The impact of financial performance on the quality of Dutch hospitals

Master Thesis MSc Business Administration

University of Twente

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Preface

This report is a master thesis at the University of Twente. The research was carried out at Consultancy Company Finance Ideas located in Utrecht. Finance Ideas is a company that as a core business advises healthcare organisations, housing associations and institutional investors (such as pension funds). Their place in the healthcare sector and interest in the subject makes them suitable to supervise this research. The supervisor from Finance Ideas is Mr. Pim Diepstraten who leads the healthcare team within the company. Personally, I would like to thank Pim Diepstraten for his supervision. Also, I would like to thank Luuk Willems from Finance Ideas in particular, who helped me greatly during writing my thesis as well as all other colleagues during my time at Finance Ideas. The data for this research was provided by Finance Ideas. The author wants to thank Finance Ideas for providing the data, but also for their support, supervision and advice during the research. Besides writing this thesis, I have learned a lot by working on projects with them and I am thankful for the opportunity. Additionally, thank you to the University of Twente and in particular my supervisor Dr. Samy Essa and second supervisor Prof. Dr. Rez Kabir.

Abstract

The Dutch healthcare sector is finding itself in an ongoing transition. Firstly, Dutch healthcare is moving to a system which stimulates managed competition among healthcare providers. Combined with budget cuts, this will lead to increased pressure on financial performance and quality. Secondly, patients, insurers and the government demand more transparency regarding quality. It has become increasingly important healthcare providers give insight in the quality they provide. Based on two sets of quality indicators, Quality Window and ZorgRating, and one set of financial performance indicators, also ZorgRating,this thesis researched the effect of financial performance on the quality for Dutch hospitals. The sets of quality indicators come from the Quality Window by the National Association for Hospitals (NVZ in Dutch) and from Finance Ideas respectively. The financial performance indicators are retrieved from ZorgRating, which is a product from Finance Ideas which tracks financial information from all Dutch healthcare organisations. It is hypothesized that financial performance will have a positive effect on hospital quality. Ordinarily least squared regression was picked as method of analysis. Empirical results suggest that over the period 2009-2014, financial performance had no effect on hospital quality. Considering certain limitations and also due to the fact that the described changes were announced in 2012, it will be interesting for future research to analyse if the hypothesized effect will become evident.

1. Introduction

Two significant changes in the Dutch healthcare sector have led to the formulation of this research. The changes in the Dutch healthcare sector are the transition to managed competition between hospitals from a heavily regulated system and the upcoming demand of transparency regarding quality in hospitals. These changes might have strong implications for the financial situation of hospitals.

Managed competition

Before discussing managed competition, it is important to shortly explain how the Dutch healthcare systems works and became what it is today. Earlier in 2006, the Dutch government chose for a unique healthcare system by implementing the Health Insurance Act (van de Ven & Schut, 2009). The Health Insurance Act is a mandate, which obliges every Dutch citizen to buy basic private health insurance. The uniqueness lies in the competition between health insurers as The Health Insurance Act allowed for competition among them. According to the EHCI report in 2015, Dutch healthcare "is *characterized by a multitude of health insurance providers acting in competition, and being separate from caregivers/hospitals*" (Björnberg, 2016, p. 7). The report also credits the Dutch for having *"probably the best and most structured arrangement for patient organisation participation in healthcare decision and policymaking in Europe"* (Björnberg, 2016, p. 7). However, healthcare and the system as it was installed in 2006, became too expensive. As a consequence, although it is not in the form of a new law, the government is since 2012 also stimulating managed competition between healthcare providers, such as hospitals. Like insurers, also hospitals and other healthcare organisations have to compete. According to Schut & van de Ven (2005), countries and their healthcare systems usually go through a series of phases. Increased (regulated) competition is one of the later phases. These changes are generally paired with budget cuts in order to counteract rising costs. The changes in the Dutch healthcare sector follow that pattern. Additionally, a shift to more ambulant care has an effect on either financial performance as well as the quality of healthcare. Ambulant care, opposed to intramural care, means care within the homes of the patient. The main motive of more ambulant care is to cut costs by letting elderly stay at home longer. Healthcare institutions, such as hospitals and nursing homes will face the consequences financially. Formerly, the financial position of practically all individual Dutch healthcare institutions was quite stable. Healthcare institutions were largely funded by the government based on capacity, which led to a stable revenue for all organisations. This will not be the case anymore, as the government decided healthcare organisations will be funded based on demand, rather than on capacity. The amount of funding from the government would be based on the size of a healthcare organisation, which did not have to fill that capacity in order to receive funding. Now it will thus be based on the actual healthcare an organisation delivers. Also in the past, the limited number of healthcare organisations that were nearly bankrupt would receive financial aid from the government, but that is also not the case anymore. The Dutch Minister of Health Edith Schippers clearly stated such rescue operations will not be part of the future.

