EU, adopted by the European Parliament in 2014. The directive was adopted with the aim of improving the procurement process by encouraging quality and innovation. In addition, the directive also takes into account long-term costs, environmental and social factors. New procedures in the directive offer more freedom to contracting authorities, giving them the opportunity to work more closely with suppliers. This creates room for negotiation and dialogue, an element that was lacking in the traditional model (European Union, 2014).

A variety of value-based procurement (VBP) methods are arising and contracting authorities are increasingly shifting towards these more holistic approaches to procurement. VBP which, according to Pennestrì *et al.* (2019), is defined as "achieving outcomes that matter to people at the lowest possible costs" (p688), puts greater emphasis on the evaluation of long-term performance. Among the different methods is the Most Economically Advantageous Tender (MEAT) VBP method which is developed by MedTech Europe and the Boston Consulting Group (BCG). The method takes into account the health outcomes that are important to the patient and the total costs of care along the entire care path. As a result, this method would for example prefer medicine X (costing €10.000,-) over medicine Y (costing €2.000,-) knowing that treatment with medicine X would result in a more favorable health outcome for the patient and that using medicine Y could result in additional future healthcare expenses. Additionally, the MEAT VBP method takes into account the benefits for care providers and society. Contracts are awarded based on the Best Price-Quality Ratio (BPQR) principle which eventually results in the Most Economically Advantageous Tender (MEAT) (MedTech Europe & BCG, 2016).

In summary, a short-term view where a bid is evaluated merely on cost price does not only affect the patient but jeopardizes the integrity of the healthcare system as a whole. Using a more comprehensive approach to procurement will deliver value at all levels of the healthcare system. Patients will receive higher quality care at lower costs. Care providers are able to deliver care more efficiently and as a result, see an increase in patient satisfaction. Payers (healthcare institutions) face reduced risk and will be more capable of controlling costs as they take into account the total cost of care. Suppliers contribute by aligning prices with patient outcomes and society as a whole benefits from the new system as healthcare expenses are reduced and overall health improved (Penestrì *et al.,* 2019).

3.5 A value-based culture

To maximize value for the patient, it is important that all the involved parties are aligned. All stakeholders should be aware of the goal, i.e. providing quality care for the patient, and act accordingly. It is essential to work together, to learn from each other, and to continuously improve. However, in practice, it appears that in many hospitals there is a culture that is inconsistent with this ideology. A closed culture that is characterized by poor collaboration and where comparing outcomes is uncommon hampers the potential of care providers and thus the quality of care. The following section provides an overview of the various elements that are important to improve the culture in hospitals and thereby increase the quality of care.

3.5.1 Outcome transparency

A fundamental cultural misinterpretation of many hospitals is the tendency to focus on patient outcomes in terms of *who* achieved the best results other than *how* these results were achieved. This results in a closed culture in which physicians are less likely to share and compare results for fear of being judged. However, transparent comparison of outcomes is often reported as an important driver for improving the quality of care.

On the one hand, it allows healthcare providers to improve their practice by internal (comparison within a facility) or external (comparison with other facilities) evaluation of treatment efficiency. On the other hand, accessible and transparent data on treatment outcomes allows patients to make more conscious choices about which treatment, provider, or facility they consider appropriate (Kaplan, 2018). Although public reporting in theory certainly enables patients to make informed choices, there is little evidence to suggest that patients actually use this information in practice to support their decision-making *(*Faber *et al., 2009;* Shaller *et al., 2014).*

Open comparison of outcomes encourages healthcare providers to deliver better outcomes to earn recognition from peers and to protect their sense of honor. They will strive to deliver the best results, but will also recognize that collective learning is most effective. The transparent comparison of outcomes triggers a form of 'coopetition'. On the one hand, healthcare providers will compete with one another as they all seek to deliver the best outcomes, and on the other, they collaborate to improve the quality of care (Lamb et al., 2013; Katz et al., 2020). To facilitate outcome comparison between different hospitals, the use of standardized outcome measures is essential. The standard sets provided by ICHOM could offer a solution.

The effect of public reporting on the adherence to clinical guidelines and consequently improving the quality of care is seen in the example of the Swedish Coronary Care Registry (Fig. 9). Following public disclosure, a drastic increase in quality index scores was observed. The average rate of improvement of all hospitals grew by 22% after public disclosure of quality index scores. Moreover, hospitals that performed below average improved their quality index scores by 40% (Larsson et al., 2011).

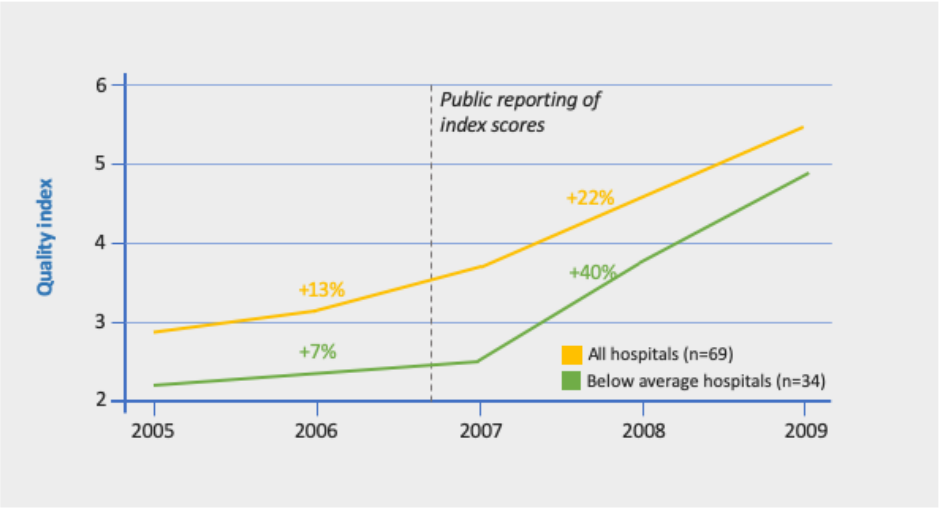

Figure 9. The impact of public reporting on the quality of care in the Swedish Coronary Care.

Implementing an open culture where healthcare providers are not judged on their outcomes but where the focus is on learning from outcomes must be instigated using a top-down approach. Managers are responsible for successfully promoting and monitoring an open culture in which improving the quality of care is the primary goal (Kaplan, 2018).

Outcome transparency has the potential to have a major impact on the quality of care. Among healthcare providers, outcome transparency could help develop a culture of learning and continuous improvement, as long as the implementation of this change is correctly guided by management.

Transparent comparison of outcomes can be realized by introducing learning communities in which specialists come together at a fixed moment in time to exchange knowledge and best practices. Within a learning community it is important that there is a strong sense of trust. The purpose of the community is to share outcomes and best practices to improve as a physician and increase value for the patient. Participants should be aware of this purpose within a learning community. To ensure this trust, a learning community must be regulated through clear rules (Katz *et al.,* 2020)

3.5.2 Shared decision-making

One of the four components of the Dutch national program for outcome-based care (Programma Uitkomstgerichte Zorg 2018-2022) initiated by the Ministry of Health, Welfare, and Sport is shared decision-making (Ministerie van Volksgezondheid, Welzijn en Sport, 2018). In shared decision-making, patients and clinicians use evidence-based information (e.g. PROMs, PREMs, and CROMs) to jointly decide what treatment option is most appropriate. Thus, unlike a traditional consultation, shared decision-making actively involves the patient in the decision-making process. The patient is encouraged to think about the possible treatments or screening options and the likely pros and cons for themselves, allowing them to discuss their personal preference with the physician. Shared decision-making respects a patient's autonomy and causes patients to be more engaged. Many patients still experience decision-making related to care as a unilateral process. However, 94% of patients indicate that they want to be actively involved in the decision-making process. A survey involving nearly 7900 patients revealed that 14% of patients feel inadequately involved. In addition, 48% of patients indicated that they are often presented with only one treatment option, and 37% find it difficult to discuss personal preferences with a doctor or nurse (Harnas *et al.,* 2017).

Despite the fact that there is considerable interest in shared decision-making, in practice, it appears that its implementation is still slow and difficult (Gravel *et al.*, 2006). In addition, the development of effective approaches to shared decision-making is fragmented (Zonmw, 2016 via Ministerie van Volksgezondheid, Welzijn en Sport). Three elements are important in facilitating that shared decision-making can become a part of daily operations (Elwyn *et al.,* 2010):

1. Easy access to evidence-based information concerning possible treatment options.
2. Guidance on weighing the benefits and drawbacks.
3. A supportive culture that encourages the involvement of patients.

Studies indicate that shared decision-making is associated with improved affective-cognitive outcomes (Shay & Lafata, 2014). Additionally, evidence has been provided to believe that shared decision-making can improve outcomes for patients suffering from chronic illness when the decision-making process is not restricted to a single session (Joosten *et al.,* 2008). Overall, implementing shared-decision making in daily operations requires a considerable cultural change. To help decide on treatment options, patients must have access to evidence-based information such as PROMs, PREMs, and CROMs. In addition, health care providers need to fundamentally change the way they conduct a consultation by actively involving the patient in the decision-making process.

Shared decision-making can already be implemented through a few simple steps. First, a patient should be informed that there is not necessarily a best choice. Taking no action or maintaining the status quo are also options (Towle *et al*., 2006). Once all options have been discussed, the pros and cons of each option should be weighed. Patients may benefit from figures on the risk of complications to help them make trade-offs. When exact figures are missing, it may help to give an indication of the expected complications in, for example, 1 in 100 patients. This data can be used by the patient to weigh the pros and cons.

To support the patient in the choice process it is important to ask questions. As a physician, asking questions helps the patient to gather information and make a well-considered decision. The following questions could help in the decision-making process: What is the purpose of your treatment? What are your expectations of the treatment? How do the pros and cons of the various options weigh? What are you most concerned about regarding the surgery? It is important to be empathetic, to build a good relationship with the patient, and to clearly indicate that it is a shared process to ensure that the patient does not feel that he/she is alone (Stiggelbout et al., 2012).

If a patient really does not want to make the decision themselves, then this should also be respected. In addition, a patient should not feel that he/she is under time pressure. Some patients like to involve their relatives in their choice (Edwards *et al*., 2001). It is therefore important to give patients the time and space to do so.