Transparency of quality

The second motive for this research is the increased demand for transparency regarding quality of delivered care. Patients, insurers and the government are demanding more transparency regarding quality. Patients are allowed to choose more freely where they want to receive care and care insurers can also have preferred suppliers for care. Insurers used to offer their client insurance for all healthcare organisations, but in the future might be selective based on quality. Additionally, a pay-for-performance system might emerge. As a response to the increasing demand for transparency, the Dutch Association of Hospitals (NVZ in Dutch) launched the "Quality Window" (van Rooy, 2014). According to the president of the Dutch association of hospitals this tool, still in development, will help access useful information about a hospital's quality, and allows users to compare hospitals more easily (van Rooy, 2014). Hospital are now obliged to deliver the information for the quality indicators in the Quality Window in order to compile and publish an annual list of quality indicators on all hospitals. The leading institutions are the Healthcare Inspectorate (IGZ in Dutch), Dutch Association for Hospitals (NVZ), Dutch Federation of Academic Healthcare Centre (NFU), Federation Medical Specialists (de Federatie) and Nurses & Caretakers Netherlands (V&VN). They develop the quality indicators in cooperation with academics. The results are published on a new website, the NVZ Kwaliteitsvenster. Roughly translated this means "Quality Window". In the rest of the paper it will be referred to as Quality Window. This website was launched in 2013 so all data is publicly available.

The purpose of this study is to examine the effect of financial performance on the quality of delivered healthcare in the Dutch healthcare sector, and what implications the described changes have now. In appendix A an extensive background information on the financial situation and developments in the Dutch healthcare is presented, which is basically divided into five categories.

1.1. Problem definition

The ongoing changes regarding transparency, financial pressure and its consequences, and budget cuts in the Dutch healthcare sector are the main reasons for this research. It is unclear if a relationship between financial performance and quality in the Dutch healthcare sector exists, and if it exists what it means for healthcare organisations. Healthcare organisations will have to adapt financially, but are unaware of the potential implications on their quality. It can be assumed that Dutch healthcare institutions will try to at least maintain their quality level despite financial changes. However, for Dutch hospitals and the healthcare sector in general the implications remain unclear. Additionally, quality has recently received increased attention from patients and care insurers. The call for increased transparency regarding quality of delivered healthcare has led to hospitals releasing information on quality. However still limited to 2 years (2013 and 2014), the importance of transparency is acknowledged by healthcare organisations, and hospitals specifically. The data on other healthcare organisations is limited, as it does not reflect quality as clearly as the data on hospitals. Financial information is available for all Dutch healthcare organisations; healthcare

organisations are obliged to hand in their financial statements to the authorities each year. Financial analysis happens in all industries, including healthcare. However, it is still unclear which financial ratios give a good indication on the performance of Dutch healthcare institutions.

This research will be the first to analyse the relationship between financial performance and quality for the Dutch healthcare sector and the implications. It is unique as it uses the only database that has the financial information of the entire Dutch healthcare industry gathered in one place and combines it with quality information that has been published since 2013. Such data has not been researched in the Dutch healthcare sector yet.

1.1.1. Research goal

The main research goal is to examine the impact of financial performance on healthcare quality for Dutch hospitals. This is academically relevant as it extends research on the topic to the Netherlands. Also, it contributes to further defining that relationship, which is still unclear, although it was studied extensively in mainly the United States (Bazzoli, Chen, Zhao & Lindrooth, 2008). A somehow clear relationship is not found yet. In the Netherlands the relationship will become increasingly important. In practice, it gives Dutch healthcare organisations empirical evidence on the implications financial changes in the industry potentially have and provide an indication which financial ratios and variables for quality are relevant in measuring it. It helps to understand what the implications of increased financial pressure are. Finding which financial ratios and quality variables are most relevant will provide towards the main goal and is a vital chapter of this research. The potential relationship between financial performance and quality can only be identified if either is measured correctly and reflects what it should reflect. Much of past research mostly examined the relationship based on availability of data. Since the financial data in this research is very extensive a choice can be made on how to measure financial performance. However, the data on quality is limited to a number of quality variables due to the availability of quality data.

In conclusion, this leads to the following research question:

> *"What is the effect of financial performance on hospital quality in the Dutch hospital sector?"*

In order to answer the research question, the following sub questions should be answered first:

1. How can financial performance for the health sector be measured?
2. How can quality of healthcare be measured?
3. Is there an effect of financial performance on hospital quality in the hospital sector of other countries?
4. How could a potential effect be explained?

In order to answer the main research question, the sub-questions will have to be answered. Firstly, the first two questions will be answered via literature research. This will provide an answer, which can be tested with the data. The literature does not provide us research on the Dutch healthcare sector. Therefore, questions 3 and 4 will be answered through literature on the U.S. healthcare sector and by some German literature too. Statistical analysis will be used to examine if any found associations are found in the Dutch healthcare sector too.