3.5.3 The Quadruple Aim

In 2008, Donald. M Berwick defined the 'Triple Aim' in which he states that 'improving the U.S. healthcare system requires the simultaneous pursuit of 3 aims: improving the experience of care, improving the health of populations, and reducing per capita costs of healthcare'. Mr. Berwick refers to the U.S. healthcare system, however, the principles that he describes in his paper have been adopted all around the world. To this day, his work has been cited 5127 times (5128 including this citation) emphasizing how influential his work has been. 6 years later, Bodemheimer and Sinsky (2014) have expanded the model acknowledging the importance of provider experience in the quality of care. The model that they propose is called the quadruple aim (Fig. 10) and is based on the observations that, although hospitals are implementing principles of the triple aim, high levels of care provider dissatisfaction and even burnouts hamper the ability to successfully achieve these aims. In their article Bodemheimer and Sinksy state that burnouts and care provider dissatisfaction are associated with reduced health outcomes and a decrease in patient satisfaction which could eventually lead to an increase in costs. Thus, to improve health care one should also consider the well-being of care providers.

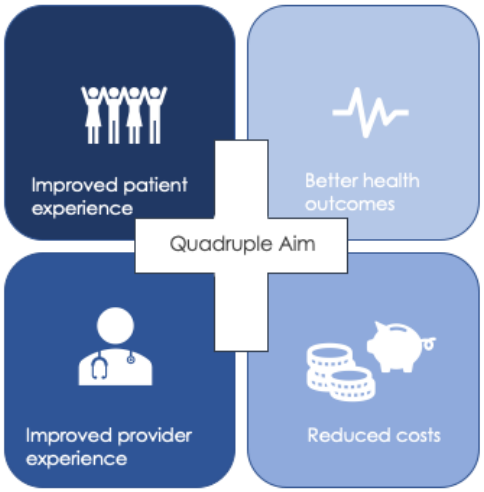

Figure 10. The Quadruple Aim.

In the Netherlands, 20% of young physicians (age <35) indicate that they suffer from burnout symptoms, which is 5% higher than the national benchmark (VvAA, 2019). Burnout and dissatisfaction among care providers threaten the goals posed by the triple aim to i. improve the experience of care, ii. improve the health of populations, and iii. reduce per capita costs of healthcare on several levels. In general, dissatisfaction of care providers is associated with lower patient satisfaction (McHugh et al. 2011; Haas et al. 2000). The vast majority of GPs in the Netherlands experience the workload as too high. According to 66% of GPs, the workload has even reached its limit which comes at the expense of time for the patient and the quality of care (Boekee & Hoekstra, 2018). When care providers are dissatisfied, the chances of them dropping out of their practice are considerably higher (Buchbinder et al. 2001). There is already a shortage of general practitioners at present (Boekee & Hoekstra, 2018). When physicians leave the profession, this shortage will only grow and thus hinder the goal of realizing a healthy population. In addition, dissatisfied physicians appear to prescribe inadequate medication to an increased degree, potentially resulting in costly complications (Williams & Skinner, 2003). Also, physicians with burnout symptoms tend to have a negative impact on the adherence of patients to therapy plans which in turn negatively impacts clinical outcomes (DiMatteo et al. 1993). The Group Health Cooperative was a non-profit healthcare organization that aimed at improving its Triple Aim performance. However, their efforts to pursue the goals of triple aim resulted in an increase in burnout

among physicians which in turn resulted in a decline in quality and an increase in costs. The organization saw improvement only after they began to focus more on the well-being of the physician by increasing the time for consultation and reducing the size of the group. Burnout rates decreased significantly, quality of care increased, and costs were reduced (Reid *et al.,* 2010). The example of the Group Health Cooperation demonstrates pursuing the Triple Aim goals without addressing care provider well-being is likely to have unfavorable results.

Summarized, it can be concluded that to improve the quality of healthcare one should acknowledge the importance of care provider well-being. The triple aim model was designed to shift from a physician-centric to a patient-centric healthcare system (Berwick, 2008). However, in practice efforts to adhere to the triple aim have been shown to increase physician burnout and dissatisfaction resulting in reduced quality of care (Bodenheimer & Sinsky, 2014). The quadruple aim acknowledges that the well-being of care providers is essential to delivering high-quality care.

3.5.4 Facilitating cultural change

Value-based healthcare is growing in popularity and an increasing number of initiatives for improving care are emerging. However, to significantly improve our current healthcare system, fundamental changes in the system are needed (Porter, 2008). Introducing such major fundamental changes to a health care system requires significant cultural changes within a hospital (department). However, not everyone will be eager or willing to go along with the cultural changes required. Change often triggers a sense of loss (Maris, 1986), making it difficult to predict how individuals will respond to cultural change. To manage the introduction of cultural change, a number of steps are essential.

1. *Willingness* - All stakeholders must be on the same page and willing to undergo the cultural change. To create willingness among stakeholder, it is important to provide them with information and insights on how cultural change can improve the quality of care. If stakeholders realize how cultural change can impact the quality of care, they will be more willing to go along with it. The Santeon Group, for example, invests a lot in providing good examples, education and events to convince stakeholders of the importance of value-based healthcare (van Herwaarden, 2020). In addition, the appointment of champions who share their own motivation and success stories can help people understand the importance of cultural change (Grupta *et al.,* 2017).
2. *Infrastructure* - To successfully implement cultural change, it is important to have an infrastructure in place to support it. This includes the right IT infrastructure, outcome-based incentives and training on value-based healthcare and continuous improvement. By laying the right foundations within an organization, one can ensure that the success rate of a cultural change is significantly higher (Wagner *et al.,* 2014).
3. *Leadership* - Another important factor within cultural change is leadership. A lock of strong leadership has been shown to be one of the main factors in the failure of cultural change (Edgar H. Schein, 1995)

Important investments for managing value-based healthcare initiatives are change management, human resources and an adequate IT infrastructure. With respect to human resources, it can be very valuable to invest in a project management team that takes the lead in implementing VBHC initiatives. The goal of the team is to ensure that everyone has a shared vision and understanding of the project. In addition, the project management team is responsible for driving the initiative and ensuring that everyone stays true to the vision of the project (World Economic Forum, 2018).

3.5.5 Barriers to cultural change

In addition to laying the right foundation for effectuating cultural change, it is equally important to realize what barriers one might encounter in the process and how to overcome them. One of the root causes of internal resistance to cultural change is cultural diversity. Cultural diversity refers to the many

different professional sub-groups that a hospital has (i.e., medical specialists, nurses, data analysts, etc.). Making cultural change will have a different impact on all these subgroups. One will need to assess the impact for each subgroup to ensure that it does not have a negative effect (Scott *et al.,* 2003). In addition, one must be aware that cultural change is not implemented overnight. The culture of an organization is expressed in many different aspects e.g. the work protocols, design of spaces, incentives, and exemplary individuals. To make changes that affect the entire organization one must anticipate a realistic time frame. Another influence on the implementation of cultural change is that of external factors such as institutions that are responsible for training healthcare providers. In the UK, for example, it is well known that in order to make changes in the National Health Services (NHS), one must also target the Royal Medical College as they exert influence over the training and core values of healthcare professionals (Davies *et al.,* 2000). In general, you could argue that successful implementation of value-based healthcare start with the education of healthcare professionals. The implementation of value-based healthcare would progress much more naturally when healthcare professionals are educated about how value-driven healthcare works and how it can be applied in practice. However, few medical schools in the Netherlands include value-based healthcare in their curriculum. Thus, external parties also influence the success of cultural change. Finally, it is essential that the goals and interests of cultural change are clear to everyone and are consistently upheld by strong leadership (Edgar H. Schein, 1995; Scott *et al.,* 2003).

Chapter 4: Methods

4.1 Developing the survey

To study how advanced Dutch hospitals are in the implementation of value-based healthcare, a survey of 16 questions was designed using software provided by SurveyMonkey[11] (Appendix C). The first question of the survey asks for the name and position of the respondent with the purpose of determining the reliability of the answers. The second question asks for the name and location of the hospital and the third question determines the type of hospital so that a comparison can be made between responses from different types of hospitals. A distinction is made between the different types of hospitals to gain insight into how the various types of hospitals differ from each other. Additionally, this information is used to identify if there may be a type of hospital that would be most suitable for customer acquisition. The extent to which a hospital has progressed with the implementation of value-based healthcare was assessed based on 5 indicators i.e., data measurement, IT infrastructure, culture, continuous improvement, and external collaborations, inspired by the report 'Implementing Value-Based Healthcare in Europe Handbook for Pioneers' by Gregory Katz (2020). Each topic was evaluated using two questions. Willingness to implement value-based healthcare was also assessed using 2 questions. The data collected using this survey is provides insight into the components in which hospitals are advanced and less advanced with respect to value-based healthcare. This information can be used to determine in which areas hospitals might benefit from support. In addition, the data can be used to support the selection of potentially interesting hospitals for customer acquisition. The questions in the survey were formulated as briefly and unambiguously as possible in order to maintain attention and minimize variation in interpretation. In order to score the hospitals on the extent to which they implement and are willing to implement value-based healthcare, a 5-point Likert scale (strongly disagree, disagree, neutral, agree, and strongly agree) was used. To determine the priority a hospital gives to implementing value-based healthcare, a 6-point scale was used. The question was stated as "Choose the level of priority given to the implementation of value-based healthcare compared to other investment options", and the response options included "no priority", "lowest priority", "low priority", "medium priority", "high priority", and "highest priority". A 6-point scale was chosen instead of a common 5-point Likert scale to provide respondents with the option to choose for "no priority". This type of priority scale has been previously described by Mahmoodi-Shahrebabaki & Yaghoubi-Notash (2014).

After the survey was drafted, it was sent for feedback to Bart Seuntjes (Strategic Director at Avertim and experienced with surveying), Neil Vanonckelen (Director at Avertim involved in the VBHC project), Dr. Anita van der Zwan (Life Science consultant at Avertim involved in the VBHC project), Dr. Timo Koopmans (Senior Life Science consultant at Avertim) and Dr. Hein Roelfsema (reviewer of this thesis). After feedback was processed the final version of the survey was sent as described in the section below.

4.2 Obtaining response

The goal was to present the survey to all boards of directors of all hospital groups in the Netherlands. To achieve this, an overview of all hospital groups in the Netherlands was made in Excel using zorgkaartnederland.nl[12]. Next, for each hospital group the board members were identified using Google. The search term that was used repeatedly was "raad van bestuur 'name hospital'". An Excel file was created containing the names of all board members of all hospital groups in the Netherlands. In order

11 https://www.surveymonkey.com/ Surveymonkey is one of the largest online survey platforms in the world. The online software allows surveys to be built, sent and analyzed

12 https://www.zorgkaartnederland.nl/ ZorgkaartNederland is a platform of the patient federation Netherlands (or patiëntenfederatie Nederland in Dutch) on which information and ratings of all healthcare institutions of the Netherlands can be found.

to retrieve their email addresses Lusha[13], GetEmail[14] and Hunter[15] were used. If only one mail address of a hospital group could be retrieved then the composition of this mail address was used to determine the other addresses (e.g. firstname.lastname@hospitalname.nl). Using this approach, a total of 73 hospital groups were included and 265 email addresses obtained.