There has been no prior research on the relationship between financial performance and quality of healthcare in the Dutch healthcare sector. Although similar research exists for American hospitals, this research will contribute by extending it to the Netherlands. A potential relationship could have certain implications for Dutch healthcare. If there is a relationship, it is incentive for Dutch healthcare institutions to take another look at their financial status or at the quality of the healthcare they deliver. This will depend on whether a potential relationship could be explained with a causality. Controversially, if no relationship exists and financial performance has no influence on quality or vice versa, that could also have consequences. If quality is not influenced by financial performance, Dutch healthcare institutions could choose to do what is minimally required to survive financially and perform day-to-day activities. However, since it could be assumed the healthcare sector wants to deliver quality, there will always be an incentive to perform financially, as substantial improvements in healthcare usually require large investments.

1.1.2. Research structure

The theory and empirical results of the relevant literature are summarized in the following section. Following, in section 3 is a discussion of study methods and data collection. Finally, the results are presented in section 4 and the conclusions and implications are discussed in section 5.

2. Literature Review

This thesis examines the effect of financial performance on quality of delivered healthcare by Dutch hospitals. In order to do that, first it must be understood what financial performance and quality is, why it important and what its drivers are. Also, the specifics of financial performance and quality for hospitals must be understood, compared to other industries. Consequently, theory and empirical results on the effect of financial performance of hospital quality are discussed. However, before that, the differences between American and Dutch hospitals are shortly discussed. As most of the theory in this thesis is retrieved from literature on American hospitals, it is important to discuss the differences between non-profit and for-profit hospitals. Dutch hospitals are exclusively non-profit whereas a large part of American hospitals is for-profit. Also, a difference exists between non-profit and government non-profit hospitals in the United States. Theory and empirical results from the United States might thus not always be generalizable to the Netherlands.

2.1. Healthcare system in the United States and the Netherlands

With the exception of some very specialized hospitals (for example plastic surgery), hospitals in the Netherlands are non-profit and answer to a government-related organisation. Economic theory predicts that for-profit organisations want to maximize stakeholder value and profits, non-profits usually seek to meet other (healthcare related) objectives (Adelino, Lewellen & Sundaram, 2015; Thorpe, 2000). However, specific to hospitals it is also found that there is a negative relation between earnings and the likelihood a CEO of a non-profit hospital will be let go (Brickley & van Horn, 2002) insinuating financial objectives are part of a non-profit hospital's objectives. Property rights theory states for-profit organisations may perform more efficiently (Blank & Eggink, 2013). Mutter & Rosko (2008), as found in an article by Blank & Steggink (2013) find that for-profit hospitals are indeed more cost efficient than non-profits. Also, donors consider a hospital's profitability when donating money (Frank et al., 1990). The underlying motives for increased financial pressure, as discussed in the introduction, are not the same for US hospitals, but Dutch hospitals have become more similar to US hospitals than a couple of years ago, due to a changed cost structure. Chen, Bazzoli & Hsieh (2009) hypothesized there would be on an impact of the financial condition of a hospital on the provision of unprofitable services. Within the wide array of services a hospital provides, many are well compensated, whereas others are not profitable. Economic theory predicts for profit hospitals will avoid unprofitable services. Not for profits will use profits from other services to provide unprofitable services, but will struggle to do so if they are in poor financial condition. Chen, Bazzoli & Hsieh (2009) used cash flow to total revenues and operating margin as their financial measures and a number of unprofitable services to examine the relationship. Although they compared for profit hospitals with not for profit hospitals, which is irrelevant to the Dutch hospital sector, they also found not for profit hospitals in strong financial condition provide more unprofitable services than not for profits in poor financial condition. Also the quality of the unprofitable services in financially stronger hospitals was higher than in hospitals which were in a poorer financial condition.

It is not implied that financial performance is irrelevant to hospitals. On the contrary, hospitals require a good financial performance to perform their daily tasks, and to invest in innovation and quality to remain viable. However, excellent financial performance is not the goal, but a mean to a goal when considering non-profits. In this thesis theory and empirical research related to for-profit hospitals must be interpreted carefully.

2.2. Financial performance

Financial performance was operationally defined as Return on Assets (ROA) by Venkatraman & Ramanujam (1986). Financial performance is widely accepted as the best measure of a business's performance. A wide body of literature uses financial performance to examine the relationship between variable A and business performance. Financial performance can be referred to as profitability and ratios such as ROA, return on equity (ROE), return on investments (ROI) and profit margins are often used to measure financial performance. Ratios that are used in hospitals are discussed in section 3.2. In short, financial performance is the result of a firm or organisation's policies and operations in financial terms. Financial performance is vital to any firm's success or survival. Although maximization of financial performance is not the goal for all firms, financial performance is an important factor in reaching any firm's goals. In order to maintain daily activities and to invest for the future, a firm requires sufficient financial assets. In order to have sufficient financial assets, companies usually monitor their financial position. Assessing financial performance is key to ensuring long-term financial survival (Pink et al., 2006). The purpose of analysing financial ratios is to identify financial strengths and potential problems (Chu, Zollinger, Kelly, & Saywell, 1991). Bai, Hsu & Krishan (2014) argue that financial performance increases availability of internal funding and raises the ability to raise external capital.

2.3. Quality of hospitals

There is no widely accepted definition of what quality entails in hospitals, although scientists agree it is multidimensional (Beattie, Murphy, Atherton & Lauder, 2015). It could be argued that elements that are measured to reflect quality in a hospital, are the definition of quality. In this sector three types of measuring hospital quality are mentioned: outcome, process and structural measures. It is as challenging as it is important to measure hospital quality, especially if a hospital intends to improve it (Lieberthal, 2008; Meyer, Silow-Carroll, Kutyla, Stepnick & Rybowski, 2004). Challenges are found on many levels. Loeb (2004) mentions the many perspectives of quality from key stakeholders as a challenge and that is seen as a costly endeavour which does not provide sufficient cost benefit. However, Loeb (2004) also states: "*No longer can health care organisations afford to remain complacent and assume that stakeholders understand that quality care is being provided; rather, evidence is required*" (p. i5). Measuring quality is essential in order to improve it (Beattie, Murphy, Atherton & Lauder, 2015; Meyer et al., 2004; Werner, Bradlow & Asch, 2008). The benefits of improving healthcare speak for themselves. Poor quality-care can lead to unnecessary injury or death, and at the very least adds significantly to the costs of healthcare (Meyer et al., 2004). Bazzoli,

Chen, Zhao & Lindrooth (2008) argue that hospitals can benefit financially from boosting quality, based on economic theory (p. 979).

Quality of care is a very actual topic the Netherlands, Europe and United States (Adelino et al., 2015; Busse et al., 2009; Jarman et al., 2009). Not only should quality of care be correctly displayed, it should also be comparable, easy to measure, and it should not cost much effort to register and publish, all of which present challenges. Many European countries are following the U.S. by making quality of care more transparent. In the Netherlands, 2015 was proclaimed as 'year of transparency in healthcare' by the Minister of Health, Welfare and Sport Edith Schippers (Kiers, 2014). The goal is to improve healthcare, and make it easier for patients to compare and choose their healthcare provider. The rest of this chapter will discuss what quality is for hospitals and why it is important in general, and why it is so important to measure.

There are multiple options when it comes to measuring quality in hospitals: measuring processes or measuring outputs (Lieberthal, 2008; Werner, Bradlow & Asch, 2008). Recently, a third measure has emerged: structural measures. Examples of processes which could be measured are: the number of times a surgeon washes his hands during the day, or more general: how often does a surgeon deviate from protocol. Outcome measures are widely known and easier to understand for the public. Examples are mortality ratios or the percentage of infections among patients. Forster et al. (2000) provide an example in which patients, as the most important customer of a hospital, can expect that the risk of acquiring an infection at the hospital is reduced to a minimum. That would be perceived as hospital quality. One could measure this by output and measure the number of infections suffered by patients. Output measures are tangible (Werner, Bradlow & Asch, 2008) and are easy to communicate. They are preferred by patients (Brook et al., 2000) and can be used to assess quality of medical care, quality of health care professionals and to monitor health policy (Mant & Hicks, 1996). Another advantage is the Hawthorne effect; being measured alone may already improve quality (Birkmeyer, Dimick & Birkmeyer, 2004). However, a disadvantage is the fact that single outcome measures never reflect overall quality (Lieberthal, 2008). Infections, or other often used measures such as mortality, do not fully account for health and quality in general. Also, many other factors rather than quality can influence the outcome for infections or mortality or any other single output measure (Brook et al., 2000). This disadvantage, often defined as 'risk-adjustment', is much less relevant for process measures (Werner, Bradlow & Asch (2008). It should also not be overlooked that processes need to be improved to improve actual healthcare since outcomes are a result of processes (Forster et al., 2000) and outcome measures can be influenced by hospitals to make the hospital look better. Process measures are directly linked to quality improvement activities (Birkmeyer, Dimick & Birkmeyer, 2004). In detecting a difference of quality, process measures are more sensitive than outcome measures (Mant & Hicks, 1996). For example, it requires a lot more data to show a statistically significant difference of 1% in mortality than a larger difference of a process measure. According to Werner, Bradlow & Asch (2008) "*process measures are*