The obtained email addresses were added to a contact list in SurveyMonkey and a message was prepared inviting readers to complete the survey. The first invitation was sent to 251 email addresses (SurveyMonkey excluded 3 email addresses). Three reminders were sent at 1-week intervals. In addition, a separate invitation was sent to 17 different mail addresses targeting 8 different employees (using 2 different addresses per employee on average) from the Amsterdam AMC and VUmc since these were the only University Medical Centres (UMCs) that had not responded. Finally, the questionnaire was sent to an acquaintance who works as a director at the Gelre hospital.

4.3 Data preparation

Among the 47 responses, there were 5 institutions with multiple respondents, i.e., Amphia Breda (2 respondents), ETZ Tilburg (2 respondents), Gelre hospitals (3 respondents), HagaZiekenhuis (2 respondents), and Maasstad hospital (2 respondents). All of these hospitals are top clinical hospitals. For each hospital with multiple respondents, the average score of the respondents for each question was calculated and used as a representative score for the hospital. Additionally, the survey had one response from a healthcare institution within the category 'Other', i.e., SEIN Heemstede. SEIN is an outpatient clinic for epilepsy. The "other" option was included in the survey to keep the option open for other types of institutions to also complete the survey. Should there be sufficient response from other types of institutions, this data could be included in the analysis. However, since this is not the case, the focus of this study remains on larger hospital organizations characterized by having a board of directors. The new distribution of the sample size per group after data preparation is as follows: $n_{general}=15$, $n_{specialist}=2$, $n_{topclinical}=16$, $n_{UMC}=7$, and $n_{other}=0$. Hence, $n_{total}=40$. As can be seen, the sample size of general hospitals is also reduced by 1. This can be explained by the fact that one of the two respondents from the Amphia hospital categorized it as a general hospital. However, the Amphia hospital is a top clinical hospital. In addition, the sample size of specialist hospitals was also reduced by 1 which can be explained by the fact that one of the two respondents from the HagaZiekenhuis categorized it as a specialist hospital, while in fact it is a top clinical hospital.

In the second to last question of the survey, respondents are asked to indicate the level of priority they assign to the implementation of value-based healthcare using a 6-point priority scale. The scores for this question were corrected by assigning 0 points for 'no priority', 1 point for 'lowest priority', 2 points for 'low priority', 3 points for 'medium priority', 4 points for 'high priority', and 5 points for 'highest priority'. Thus, no more than 5 points can be scored for this question, as is the case for the other questions in the survey.

4.4 Comparing mean scores

To determine which type of hospital scored best and which type of hospital scored lowest on the indicators used, the average score was calculated for each hospital type. Next, the average scores per question were calculated and plotted against each other in a bar graph for each hospital type. In addition, the z-score for each respondent and each question was calculated according to the following formula:

13 https://www.lusha.com/ Lusha is a platform that helps in gathering contact details through smart AI and scraping information from the internet.

14 https://getemail.io/ GetEmail is a platform that uses big data and AI to help gather email addresses.

15 https://hunter.io/ Hunter is a platform that, based on the URL of a website, finds all possible email addresses that can be found on the Internet that are related to this domain.

$$Zi = \frac{(Xi - \mu i)}{\sigma i}$$

In which X_i= *score given for answer i*
μ_i= *average score for answer i*
σ_i= *standard deviation for answer i*

Next, for each combination of question and hospital group, the average z-score was calculated and plotted in a bar graph. The graph shows how many standard deviations the average answer of a hospital type deviates from the overall average. This data provides insight into how the hospitals' responses deviate from the mean and serves to support Figure 10 as it provides a more visual representation of the detected differences. In addition, Figure 11 shows for each hospital type whether it scored below or above average per question.

Next, the detected differences between the responses of the different hospital types were tested for significance. Because the sample size for each category is small and unequal ($n_{general}$=15, $n_{specialist}$=2, n_{top}=16 and, n_{UMC}=7) it cannot be assumed or effectively tested that the data is normally distributed. Normally distributed data is an assumption for the Analysis of Variance (ANOVA) test used to test whether the population means of two or more groups are significantly different from each other. Since this assumption cannot be met, a non-parametric test was used, i.e., the Kruskal-Wallis test. The Kruskal-Wallis test can be used when data is ordinal (as with a Likert scale) and when the assumptions of the ANOVA test cannot be met, for example, when the sample size is too small and unequal. However, the Kruskal-Wallis test only tests whether a significant difference exists between the different groups but does not indicate between which groups this difference exists. To identify between which groups there is a significant difference, a Dun-Bonferroni post hoc test was performed using SPSS Statistics 27.

4.5 Pearson's correlation analysis

One of the goals of this study is to characterize hospitals and identify the most appropriate type for customer acquisition. Analyzing how answers to the questions in this survey are related helps to characterize hospitals. To analyze if any correlations exist between the different questions in the survey, a Pearson's correlation analysis was performed using SPSS Statistics 27. A correlation matrix was created and the correlations found were tested for significance.

4.6 Ranking

To gain insight into how the scores of all respondents compare to each other, a ranking was made. For each question, a total of 5 points could be awarded. The distribution is as follows: 'strongly disagree' 1 point, 'disagree' 2 points, 'neutral' 3 points, 'agree' 4 points, and 'strongly agree' 5 points. Since there are 12 questions for which points can be awarded, the maximum score that can be obtained by each respondent is 60 points. The total score for each respondent was calculated by summing the scores for each question. Hospitals were then ranked according to the number of points they were awarded. To analyze in which area hospitals score best and in which area they score lowest, the total score for each question was calculated. The total score was calculated by summing the scores of all respondents for the given question. Subsequently, the questions were ranked according to their scores. Since the corrected total number of respondents is 40 and the maximum number of points that can be obtained per question is 5, the maximum score per question is 200. The results obtained from ranking the questions provide insight into the topics that hospitals are generally most, and least advanced in with respect to value-based healthcare.

4.7 Data filtering

To analyze which respondents are most interesting for customer acquisition, the data was filtered using three different approaches. This selection was made to determine which parties might be interesting for customer acquisition under the assumption that hospitals that are less advanced in the implementation of value-based healthcare are more interesting than hospitals that are more advanced. When a score ≤ 3 (neutral) is obtained for a question it is assumed that there is room for improvement and therefore an opportunity to provide service related to this topic.

First, a selection of hospitals was made that, according to the survey, have a high willingness to implement value-based healthcare but are relatively unadvanced in doing so. The willingness score is defined as the total score obtained for the questions within the category willingness, i.e., willingness to invest and the level of priority. The implementation score is defined as the total score obtained for the indicators used to assess the implementation of value-based healthcare, i.e., within the category data, IT, culture, improve, and collaboration. Data was filtered as follows:

1. Choose the level of priority given to the implementation of value-based healthcare ≥ 4 (high priority). This selection resulted in a subset of 19 hospitals.
2. The hospital is willing to invest to facilitate the transition towards value-based healthcare ≥ 4 (agree). This selection resulted in a subset of 18 hospitals.
3. Next, for each hospital the amount of implementation measures for which they scored < 3 was determined.
4. Hospitals that scored < 3 on more than 3 out of 10 implementation measures were selected.

As Avertim has vast experience in the field of change management, hospitals that are unadvanced in the implementation of cultural change could be interesting for customer acquisition. Therefore, data was also filtered to select hospitals that scored relatively low on questions related to hospital culture as follows:

1. Choose the level of priority given to the implementation of value-based healthcare ≥ 4. This selection resulted in a subset of 19 hospitals.
2. The hospital is willing to invest to facilitate the transition towards value-based healthcare ≥ 4. This selection resulted in a subset of 18 hospitals.
3. Next, two filters were applied independently:
    a. In the hospital patient outcomes are transparently compared across care providers ≤ 3.
    b. In the hospital, there is a focus on using patient data to improve health outcomes rather than to judge care providers ≤ 3.

In the filter that was applied to select for hospital culture, culture measures ≤ 3 was chosen instead of < 3 as there are no hospitals that meet the criteria: willingness to invest ≥ 4, priority ≥ 4, and culture < 3. To explore whether there are hospitals that (strongly) disagree with both statements regarding hospital culture but have a reasonable willingness score, data were filtered as described in step 3a and 3b but using less stringent criteria for priority (≥ 3, or medium priority). Thus, the applied filter can be described as follows: willingness to invest ≥ 4, priority ≥ 3, culture measures < 3.

Chapter: 5 Results

5.1 Survey response

The first invitation to complete the survey was sent to 251 email addresses and resulted in a total of 42 responses. The second independent invitation that was sent to 17 different mail addresses targeting 8 different employees of the Amsterdam UMC resulted in 1 response. The last invitation that was sent to an acquaintance resulted in a total of 3 responses as this individual forwarded the survey to colleagues. In total, 47 responses were collected from 41 different institutions, meaning that response has been obtained from 57.7% of the institutions that were written. Responses are distributed as follows: $n_{general}$= 16, $n_{specialist}$=3, $n_{topclinical}$=20, n_{umc}=7, and n_{other}=1. The response rate is expressed as a percentage of the total number of institutions contacted rather than as a percentage of the total number of contacted individuals as multiple mail addresses were used for each contact. The number of mail addresses used per respondent varies and the number of incorrect mail addresses is unknown. The average time to complete the survey was 03m:38s.

5.2 Comparing mean scores

To determine which type of hospital scored best and which type of hospital scored lowest on the indicators used in the survey, the average score for each hospital type was calculated and compared. Results are depicted in Table 2. Top clinical hospitals were found to score best with a total average score of 42.7 out of 60, followed by specialist hospitals (avg. score 42), and UMCs (avg. score 41). General hospitals were found to have the lowest average score, scoring 39 out of 60 points. Also, top clinical hospitals were found to have the highest implementation score on average scoring 34.7 out of 50. For willingness, specialist and top clinical hospitals were found to score best with 8 out of 10 points.