increasingly being adopted as tools to motivate quality improvement" (p. 1465). Mant & Hicks (1996) argue it is increasingly accepted that, when a package of care works, processes are measured and not outcomes. Bradley et al. (2006) found a modest relation between certain process measures and risk-standardized mortality (which is comparable to human standardized mortality ratio (HSMR), which will be explained later). There are plenty of advantages that plea for process measures, but as well as outcome measures also has its disadvantages. One major disadvantage of process measures is that they are hard to aggregate (Lieberthal, 2008). By this the author means that it is difficult to sum or combine a set of process measures. To use the example from earlier, it is difficult to combine the number of times hands are washed with the number of times a surgeon deviates from protocol. Another disadvantage is the fact that it is impossible to measure all important processes of care (Werner, Bradlow & Asch, 2008). Not everything is measurable, and not everything that is measurable is important and vice versa. However, Werner, Bradlow & Asch (2008) found in their study *'performance on process measures not only directly affects patients' outcomes, but is also a marker of unmeasured aspects of health care quality*' (p. 1475). In other words, outcome measures can only be partially explained by measurable process measures, and thus an improvement in measurable process measures could also mean an improvement in immeasurable process measures. Brook et al. (2000) argue that outcomes - such as mortality rates - are a poor measure of quality. Although it is often the measure the public wants when they select a hospital, outcomes are influenced by many factors other than the expertise and quality of hospitals, according to their research. Also, many outcomes occur with a time lag. A chronically ill patient might be ill for several years, and that will not be taken into account right away. The published results in the Netherlands contain output data such as, number of infections, mortality ratio, but also data on processes such as the percentage of doctors that receive feedback and the percentage of medicine that is checked by a doctor before handed out to the patient (NVZ, n.d.). Another measure is that hospitals have to reach a certain quota on several treatments. If they do not reach it, they can be excluded from offering that certain treatment. As a result, many hospitals in the Netherlands have merged, in order to be able to offer these treatments. Although performance of treatments goes up as they are performed more often (Birkmeyer, Dimick & Birkmeyer, 2004) this has also led to price changes in the merged hospitals (Olsthoorn, 2015).

There are a few issues with using disease-specific quality indicators when it comes to comparing providers of care. Complicated and rarely performed procedures, or numbers from small hospitals will show little statistical significance (Busse et al., 2009). Also, such specific measures hardly reflect overall quality and are hard to aggregate. Showing comparable data on hospital quality has value to all stakeholders in healthcare. In the United States, but also in the Netherlands initiatives exist which compare and rank hospitals. Perhaps not surprising, Halasyamani & Davis (2007) found a poor correlation between two popular scorecards on hospital performance; the popular U.S. government-sponsored scorecard 'Hospital Compare' and scorecard 'Best Hospitals' by *U.S. News and World Report*. A different method was used in scoring and ranking American hospitals which would explain the poor correlation, but it is

still a little surprising as both scorecards serve the same goal. As a tool used for transparency and incentives, existing quality measures are far from perfect (O'Leary, Barnard & Noskin, 2007).

Conclusively, process measures, although not perfect, have an edge over outcome measures when it comes to measuring hospital quality. However, Mant & Hicks (1996) describe three circumstances in which outcome measures are of value:

- when how you do it, is as important as what you do;
- when using process measures is invalid or impractical;
- when the overall effectiveness of an intervention is critically dependent upon its complication rate

As an alternative, when process measures are not available or too complicated to measure, outcome measures can be used.

A third measure of hospital quality has emerged. Structural measures can also be used to measure hospital quality (Ploeg et al., 2010; Birkmeyer, Dimick & Birkmeyer, 2004). Structural measures are variables which reflect the setting in which care is delivered. This includes the hospital's resources. A common used variable is the how often a hospital performs a certain procedure. Although there is much debate about the measure, it is commonly accepted that hospitals that perform a procedure often have less complications and higher long-term survival rates than hospitals who do not perform a procedure often (Birkmeyer, Dimick & Birkmeyer, 2004). Whether a hospital is academic or not, privately or government-run, not-for profit or for-profit are more examples of structural measures. Lieberthal (2008) found that academic hospitals are generally of higher quality than not-academic.

Usually, data for structural measures is easily accessible and inexpensive as it is often a part of administrative data (Birkmeyer, Dimick & Birkmeyer, 2004). Also, many structural measures are strongly related to surgical outcomes (Birkmeyer, Dimick & Birkmeyer, 2004). However, there are some disadvantages. Small hospitals will not be able to become a high-volume hospital on procedures. Structural variables are also not actionable, and do not contribute towards quality improvement (Birkmeyer, Dimick & Birkmeyer, 2004). Most importantly, hospitals with a structural advantage can produce poor quality and hospitals with a disadvantage can overcome that and provide excellent healthcare (Mutter, Rosko & Wong, 2008).

Table 1 summarizes the three measures of quality. It encompasses a definition and advantages and disadvantages of each measure.