Table 2. Average scores per hospital type

Hospital type	Total score	Implementation score	Willingness score	Sample size
General hospital	39.9	32.7	7.3	15
Specialist hospital	42.0	34	8.0	2
Top clinical hospital	42.7	34.7	8.0	16
University Medical Centre	41.0	34.1	6.9	7

*Maximum achievable total score = the amount of questions * maximum score per question = 12 * 5 = 60*
Maximum achievable implementation score = 50
Maximum achievable willingness score = 10

As normal distribution could not be assumed or effectively tested due to small and unequal sample sizes, an Analysis of Variance test (ANOVA) to compare the means of groups could not be performed. A non-parametric test, the Kruskal-Wallis test, was conducted to compare the effect of hospital type on the answer provided for each question of the survey. Results are depicted in Figure 9. Additionally, Figure 10 shows the average Z-score per hospital type for each question. Table 4 provides an explanation for the abbreviations used to designate the survey questions in Figures 9, and 10. The test showed that the effect of hospital type on the use of specialized software for the analysis of patient data was significant H(3)=10.007, p=0.019. Additionally, a Dun-Bonferroni post hoc test was performed to identify between which hospital groups a significant difference was detected. Pairwise comparison indicated that the difference in mean scores was significant between general hospitals and top clinical hospitals (p=0.020, Std. Test Statistic= -2.936). In addition, it was found that responses to the statement "patient outcomes are transparently compared across care providers" also differed significantly between hospital groups. H(3)=8.219, p=0.042. Responses were found to be significantly different between UMCs and top clinical hospitals (p=0.026, Std Test Statistic=2.848). Willingness to invest to facilitate the transition towards value-based healthcare was also found to differ significantly between hospital

groups H(3)=8.695, p=0.034. A significant difference was detected between UMCs and top clinical hospitals (p=0.026, Std. Test Statistic=2.231), and between general hospitals and top clinical hospitals (p=0.043, Std. Test Statistic=-2.691). In both cases, top clinical hospitals were found to be more willing to invest in value-based healthcare. Finally, a significant difference between the level of priority given to the implementation of value-based healthcare was detected H(3)=15.126, p=0.002. Top clinical hospitals were found to assign a higher priority to the implementation of value-based healthcare than UMCs (p=0.002, Std. Test Statistic=3.612).

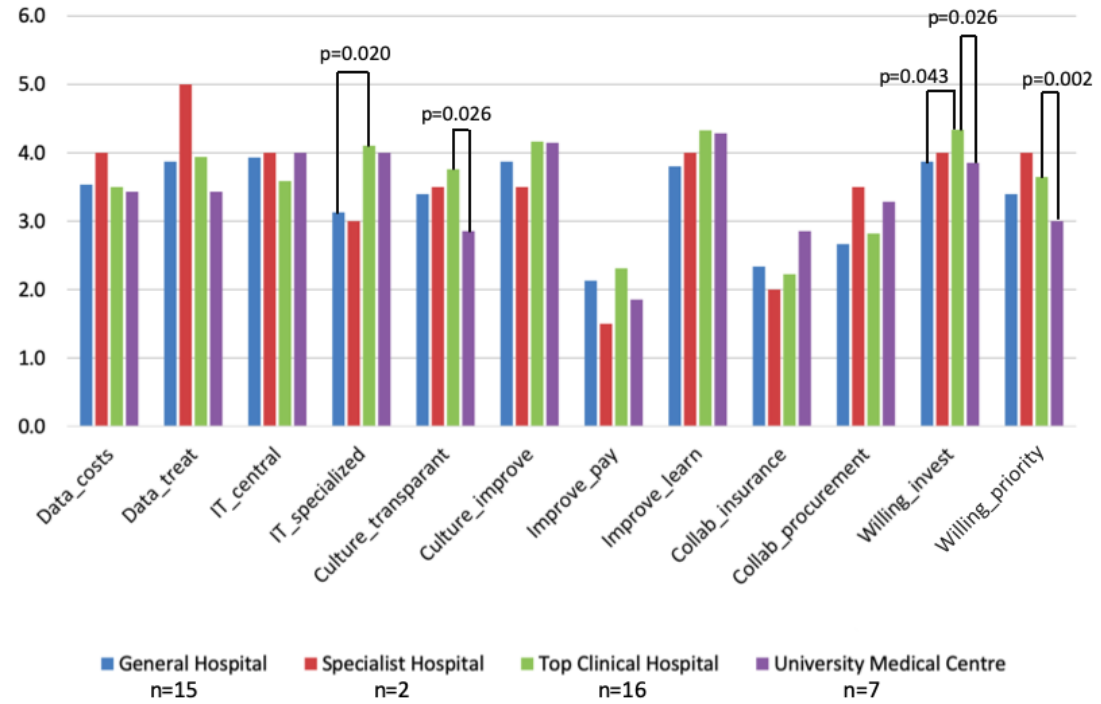

Figure 9. Comparison of mean scores by hospital type.

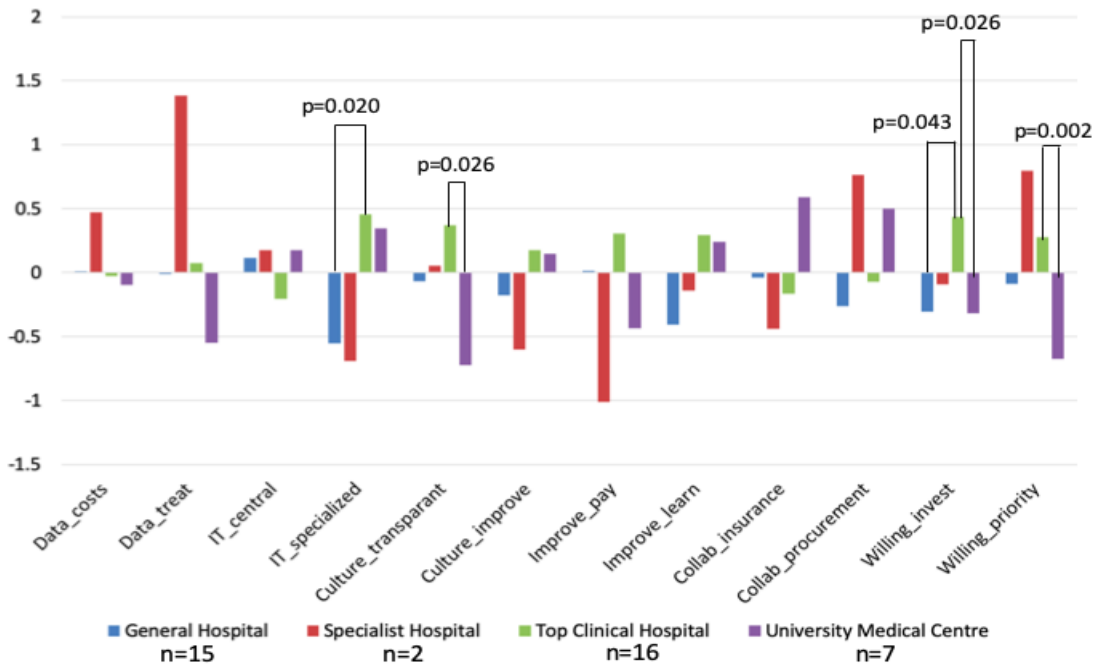

Figure 10. Comparison of mean Z-scores by hospital type.

5.3 Correlation analysis

To analyze if correlations exist between the responses to the survey questions, a correlation analysis was performed. One of the goals of this study is to characterize hospitals and identify the most appropriate type for customer acquisition. Analyzing how answers to the questions in this survey are related helps to characterize hospitals. In addition, this study aims to assess how advanced hospitals are in implementing value-based healthcare. Performing a correlation analysis provides insight into how the (implementation of) different components are related to each other. A possible application of this information is to determine which components might best be implemented simultaneously. In addition, a comparison can be made as to how the willingness to invest is related to the implementation of the various components. Finally, the correlation analysis provides insight into how the priority level is related to the implementation of the various topics.

A total of 16 significant positive correlations between questions were identified (Table 3). Mapping the minimum set of costs for treating a specific condition was found to be strongly related to mapping the minimum set of treatments for treating a specific condition $r = 0.661$, $p < 0.0001$. This data suggests that to some extent, hospitals that have identified the set of treatments needed to treat a specific condition have also identified the total set of costs needed to treat this condition. However, for all of the correlations described in this section, follow-up research on the nature (if any) of this correlation is needed to make a more valid statement. In addition, the following correlations were found in this study:

The use of specialized software for the analysis of patient data was found to be related to four other topics.

1. A hospital culture in which health outcomes are transparently compared across care providers was found the be related to using specialized software for the analysis of patient data r=0,432, p=0,0053
2. Using specialized software for the analysis of patient data was also found to be related to using patient data to improve patient health outcomes rather than to judge care providers r=0,400, p=0,0106
3. Using specialized software was also found to be related to taking initiatives to facilitate learning on the concept of value-based healthcare r=0,497, p=0,0011
4. Finally, it was found to be correlated to the willingness of hospitals to invest to facilitate the transition towards value-based healthcare r=0,525, p=0,0005

A hospital culture in which patient outcomes are transparently compared between care providers was not only found to be positively correlated to the use of specialized software. It was also found to be related to four other topics.

1. A culture in which patient data is used to improve health outcomes rather than to judge care providers r=0,501, p=0,001.
2. Initiatives to facilitate learning on the concept of value-based healthcare r=0,351, p=0,0266
3. Willingness to invest to facilitate the transition towards value-based care delivery r=0,386, p=0,0139.
4. The priority level given to the implementation of value-based healthcare r=0,646, p<0.0001.

Having a hospital culture that focuses on using patient data to improve health outcomes rather than judging care providers was positively correlated to three topics.

1. Taking initiatives to facilitate learning on the concept of value-based healthcare r=0,471, p=0,0022.
2. Willingness to invest to facilitate the transition towards value-based healthcare r=0,456, p=0,0031
3. The priority level given to the implementation of value-based healthcare r=0,459, p=0,0029

Taking initiatives to facilitate learning on the concept of value-based healthcare was found to be correlated to two topics.

1. Including value-based metrics in the hospital's procurement practices r=0,383, p=0,0146
2. Willingness to invest to facilitate the transition towards value-based healthcare r=0,415, p=0,0077

Finally, the level of priority given to the implementation of value-based healthcare was also found to be positively correlated to two topics.

1. Taking initiatives to facilitate learning on the concept of value-based healthcare r=0,506, p=0,0009
2. Willingness to invest to facilitate the transition towards value-based healthcare r=0,461, p=0,0027

Table 3. Correlation of survey questions

Questions	Correlation coefficient (Pearsons R)	P-value
Data_costs & Data_treat	0.661	<0.0001
IT_specialized & Culture_transparant	0.432	0.0053
IT_specialized & Culture_improve	0.400	0.0108
IT_specialized & Improve_learning	0.497	0.0011
IT_specialized & Wlling_invest	0.525	<0.0001
Culture_transparant & Culture_improve	0.501	0.001
Culture_transparant & Improve_learning	0.351	0.0266
Culture_transparant & Willing_invest	0.386	0.0139
Culture_transparant & Willing_priority	0.646	<0.0001
Culture_improve & Improve_learning	0.471	0.0022
Culture_improve & Willing_invest	0.456	0.0031
Culture_improve & Willing_priority	0.459	0.0029
Improve_learn & Collab_procurement	0.383	0.0146
Improve_learn & Willing_invest	0.415	0.0077
Willing_priorty & Improve_learn	0.506	0.0009
Willing_priority & Willing_invest	0.461	0.0027

5.4 Ranking

To analyze which hospitals are most advanced in the implementation of value-based healthcare and which are least advanced, the hospitals were ranked based on their overall score. Of all the respondents, the Catarina Hospital had the highest score, i.e., 51 out of 60 points. The lowest score was obtained by the HagaZiekenhuis with a total score of 32.5. The results of the ranking are depicted in AppendixD. In addition, the survey questions were ranked by the total score to determine which component hospitals were most advanced in and which they were least advanced in. The best score was obtained for the question "In the hospital initiatives are taken to facilitate learning on the concept of value-based healthcare" with an average score of 4.1. The poorest score was obtained on the question of whether a patient's health outcome is a determinant for the individual care provider's overall pay, with an average score of 2.13. Only 1 of the respondents indicated that they agreed with this statement. The results of the question rankings are depicted in Table 4.

Table 4. Question abbreviations, and ranking					
Abbreviation	**Question**	**Total score**	**Mean**	**Median**	**Rank**
Improve_learn	In the hospital initiatives are taken to facilitate learning on the concept of VBHC	164.17	4.10	4	1
Willing_invest	The hospital is willing to invest to facilitate the transition towards VBHC	162.33	4.06	4	2
Culture_improve	In the hospital there is a focus on using patient data to improve health outcome rather than to judge care providers	160.67	4.02	4	3
Data_treat	The hospital has mapped the minimum set of treatments needed to treat a specific condition	155	3.88	4	4
IT_central	Individual patient data are centrally stored and easily accessible to all care providers involved in treating that specific patient	152.33	3.81	4	5
IT_specialized	The hospital uses specialized software for the analysis of patient data	146.67	3.67	4	6
Data_costs	The hospital has mapped the minimum set of costs that are needed to treat a specific condition	141	3.53	4	7
Willing_priority	Choose the level of priority given to the implementation of VBHC	138.33	3.56	3.5	8
Culture_transparant	In the hospital patient outcomes are transparently compared across care providers	138.17	3.45	3	9
Collab_procurement	The hospital includes specific value-based procurement metrics in its procurement practices	115.17	2.88	3	10
Collab_insurance	The hospital has contracts with insuring parties that insure a total cycle of care including all treatments necessary to treat a specific condition	95.67	2.37	2	11
Improve_pay	Patient health outcome is a determinant for overall pay of individual care providers	85	2.13	2	12
*The maximum achievable score per question = the total amount of respondents * maximum score per question = 40*5 = 200*					

5.5 Data filtering

Results of data that was filtered based on a high willingness and low implementation scores are depicted in Table 5. Of the selection of four hospitals that are depicted in table 4, the Sint Antonius hospital in Nieuwegein and the regional hospital Koning Beatrix were found to score < 3 on 50% of the implementation measures. The OLVG Amsterdam and Isala hospital in Zwolle were both found to score < 3 on 40% of the implementation measures. The Sint Antonius and Koningin Beatrix hospital both disagreed (score 2) with the following statements:

1. "The hospital has mapped the minimum set of costs that is required to treat a specific condition, including rehabilitation"
2. "Individual patient data are centrally stored and easily accessible to all care providers involved in treating that specific patient"
3. "Patient health outcome is a determinant for overall pay of individual care providers"
4. "The hospital includes specific value-based procurement metrics in its procurement practices"

With regard to the statement "The hospital has contracts with reimbursing parties that reimburse a total cycle of care including all treatments necessary to treat a specific condition based on outcome" the Sint Antonius hospital disagreed and the Koningin Beatrix hospital strongly disagreed.

All 4 hospitals either disagreed (score 2) or strongly disagreed (score 1) with the statements:

- "The hospital includes specific value-based procurement metrics in its procurement practices"
- "The hospital has contracts with insuring parties that reimburse a total cycle including all treatments needed to treat a specific condition based on outcome"

Additionally, 3 out of 4 hospitals disagreed with the statement "Patient health outcomes is a determinant for overall pay of individual care providers". In contrast, the OLVG Amsterdam strongly agreed with this statement. The OLVG was found to have additional contrasting answers. The OLVG strongly disagreed with the statement "The hospital uses specialized software for the analysis of patient data" while the other three hospitals were either neutral, agreed, or strongly agreed. Additionally, the OLVG disagreed with the statement "In the hospital initiatives are taken to facilitate learning on the concept of value-based healthcare" while the other hospitals either strongly agreed (St. Antonius hospital, and Isala hospital) or had a neutral opinion (regional hospital Koningin Beatrix). Also, the OLVG opted neutral regarding the statement "The hospital has mapped the minimum set of costs that are required to treat a specific condition, including rehabilitation", while the other hospitals disagreed.

Table 5. Selection of hospitals with a high willingness and low implementation score

Hospital	Data Cost	Data Treat	IT central	IT Specialized	Culture Transparant	Culture Improve	Improve Pay	Improve Learn	Collab Insurance	Collab Procurement	Willing Invest	Willing Priority
Isala, Zwolle	2	4	3	4	3	4	2	5	2	2	5	4
OLVG, Amsterdam	3	4	4	1	4	5	5	2	2	2	5	4
Sint Antonius hospital, Nieuwegein	2	4	2	5	5	5	2	5	1	2	5	5
Regional hospital Koning Beatrix	2	4	2	3	3	4	2	3	2	2	4	4

Note: Scores can be interpreted as follows: 1 = strongly disagree (or lowest priority), 2 = disagree (or low priority), 3 = neutral (or medium priority), 4 = agree (or high priority), and 5 = strongly agree (or highest priority)

Since Avertim has extensive experience in change management, the data was also filtered for the implementation of cultural change. 6 hospitals were identified that met the criteria willingness to invest ≥ 4, priority level ≥ 4, and culture transparent ≤ 3. All 6 hospitals opted neutral with regard to the statement "In the hospital patient outcomes are transparently compared across care providers" (Table 6). Therefore, data was filtered again by using less stringent criteria for priority (≥ 3 or medium priority). No hospitals were found to meet these criteria.

Table 6. Hospitals filtered on high willingsness and low transpareny

Hospital	Culture Transparant	Culture Improve	Willing Invest	Willing Priority
Regional hospital Koning Beatrix	3	4	4	4
Adrz	3	3	4	4
Isala, Zwolle	3	4	5	4
Martini hospital, Groningen	3	4	4	4
CWZ, Nijmegen	3	4	4	4
Rivierenland hospital, Tiel	3	5	4	4

Note: Scores can be interpreted as follows: 1 = strongly disagree (or lowest priority), 2 = disagree (or low priority), 3 = neutral (or medium priority), 4 = agree (or high priority), and 5 = strongly agree (or highest priority)

When applying the criteria willingness to invest ≥ 4, priority level ≥ 4, and culture improve ≤ 3, two hospitals were identified i.e. Slingeland, Doetinchem, and Adrz. Both hospitals opted neutral with regard to the statement "In the hospital there is a focus on using patient data to improve health outcome rather than to judge care providers" (Table 7).

To search the data for hospitals that (strongly) disagreed with either one or both statements, less stringent criteria for priority were applied (≥ 3 or medium priority). However, no hospitals were found to meet these criteria.

Table 7. Hospitals filtered on high willingness and low 'culture improve' score

Hospital	Culture transparant	Culture Improve	Willing Invest	Willing Priority
Adrz	3	3	4	4
Slingeland, Doetichem	4	3	4	4

Note: Scores can be interpreted as follows: 1 = strongly disagree (or lowest priority), 2 = disagree (or low priority), 3 = neutral (or medium priority), 4 = agree (or high priority), and 5 = strongly agree (or highest priority)

Chapter 6: Concluding statement

A global urge to improve the quality and efficiency of healthcare is fueling the rising popularity of value-based healthcare. This study is intended as exploratory research to gain insight into the implementation of value-based healthcare in Dutch hospitals.

In this study, a survey was used to examine the implementation of value-based healthcare and the willingness to implement this concept. A 5-point Likert scale was used to be able assign scores to the answers and compare results. First, the types of hospital that had the highest average score and the type of hospitals that had the lowest average scores were determined. Top clinical hospitals were found to have the highest average score with 42.7 out of 60 points. The lowest scoring hospitals were found to be general hospitals, who scored 39.9 out of 60 points on average. Additionally, the data from this study shows that top clinical hospitals make more use of specialized software for analyzing patient data compared to general hospitals ($p=0.02$). In addition, a transparent comparison of outcomes among care providers was found to be more common in top clinical hospitals versus UMCs ($p=0.026$). UMCs answered 'neutral' on average when asked if in the hospital patient outcomes are transparently compared among care providers. Considering that all UMCs in the Netherlands are included in this study, it can be concluded that UMCs in the Netherlands can generally improve in the field of outcome transparency. Furthermore, the data shows that, compared to the other hospital types, top clinical hospitals are most willing to invest to facilitate the transition to value-based healthcare (Fig 9.). The willingness to invest differed significantly compared to general hospitals ($p=0.043$) and UMCs ($p=0.026$). In addition, top clinical hospitals also assigned a relatively high priority to the implementation of value-based healthcare. The difference compared to UMCs was found to be significant ($p=0.002$). The fact that top clinical hospitals score highest on average compared to other hospitals types, show the highest willingness to invest and assign a relatively high priority to the implementation of value-based healthcare could be explained by the criteria that a top clinical hospital has to meet to maintain its status as an STZ (Samenwerkend Topklinisch OpleidindsZiekenhuis) hospital. STZ is the Dutch association of top clinical hospitals. To be accredited as an STZ hospital, a hospital must meet a number of criteria. Many of these criteria can be directly described as measures to implement value-based healthcare e.g. the use of PREMS and PROMS for cyclic learning and continuous improvement, the demonstrable use of patient input, active stimulation of shared decision-making, an open culture focused improving the quality of care, and transparency and collaboration among healthcare providers (Van Dam, 2020). Based on these criteria, a top clinical hospital always strives to provide the best possible and most innovative care to treat complex conditions.

A total of 16 different significant correlations were found between the different questions of the survey. The strongest correlation was detected between the question "The hospital has mapped the minimum set of costs involved in treating a specific condition" and "The hospital has mapped the minimum set of treatments involved in treating a condition", $r=0.660$, $p<0.00001$. An almost equally strong correlation was found between the questions "The hospital is willing to invest to facilitate the transition towards value-based healthcare" and "In the hospital, patient health outcomes are transparently compared across care providers", $r=0.646$, $p<0.0001$. However, additional research will be needed to assess the nature of these correlations.