Table 1: Types of quality measures summarised			
	Process measures	**Outcome measures**	**Structural measures**
Definition	Measures processes that are performed by the medical specialists	Measures outcomes such as mortality, or infection rates	Measures a hospital's resources, and reflects the setting the care is delivered in
Advantages	Measures actions undertaken by clinicians and related to the actual care, usable for improvement of care	Easy to communicate, what patients/care insurers like to see	Accessible, inexpensive data, strong relation to surgical quality
Disadvantages	Hard to aggregate, single measure does not reflect overall quality, not everything is measurable	Can be influenced by many other factors rather than quality,	No proven relation with actual quality (except surgical)

2.3.1. Mortality rates

Mortality rates are a very often used measure for quality in hospitals. Since these are often utilized in measuring the quality in hospitals, it is worth examining if mortality rates are really effective in that regard. Also in this thesis, mortality rates are a part of the analysis. Many articles use risk-adjusted mortality rates. As some hospitals treat patients which have a higher risk to pass away than others, this difference is taken away by adjusting for risk. In the Netherlands this ratio is called the Human Standardized Mortality Ratio (HSMR). This section will elaborate on the pros and cons of mortality rates and comparable measures of quality. In Germany, about 4% to 10% of hospitals exceeded the national average with the lower limit of a 95 per cent confidence interval on the HSMR (Busse et al., 2009). The HSMR is an often-used ratio in hospitals in various countries across the world (Pouw et al., 2013). It is a risk-adjusted mortality rate for hospitals based on certain characteristics. Risk-adjusted mortality rates are already used for decades in hospitals. However, the HSMR is a rate that is recently accepted in many hospitals in many countries. The outcome is very easily readable. If a hospital scores 100 it had the expected number of deaths, a score lower than 100 means there were less deaths than expected. Consequently, over 100 means that there were more deaths than expected based on patient characteristics (Jarman et al., 2009; Pouw et al., 2013). In the Netherlands, before HSMR, mortality figures were based on clinical databases and related to certain patient groups or procedures (Jarman et al., 2009). HSMR received attention from the Dutch government when a study in 2009 estimated more than 1.700 unnecessary deaths occurred every year in Dutch hospitals (de Bruijne et al., 2004; Jarman et al., 2009). In 2010 it was decided all Dutch hospitals need to publish their HSMR, following countries such as the UK, Australia, Canada and the US. In the UK, hospitals with poor HSMR scores initiated organisational changes and were able to lower their HSMR to a better level (Heijink, 2008).

Adjusted mortality rates, which the HSMR essentially is, are very often used to measure quality at hospitals, as they are a clear and easy way to inform the public about hospital quality. They are also used to compare with other measures, and because of the lack of a better alternative to measure overall quality. Although mortality rates signal hospitals whether their performance is at par or not, hospital mortality rates are often very imprecise when it comes to measuring hospital quality (Birkmeyer, Dimick & Birkmeyer, 2004). Mortality rates were found unable to detect quality problems regarding medical diagnoses consistently (Hofer & Hayward, 1996). According to Hofer & Hayward (1996), with the exception of high-volume surgery, mortality has not been a valid indicator of quality. Later on, Thomas & Hofer (1999) concluded that adjusted mortality rates misinform the public about hospital performance. However, research on the topic has done little to discourage use of mortality rates, due to its functional superiority as a measure.

2.3.2. Drivers of hospital quality

Meyer et al. (2004) performed a large research on hospital quality, and what the ingredients of success are. Based on observations on the best hospitals, they developed best practices. Meyer et al. (2004) determined four categories of elements which are vital to a successful strategy regarding quality: culture, people, processes and tools. Culture includes a clear quality-related mission, commitment and leadership from the Board and CEO, a supportive organisational structure, and clear communication. Regarding people Meyer et al. (2004) found that selective hiring and the ability to attract top-level physicians and nurses is vital. Tools includes a willingness to invest in IT and working together with medical staff to optimise IT systems. The findings regarding processes by Meyer et al. (2004) are important as it is then clear what its place is in having optimal hospital quality, next to how it is measured. However, the first element regarding processes that is mentioned is performance measurement. Once measurement is in place and performance improvement opportunities are identified it is important the correct problem-solving techniques are implemented. Drivers that lead to success are having multi-disciplinary teams which are able to access and question all the data. Consequently, an action plan should be developed to structurally improve processes. Quality improvement mandated top-down was not found to be effective (Meyer et al., 2004)

2.4. Relationship between hospital quality and financial performance

A large reason of why this study posits a relationship between hospital quality and financial performance is the changing Dutch healthcare system. Since 2003 the Dutch healthcare system is progressing to a managed-competition structure (Schut & van de Ven, 2005; van de Ven & Schut, 2008). This will allow insurers to buy care of their preference, mostly to be able to offer the best care to their clients. However, van de Ven & Schut (2009) argue insurers are still reluctant to selectively buy care. Van de Ven & Schut (2009) find a couple of reasons. Firstly, the sector is still too heavily regulated and insurers only run a limited financial risk as most deficits due to poor quality are still reimbursed. Secondly, there is too little high-quality information on quality available, but improvements in that area are ongoing, and some

insurers are going in that direction. Lastly, insurers are afraid to damage their reputation by only offering selective healthcare to their clients. As a consequence, the reluctance of insurers might limit the effect of financial performance on hospital quality. However, the ongoing transition to more transparency on quality, and because more healthcare organisations have increasingly more financial responsibility and independence are main reasons to expect a positive relationship between financial performance and hospital quality. Botje, Klazinga & Wagner (2013) state several business studies find quality is vital to improving business performance. According to them in healthcare this association is also found. Additionally, Botje, Klazinga & Wagner (2013) state studies find associations between quality of care and several other aspects.