In addition, the survey found that hospitals scored best when asked whether they take initiative to facilitate education on value-based healthcare, with an average score of 4.1. Willingness to invest to facilitate the transition towards value-based healthcare and having a culture where patient data are used to improve health outcomes rather than to judge care providers followed with an average score of 4.06, and 4,02 respectively. It can be concluded that hospitals, in general, have a high willingness to invest in value-based healthcare, most hospitals take initiatives to facilitate education regarding value-based healthcare, and most hospitals use patient outcomes to improve health outcomes rather than to judge care providers. The poorest score was obtained on the question of whether a patient's health outcome is a determinant for the individual care provider's overall pay, with an average score of 2.13. Only 1 of the respondents indicated that they agreed with this statement. In addition, collaborations with insurance companies that reimburse a total cycle of care including all treatments necessary to treat a specific condition was also found to be uncommon, with an average score of 2.37. Finally, little hospitals agreed

when asked if they include value-based procurement metrics in their procurement practices, with an average score of 2.88.

Therefore, it can be concluded that financial incentives based on patient outcomes, collaborations with insuring parties that insure a total cycle of care, and the use of value-based procurement metrics are uncommon among Dutch hospitals.

To filter the data on hospitals most willing to implement value-based healthcare but (based on the survey) are least advanced in doing so, 4 different data filters were applied. Of all respondents, 4 hospitals were found with a high willingness score and who (strongly) disagreed with 40% (Isala Zwolle, and OLVG Amsterdam) or 50% (St. Antonius, and Koningin Beatrix hospital) of the questions. These hospitals could potentially be interesting for customer acquisition given their priority and willingness to invest and given the fact that they score low on many of the measured indicators for value-based healthcare.

Since Avertim has extensive experience in change management, data was also filtered on hospitals that had the highest willingness score and the lowest score in terms of outcome transparency and a culture focused on improving patient outcomes. When filtering data on outcome transparency, 8 hospitals were found to be potentially interesting for acquisition. Based on the assumptions and data, the Isala hospital in Zwolle would be the most interesting hospital for acquisition.

Chapter 7: Discussion

The results of this study provide insight into the current status of Dutch hospitals with regard to value-based healthcare. Avertim wants to expand its service within value-based healthcare. This research is valuable for Avertim because it helps to determine the needs of hospitals regarding value-based healthcare and their willingness to implement the concept. In addition, this study provides insight into the most common bottlenecks but also the aspects in which hospitals are thriving with regard to value-based healthcare. These insights can be used to tailor services and help determine potentially interesting customers. However, the study also contains some limitations. The uneven and small sample size makes it difficult to effectively compare outcomes. For example, there seems to be a strong difference between specialist hospitals and other types of hospitals when asked "The hospital has mapped the minimum set of treatments involved in treating a specific condition.". However, no significant difference was found here probably due to the low sample size (n=2) of specialist hospitals. The low sample size of specialist hospitals potentially means that existing significant differences are not detected in this study. Increasing the sample size could help to resolve this issue and also increase the reliability of the data.

In addition, the study is based on a survey. Despite the fact that the survey questions were designed to be as unambiguous as possible, the answers remain largely subjective and can always differ depending on the individual answering them. Various factors such as an individual's function or even one's emotional state can influence that person's interpretation of the current state of affairs. In addition, the survey is addressed to the board of directors of each hospital. However, not every hospital's board of directors is responsible for leading value-based healthcare initiatives. The data analysis and the advice based on this analysis does not take this into consideration. One could choose to find out for each hospital which department is responsible for value-based healthcare and target this department. However, this would render an inconsistent research method. Targeting the same organ within each hospital ensures that the research method is consistent. A recent study by the NVZ (consulted after conducting this study) shows that value-based care is coordinated from the quality and safety department in 42% of Dutch hospitals (Lohuis *et al.,* 2021). Additional research into the implementation of value-based healthcare in Dutch hospitals can therefore best be directed at the quality and safety department.

Also, the implementation of value-based healthcare in this study is measured using 5 indicators. In practice, a hospital could implement many value-based healthcare initiatives that fall outside of these 5 indicators. The possible implementation of alternative initiatives is not considered in this study. A possible consequence of this is that a hospital that in practice takes many initiatives in the field of value-based healthcare outside the indicator will rank low in the implementation ranking. It is therefore important to realize that value-based healthcare is measured using the indicators described and that this is a non-exhaustive list that does not describe the implementation of value-based healthcare in its entirety. However, the study is relevant as it provides insight into the implementation of some fundamental aspects of value-based healthcare. This information can be used to support customer acquisition and for tailoring services.

Chapter 8: Recommendations

8.1 Recommendations for Avertim

The first recommendations for Avertim are based on the SWOT analysis described in Chapter 1.
Avertim has a lot of relevant knowledge that they can leverage to enter the healthcare market. However, to increase the chances of Avertim successfully entering the healthcare market, it may be advisable to recruit consultants with experience within the healthcare sector and specifically with expertise in the field of value-based healthcare. Having demonstrable experience in the field of value-based healthcare can be beneficial for business development in this sector. In addition, newly recruited consultants can transfer their knowledge on this topic to other consultants, contributing to the training of these individuals. However, there is a risk that a project within the healthcare sector cannot be found immediately for newly recruited consultants. In this case, the newly recruited consultant results in substantial costs without generating any revenue. An ideal candidate would therefore also have appropriate experience within the life science sector to be able to work on life science projects in the bridging period. Another option is that the newly recruited consultant would spend the interim period developing value-based healthcare training and providing training to other consultants. The development of a training program can save costs for external training.
Furthermore, in order to provide consultants with more knowledge in the field of value-based healthcare, Avertim could choose to offer internal as well as external training. In doing so, the company runs the risk of employees resigning after receiving training and thus a loss of investment. To reduce this risk, employees need to show a certain level of commitment. Risk aversion could be implemented by setting a minimum project duration or revenue to follow a value-based healthcare training. By doing so, Avertim assures itself of a certain level of return after offering a training course.

For customer acquisition, several recommendations can be made.
This study shows that top clinical hospitals are the most willing to implement value-based healthcare and that they assign a relatively high priority to its implementation. In addition, top clinical hospitals are under direct pressure from the STZ to implement value-driven initiatives to maintain their status as a top clinical (STZ) hospital. Based on these data, it can be argued that, in general, top clinical hospitals with relatively low implementation scores are most interesting for customer acquisition.
Of all the hospitals in this survey, the Sint Antonius Hospital and the regional hospital Koning Beatrix (both top clinical hospitals) show the highest willingness combined with the greatest number of questions answered with (strongly) disagree. The aforementioned suggests that there is much room for improvement within these hospitals and that they are willing to invest in order to facilitate these improvements. It is therefore advisable to assess whether these hospitals are interested to improve in these areas with the support of consultancy services.

Of all the respondents, the HagaZiekenhuis is the lowest scoring hospital in this study. The hospital indicates that patient outcomes are not transparently compared among healthcare providers. Furthermore, the hospital disagrees with the statement that patient data is used to improve patient outcomes rather than to judge care providers. Because, the HagaZiekenhuis assigns a low to medium priority (2.5) to the implementation of value-based healthcare it was not detected when filtering the data. The HagaZiekenhuis seems to be in a difficult position since a top clinical hospital is expected to have a culture where outcomes are transparently compared and where the focus is on using patient data to improve health outcomes. Despite the fact that the hospital assigns a relatively low priority to the implementation of value-based healthcare, improvements in the areas mentioned will be necessary to retain its status as a top clinical hospital. It is therefore advisable to also assess whether the HagaZiekenhuis is interested in consultancy.

Given Avertim's experience in change management, it is recommended to assess if the hospitals described in table 5 and 6 are interested in consultancy services. Especially the Isala hospital in Zwolle as it shows the highest willingness to invest in the implementation of value-based healthcare.

In addition, this study ranked hospitals based on their overall implementation score (Appendix D). The ranking can also be used for selection of hospitals for customer acquisition.

Finally, this study provides insight into the current state of affairs regarding value-based healthcare in different hospitals. Avertim can use this information to adapt sales decks to the needs of the customer and thus increase the chances of success. Therefore, it is advisable customize sales decks for each hospital to address the topics to which the particular hospital scored poorly, as identified in this study.

8.2 Recommendations for further research

A number of findings emerged from this study that are interesting for follow-up research. In general, it can be stated that research into the implementation of value-based healthcare in hospitals can best be focused on the quality and safety department since this department is responsible for the implementation of value-based healthcare in 42% of Dutch hospitals (Lohuis *et al.,* 2021).

In this study, a number of significant correlations were found between the questions from the survey. However, the nature of the correlations was not examined in this study. Follow-up research could be conducted to study the nature (if any) of the correlations found.
In addition, this study found that it is very uncommon among Dutch hospitals to include value-based procurement metrics in procurement practices, to have contracts with insurance companies that reimburse a full cycle of care based on outcome, and to offer physicians financial incentives based on patient outcomes. Follow-up research should be conducted to determine why hospitals are scoring poorly on the aforementioned topics. If hospitals do want to improve in these areas, this would be a good opportunity to offer service.

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Daily activities at Avertim

Avertim is a consulting company that deploys consultants on projects for clients. During my 6-month 'business management support internship' at Avertim, I was working in the team of business managers. As a business manager at Avertim, you are responsible for running your own business unit within the company. In practice, this means that a business manager is responsible for three main tasks:

1. Acquiring new customers and projects (business development and consultative sales)
2. Recruiting new consultants (human resources and consultative sales)
3. Managing your own team of consultants (team management)

During my internship, I supported the team of business managers mainly with the recruitment of new consultants. This involved finding candidates with a suitable profile, contacting them, and conducting interviews to assess whether they are a fit. When a request from a customer came in and we had to search for suitable candidates, I first looked in my own network and the CRM systems for warm contacts. After contacting warm contacts, I searched for candidates via LinkedIn. To be successful, I looked for as many candidates as possible and scheduled an interview with them as soon as possible. As a result, my week is often packed with meetings and interviews. In addition, I worked on two other topics i.e., marketing and value-based healthcare. During my interview with Avertim, I mentioned that I have owned an influencer marketing company in the past. I was then asked if I wanted to set up a marketing plan to increase the online presence of Avertim Netherlands and to create more awareness among potential new talent and clients. I've set up a zero-budget content marketing strategy that aims to achieve these goals by using currently available resources e.g., whitepapers, previously written articles, CSR initiatives, methodologies & service lines (Fig. 1), and content from the website. To create awareness, I created a content calendar and made sure that relevant information was posted consistently on the LinkedIn page of Avertim Netherlands. As a result, the number of followers grew with over 200 new followers in less than 2 months.