Next to that fact that the Dutch healthcare sector is transitioning to a system in which is expected financial performance will have an impact on quality, similar research exists in mostly the United States. Dutch hospitals, and healthcare in general, will face increasing financial pressure. Many hospitals in the U.S. have experienced this, starting in the late 1990s and early 2000s (Bazzoli, Chen, Zhao & Lindrooth, 2008). Research has been performed on the implications of increasing financial pressures. Bazzoli et al. (2007) found many hospitals continue to operate despite being financially weak. They suggest financially weak hospitals cutback on investments in plant and equipment and on hospitals standards. Hospitals possibly are able to avoid bankruptcy by reducing the quality of their healthcare. Due to limitations in their research, Bazzoli et al. (2007) avoid to conclude this leads to poor quality of healthcare. The number of Dutch hospitals is still quite stable, although some mergers have taken place in order to maintain quality (Olsthoorn, 2015). In a more recent paper, Bazzoli, Chen, Zhao and Lindrooth (2008) suggest that only deep financial problems, going beyond the customer side of business and thus beyond the primary line of activity, might be important to quality. They found that hospitals with poor operating margins did not perform significantly less on certain quality variables, only the poorest and second poorest did. The authors conclude that only once hospitals have no other choice and entertained all other options, they cut on hospital quality. However, they also mention that the relationship is not as strong as earlier literature suggested. Encinosa & Bernard (2005) found a negative significant effect of hospital finances (operating margin) on patient safety problems. They assumed a 1-year time lag. Their results suggest that the financial pressure, which is also increasing in the Dutch healthcare sector, can limit a hospital's ability to make investments in patient safety improvements. Also, Zhan & Miller (2003) found, by analysing 18 patient safety indicators, medical injuries lead to 2.4 million extra days in hospitalization and $ 9.3 billion in extra charges in the US annually. In Appendix D an additional section can be found, which elaborates on the relationship between financial performance and quality in American nursing homes. As nursing homes are not included in the analysis, this is not relevant to this literature review.

A general concern is that hospitals attempting to control costs could lead to worse health quality. McKay & Deily (2007) found no association between cost inefficiency and hospital health outcome for U.S. hospitals. There has been quite some research on the cost per case and hospital quality. Many authors predict there is a negative relationship between costs per case and hospital quality. According to Ashby et al. (2012) the results are mixed. In their own research, they (2012) found a statistical significant relationship which led to the conclusion that high-quality hospital care does not have to cost more, at least in Hawaii. However, Jha et al. (2009) did not find evidence that low-cost hospitals provide higher quality of care for all U.S. hospitals. Actually, they found that low-cost hospitals had slightly worse performance on quality. The prediction comes from the argument that low-cost hospitals (or institutions in general) have better management and therefore higher quality. This argument has been researched extensively and primarily on U.S. hospitals. Hvenegaard, Arendt, Street & Gyrd-Hansen (2011) found that in the literature either positive, negative associations or no association are found at all between quality and costs and propose a U-shaped relationship between the two variables exists. In their research they find some evidence, but are hesitant to accept their hypothesis. Carey & Burgess (1999) find a positive association between cost and mortality. They attain this result to the fact that dying patients are costlier to care for. Nayar & Ozcan (2008) found a positive relationship between technical efficiency and quality.

After examining the literature and Dutch healthcare sector the following hypothesis was formulated.

Hypothesis Financial performance has a positive effect on the hospital quality

This hypothesis is formulated based on the following reasons: the Dutch healthcare is transitioning to a healthcare system which will stimulate pay-for-performance and where transparency in quality can lead to free healthcare choice by patients. Additionally, literature on mainly the American healthcare system finds positive associations between financial performance and hospital quality. Many authors hypothesize such a relationship. Although it is not always confirmed by the data, there is evidence this relationship exists.

2.5. Chapter summary

The literature is quite extensive on financial performance and quality of hospitals. Hospitals play an important role in national healthcare, are large organisations which receive a lot of attention. Academic hospitals play a vital role in the educations of all doctors. The major social role and the many stakeholders make that hospitals are often a subject of research.

Financial performance is an important subject within hospitals. Due to differences with insurance and generally the healthcare system, financial performance for hospitals has always played a larger role in the United States than in the Netherlands. Financial performance can be an important factor for the quality in hospitals. Ratio analysis is still the most used tool for financial analysis and it is not different in the hospital sector. Ratio analysis for hospitals should contain ratios on profitability, liquidity and capital structure. This way, short-term and long-

term financial performance is covered and any potential problems should be easily discovered.