Finally, I worked on Avertim's value-based healthcare project. The management consultancy industry is highly competitive and to remain competitive, Avertim is looking to expand their services. With the rise of value-based healthcare Avertim is currently exploring the opportunities to exploit this relatively new approach towards health care delivery and management. The company had been investigating the market and the possibilities of providing services within this market for some time. To gain insight into this market, I've conducted a study on the implementation of value-based healthcare in Dutch hospitals. The research consists of a survey that scores the implementation of value-based healthcare based on 5 indicators. The scores on the different questions provide insight into the areas in which hospitals have progressed and the areas in which they are lagging behind in the implementation of value-based healthcare. This data can be used to determine and respond to the needs of hospitals. In addition, the willingness of hospitals to implement the concept was assessed using 2 questions i.e., the willingness to invest in the transition to VBHC and the priority level to implement VBHC. Hospitals that give the implementation of VBHC a high priority and are willing to invest could make an interesting target for customer acquisition.

Self reflection

During my internship period I supported the team of business managers in the Dutch office of Avertim. As a business manager, you are responsible for your own business unit within the company and you deal with recruitment, business development, sales, and team management. Prior to the internship, I agreed with my supervisor to provide support in the areas of i. HR, ii. marketing, and iii. (possibly) business development. We also discussed that, if there is a mutual click, there is a possibility to work for Avertim as a Business Engineer after the internship. I wanted to experience what it is like to work at a consultancy firm that focuses on the life science industry. I was hoping to acquire sales and business development skills, become more organized and structured, and acquire more in-depth knowledge about the life science industry.
I did not get to work on business development but was mainly involved in HR activities, such as sourcing, screening, and interviewing potential new consultants. Initially, I was not very excited about recruitment activities. However, I have come to realize that conducting interviews is not just a search for people with the right expertise. I find consultative sales and the psychology behind these methods very interesting. I find it very interesting to start a conversation with someone who is not looking for a new opportunity and then use consultative sales methods to arouse considerable interest. In order to enthuse potential candidates about projects in the life science industry, you need to have considerable knowledge of this area yourself. I enjoyed learning more about the life science industry and look forward to continue developing my knowledge within this field.

The FBE courses that proved to be most useful during my internship were Marketing and Business Research & Analytics. During my internship for Avertim, I had to develop a marketing plan. The goal of this plan was to increase the online presence of the company and to create more awareness among potential new talent and among potential customers. I benefited a lot from the material I learned during the marketing course. I made a value-proposition canvas, mapped the customer journey and identified our target groups. To increase the online presence of Avertim and to raise awareness among potential talent and customers, I created a LinkedIn page that was used for content marketing. The idea behind this page is based on the 5S model:
1. Sell: Growing sales through wider distribution via LinkedIn
2. Save: Save money because content marketing using a company LinkedIn page is free and has the potential to reach a large audience.
3. Serve: Adding value for the customer by posting interesting and relevant information like white papers.
4. Speak: Getting closer to the customer as LinkedIn offers a direct way of getting in touch with them.
5. Sizzle: Expand the business online by improving the online experience using interactivity with customers and new talent

The Business Research & Analytics course helped me in both setting up my study and analyzing my data. The lectures have taught me to formulate the questions in a survey as concisely and unambiguously as possible. I also learned how to use a Likert scale in order to easily analyze data. During an assignment I had to set up a research project based on a survey data set. I did the complete data analysis in Excel and it is very similar to the data analysis I did in this study. During this assignment, I learned how to create a correlation matrix in Excel, perform statistical tests, create useful formulas with references to other cells, and best organize my data. Besides the courses Business Research & Analytics, and Marketing, the course Strategic Management & Innovation helped me analyze the positioning of Avertim. During this course I learned to make an internal and external analysis to evaluate the positioning of a company. This knowledge helped me to make the SWOT analysis and competitor analysis.

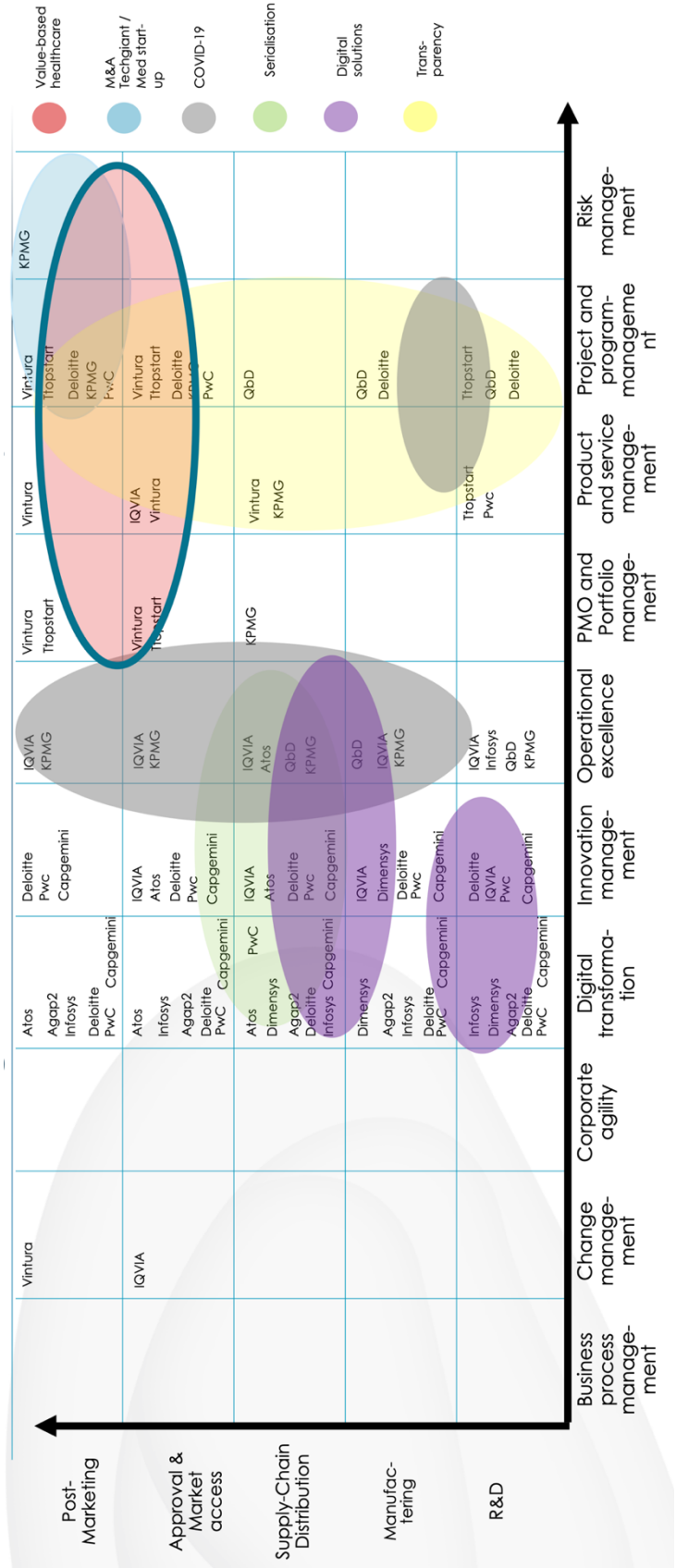
What I found most difficult at first was time management and prioritizing. The work can be very hectic and the week is always packed with meetings (business manager meetings, a lot of interviews, meetings with the marketing department, etc.). I learned to plan my weeks well but also to be flexible where necessary to be able to adjust to priorities. I think that in this job I have benefited from the fact that I am very social and find it important to communicate clearly. These qualities fit well with the position and have helped me with conducting interviews and contact with colleagues.

During the internship, I set a goal for myself to have a new consultant start at the organization through my actions before the end of my internship. I was motivated and excited by the fact that my internship supervisor told me that there has never been an intern within the company who has managed to accomplish this. I thought it would be a nice achievement to be the first within the company to realize this. I therefore stuck to this goal and started working towards it. My internship supervisor called me in the last week of my internship to tell me that one of the consultants I had proposed to work on a project with a client had been hired. For me this achievement feels like a reward and it makes me look back on my internship period with extra pleasure.

I believe that I could improve myself by asking for feedback more frequently (when needed). I tend to figure things out myself because I don't want to ask for help right away. However, I may sometimes take too much time trying to figure something out myself, making it inefficient. In that case, it would be better to ask for help earlier. In addition, I think I can still improve in the area of organization and planning. Especially planning and sticking to the schedule you've made is something I can still improve on.
I look back on my internship with great pleasure and am grateful to Avertim for the trust they had in me during my internship but also after my internship. I am looking forward to start my career as a business engineer at Avertim in January.

Appendix

Appendix A – Visualization of the healthcare and life science competitor landscape



Appendix B - Barriers to implement healthcare payment reform

BARRIERS	SOLUTIONS
#1: Continued use of fee-for-service payment in payment reforms	• Use episode-of-care payment for acute conditions and global payments for all patients to eliminate undesirable incentives under fee-for-service and to give providers the flexibility and accountability to reduce costs and improve quality
#2: Expecting providers to be accountable for costs they cannot control	• Use risk adjustment and risk limits to keep insurance risk with payers but transfer performance risk to providers • Use risk exclusions to give providers accountability only for the types of costs they are able to control • Make provisions for contract adjustments to deal with unforeseen events
#3: Physician compensation based on volume, not value	• Change physician compensation systems to match incentives under payment reform • Modify federal and state fraud and abuse laws to permit gain-sharing between hospitals and physicians
#4: Lack of data for setting payment amounts	• Give providers access to timely analyses of both utilization and costs through community multi-payer claims databases
#5: Lack of patient engagement	• Ask patients to designate their primary care physicians rather than using statistical attribution rules based on fee-for-service claims to assign them retrospectively • Use value-based benefit designs to enable and encourage patients to improve health, adhere to treatment plans, and choose high-value providers and services
#6: Inadequate measures of the quality of care	• Develop quality measures for all of the conditions and procedures that drive significant amounts of cost • Use outcome measures instead of process measures to give providers flexibility to redesign care and support effective patient choice • Use Regional Health Improvement Collaboratives to collect patient-reported information on outcomes
#7: Lack of alignment among payers	• Ask physicians and other providers to define lower-cost, higher-quality ways to deliver care and the payment changes needed to support them • Encourage employers to support regional payment reforms and to choose health plans which will implement them in a coordinated way • Offer Medicare payment reforms to a broad range of providers on an ongoing basis • Use state government and/or Regional Health Improvement Collaboratives to facilitate agreement among payers
#8: Negative impacts on hospitals	• Reduce fixed costs and improve efficiencies in hospitals • Change payment levels to hospitals to reflect higher costs per admission that may accompany lower admission rates • Increase transparency about hospital costs to ensure that prices for hospital care are adequate, but not excessive
#9: Policies favoring large provider organizations	• Remove anti-trust barriers to small physician practices joining together to manage new payment models • Combat anti-competitive practices by large providers • Avoid unnecessary standards for structure and processes in payment systems and accreditation systems that increase costs and favor large organizations
#10: Lack of neutral convening and coordination mechanisms	• Support the creation and operation of multi-stakeholder Regional Health Improvement Collaboratives in all regions

Appendix B. *Ten barriers to implement healthcare payment reform and how to overcome them.* Adapted from Ten Barriers to Healthcare Payment Reform and How to Overcome Them by Harrold D. Miller. First edition, December 2012. Copyright 2012 Centre for Healthcare Quality and Payment Reform.

Appendix C - The questionnaire

Value-Based Healthcare in Dutch Hospitals

Help improve health care in the Netherlands

In the first question of this survey, you are asked for your name and position. This has the sole purpose of showing the value of this survey to the reviewer of this study.

Please fill in the questions truthfully to ensure the quality of this study.
Data will be treated as confidential, no data from this survey will be made public.

* 1. Please fill in your name and title
For example: John Doe, CEO

* 2. Please fill in the name and location of your hospital
For example: VUmc, Amsterdam

* 3. Choose what category fits your hospital best

- General hospital
- Specialist hospital
- Top clinical hospital
- University Medical Centre (UMC)
- Other,

* 4. The hospital has mapped the minimum set of costs that are involved in treating a specific condition (e.g. what does it cost to treat a broken leg, including rehabilitation)

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

* 5. The hospital has mapped the minimum set of treatments that are involved in treating a specific condition (e.g. what is needed to treat a broken leg, including rehabilitation)

Strongly disagree	Disagree	Neutral	Agree	Strongly agree

* 6. Individual patient data are centrally stored and easily accessible to all care providers involved in treating that specific patient

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

* 7. The hospital uses specialised software for analysis of patient data

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

* 8. In the hospital, patient health outcomes are transparently compared across care providers

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

* 9. In the hospital there is a focus on using patient data to improve health outcome rather than to judge care providers

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

* 10. Patient health outcome is a determinant for overall pay of individual care providers

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

* 11. In the hospital initiatives are taken to facilitate learning on the concept of value-based healthcare

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

* 12. The hospital has contracts with insuring parties that reimburse a total cycle of care including all treatments necessary to treat a specific condition based on outcome (outcome-based reimbursement), rather than reimbursement per individual treatment

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

* 13. The hospital includes specific value-based procurement metrics in its procurement practices

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

* 14. The hospital is willing to invest to facilitate the transition towards value-based care delivery

Strongly disagree	Disagree	Neutral	Agree	Strongly agree
○	○	○	○	○

* 15. Choose the level of priority given to the implementation of value-based healthcare in the hospital compared to other investments options

- ○ No priority
- ○ Medium priority
- ○ Lowest priority
- ○ High priority
- ○ Low priority
- ○ Highest priority

* 16. May I contact you for more information?

Use the space below 'Yes' to fill in your contact information

- ○ No
- ○ Yes via,

Appendix D – Hospitals ranked on total score

Appendix D. Hospitals ranked on total score				
Hospital organization	Category	Total score	Avg. score	Rank
Catharina ziekenhuis	Top clinical	51	4.3	1
Rijnstate, Arnhem	Top clinical	49	4.1	2
St. Antonius ziekenhuis, Nieuwegein	Top clinical	48	4.0	3
Zuyderland, Heerlen/Sittard-Geleen	Top clinical	47	3.9	4
Maasstad ziekenhuis, Rotterdam	Top clinical	46.5	3.9	5
Antoni van Leeuwenhoek, Amsterdam	Specialist	46	3.8	6
Fransiscus Gasthuis & Vlietland	Top clinical	46	3.8	6
Medisch Spectrum Twente, Enschede	Top clinical	46	3.8	6
Umcg	UMC	46	3.8	6
BovenIJ ziekenhuis	General	45	3.8	7
MUMC+, Maastricht	UMC	45	3.8	7
Nij Smellinghe	General	45	3.8	7
SKB Winterswijk	General	45	3.8	7
Deventer Ziekenhuis	General	44	3.7	8
UMC Utrecht	UMC	44	3.7	8
Ziekenhuis Rivierenland, Tiel	General	44	3.7	8
Sint Antonius ziekenhuis, Utrecht, Woerden	Top clinical	43	3.6	9
Slingeland Doetinchem	General	43	3.6	9
OLVG, Amsterdam	Top clinical	42	3.5	10
Treant zorggroep	General	42	3.5	10
CWZ Nijmegen	Top clinical	41	3.4	11
Amphia Breda	Top clinical	40	3.3	12
Amsterdam UMC (Vumc & AMC)	UMC	40	3.3	12
Isala, Zwolle	Top clinical	40	3.3	12
Martini ziekenhuis Groningen	Top clinical	40	3.3	12
Adrz	Specialist	38	3.2	13
Anna Zorggroep Geldrop	General	38	3.2	13
Laurentius	General	38	3.2	13
LUMC	UMC	38	3.2	13
Gelre ziekenhuizen	Top clinical	37	3.1	14
Dijklander ziekenhuis	General	37	3.1	14
ErasmusMC	UMC	37	3.1	14
Radboudumc, Nijmegen	UMC	37	3.1	14
Tjongerschans BV	General	37	3.1	14
Wilhelmina Ziekenhuis Assen	General	37	3.1	14
Het Van Weel-Bethesda Dirksland	General	36	3.0	15
Streekziekenhuis Koningin Beatrix	General	35	2.9	16
ETZ, Tilburg	Top clinical	34.5	2.9	17
Amstelland ziekenhuis, Amstelveen	General	33	2.8	18
HagaZiekenhuis	Top clinical	32.5	2.7	19

Appendix E - Survey results

Hospital	Hospital category	Data_costs	Data_treat	IT_central	IT_specialized	Culture_transparant	Culture_improve	Improve_pay	Improve_learn	Collab_insurance	Collab_procurement	Willing_invest	Willing_priority	Corrected priority score
Catharina Hospital	3	4	4	5	5	5	5	3	5	2	4	5	5	4
Rijnstate, Arnhem	3	4	4	4	4	5	5	3	5	3	4	4	5	4
St. Antoniusziekenhuis Nieuwegein	3	4	4	5	5	5	5	2	5	2	2	5	5	4
Zuyderland, Heerlen/Sittard-Geleen	3	5	5	5	5	4	4	2	4	2	4	4	4	3
Maasstad Ziekenhuis Rotterdam	3	3	4	4.5	4.5	3.5	4	3	4	3	4	4.5	5.5	4.5
Antoni van Leeuwenhoek, Amsterdam	2	5	5	4	4	4	4	2	4	2	4	4	5	4
Fransiscus Gasthuis & Vlietland	3	4	4	5	5	4	4	2	4	3	2	5	5	4
Medisch Spectrum Twente, Enschede	3	4	4	3	4	4	5	2	5	3	3	5	5	4
Umcg	4	4	4	5	5	2	4	2	5	5	3	4	4	3
BovenIJ	1	4	4	4	3	4	5	3	4	3	3	4	5	4
MUMC+, Maastricht	4	5	5	5	4	3	5	1	4	2	4	4	4	3
Nij Smellinghe	1	5	5	5	4	4	5	1	5	1	2	4	5	4
SKB Winterswijk	1	5	5	4	4	4	3	3	4	3	3	3	5	4
Deventer Ziekenhuis	1	2	4	4	3	4	5	2	4	4	4	4	5	4
UMC Utrecht	4	4	4	5	4	3	4	2	4	4	3	4	4	3
Ziekenhuis Rivierenland, Tiel	1	4	4	5	2	3	5	2	5	2	4	4	5	4
Sint Antonius Ziekenhuis, Utrecht, Woerden	3	2	4	2	5	5	5	2	5	1	2	5	6	5
Slingeland, Doetinchem	1	4	4	4	4	4	3	3	4	2	3	4	5	4
OLVG, Amsterdam	3	4	4	1	4	5	5	2	4	2	2	5	5	4
Stadskanaal-Hoogeveen-Emmen-	1	4	4	4	5	3	4	2	4	1	3	5	4	3
CWZ, Nijmegen	3	4	4	5	3	3	4	2	4	2	2	4	5	4
Amphia Breda	3	3	4	3.5	4	2.5	4.5	3.5	4.5	2	3	3	3.5	2.5
Amsterdam UMC (Vumc & AMC)	4	3	4	2	4	3	4	2	5	2	4	4	4	3
Isala, Zwolle	3	2	4	3	4	3	4	2	5	2	2	5	5	4
Martini Hospital Groningen	3	3	3	2	4	3	4	2	5	2	4	4	5	4
Adrz	2	3	5	4	2	3	3	1	4	2	3	4	5	4
Anna Zorggroep Geldrop	1	4	4	2	3	4	3	2	4	3	2	4	4	3
Laurentius	1	3	3	4	4	3	3	2	4	3	2	4	4	3
LUMC	4	3	2	4	4	3	4	2	4	2	3	4	4	3
Gelre Ziekenhuizen	3	3	4.0	2.3	3.7	2.7	3.7	2.0	3.7	2.7	2.7	4.3	3.3	2.3
Dijklander Ziekenhuis	1	1	2	5	4	4	5	1	3	3	2	4	4	3
ErasmusMC	4	1	1	4	4	3	4	1	5	3	4	4	4	3
Radboudumc, Nijmegen	4	4	4	3	3	3	4	3	3	2	2	3	4	3
Tjongerschans BV	1	4	4	5	2	3	2	2	4	2	3	3	4	3
Wilhelmina Ziekenhuis Assen	1	3	4	4	2	3	4	3	4	1	2	4	4	3
Het Van Weel-Bethesda Dirksland	1	4	3	4	2	3	4	2	3	2	3	3	4	3
streekziekenhuis koningin beatrix	1	2	4	2	3	3	4	2	3	2	2	4	5	4
ETZ, Tilburg	3	3.5	3.5	3.5	3	3.5	2.5	2.5	3	2	2.5	2.5	3.5	2.5
Ziekenhuis Amstelland, Amstelveen	1	4	4	3	2	2	3	2	2	3	2	4	3	2
Haga Ziekenenhuis	3	3.5	3.5	3.5	2.5	2	2	2	3	2	2	4	3.5	2.5