Also quality is an often researched subject for hospitals. In short, measures for quality can be divided in three categories: process-, outcome- and structural measures. Academics are slowly developing a preference for process measures. Process measures are related to actions by clinicians and to actual care, but can be hard to measure as not everything is measurable. Outcome measures are measures that are easily presentable and are therefore popular by patients and insurance companies. However, outcome measures can be influenced by many other factors than quality. Lastly, structural measures give an indication about a hospital's size, resources and experience. Apart from surgery, where experience gives a strong indication of quality, structural measures have not proven to be strongly related to quality.

Research on quality and financial performance in hospitals is also available, but it becomes clear there is still little agreement on how to measure financial performance or quality of healthcare. Mortality rate, an outcome measure, is often used as it often measured and easily accessible. Although adjusted mortality rates exist, which adjust for patient characteristics, age etc. it does not always reflect hospital quality. Many authors hypothesize an effect of hospital quality on some measure of financial performance.

3. Method and data collection

This chapter will describe in detail how data is collected and analysed. Firstly, a detailed discussion of the chosen method is described. Following, the data variables on quality and financial performance are discussed. Following, descriptive statistics and correlations will be used to further describe the sample for this thesis.

3.1. Method

This research looks to examine the effect of financial performance on hospital quality and has data for the years 2009-2014. A regression analysis estimates the relationship between a dependent and one or more independent variables. Linear regression is often used in similar analyses. Specifically, former studies have used ordinary least square (OLS) linear regressions to examine the relationship for hospitals. To address the research question, a form of analysis must be chosen to capture the effect of financial performance of hospital quality.

Recently, Collum, Menachemi & Sen (2016) examined the effect of implementing electronic health records (EHR) on hospital financial performance. They used data on American hospitals for the time period 2007-2010 from 3 data sources. Their method of choice was a longitudinal panel study design with hospital and year fixed effects. Although their independent variable is different (implementation of EHR instead of quality variables) the research is similar to this paper. Collum, Menachemi & Sen (2016) test their hypothesis using a 1 or 2-year lag as they acknowledge it is unknown when hospitals start experiencing changes after implementation. Nguyen, Halm & Makam (2016) analysed the relationship between hospital financial performance and publicly reported (quality) outcomes. They used net revenue by operations, operating margin and total margin as financial performance indicators. Quality indicators were risk-standardised mortality and a trio of readmission rates. To estimate the relationship, Nguyen, Halm & Makam (2016) used linear regression adjusted for hospital characteristics such as teaching status, rural location and size. Burke, Randeree, Menachemi & Brooks (2008) examined whether IT governance is related to financial performance. Similar to this study, secondary data on hospital financial performance was used. They used surveys to gather data on IT governance. They regressed every separate financial variable with every separate IT governance variable using a simple linear regression. They controlled for characteristics such as case mix, ownership, membership in a hospital system and adoption of healthcare information technology (HIT). Everhart et al. (2013), in response to a trend where hospitals facing financial uncertainty were reducing nurse staffing, examined the effects of nurse staffing on hospital financial performance. They used total margin as financial performance variable and nurse staffing ratio as quality variable. They controlled for several hospital organisation factors, market factors and nursing factors. Everthart et al. (2013) chose a multivariate linear regression. It must be noted they used quality data from only 1 year, 2008 and correspondingly used financial data from 2007, as they opted for a 1-year time lag.

Linear regression. The research that is that closest related is by Nguyen, Halm & Hakan (2016) as they used multiple years (2008 and 2012, however not the years in between) on either

quality or financial data. A key difference is that this paper uses data from multiple consecutive years. They used a linear regression to perform their analysis.Linear regression is a strong statistical tool to examine a linear relationship. It assumes the dependent variable is the linear function of the independent variables. It desires that it is an as accurate predictor as possible. Accuracy in a linear regression means the sum of squared differences is minimized. Linear regression is easily implemented and easily analysed. However, there are some pitfalls.

Linear regression is very sensitive to outliers. A value which is extremely high or low compared to other data points can have a disproportionally large effect causing the regression to perform poorly. In order to compensate for outliers, outliers could be removed or given less weight in the analysis. However, one should be careful it does not bias the results. Another issue with linear regression is capturing a non-linear relationship. Purely hypothetical, if quality would increase if financial performance increases, that could be linear. However, if financial performance increases on to a certain point, and quality decreases, because (hypothetically) with such good financial performance a non-sufficient amount is invested in quality that would suggest a non-linear relationship. Another possibility is an exponential relationship. A linear regression might also perform poorly if several variables are strongly correlated.

In a regression one should always be careful in choosing variables. A regression might show results which could be due to variables not included in the sample. To mitigate this bias, control variables can be used.

In conclusion, a variety of regressions is used to examine a relationship between financial performance and quality as well as for similar subjects. Firstly, the sample as well as the data variables will be defined in order to choose the regression.[1]

3.1.1. Model specification

Three regressions will be performed. For the sample 2009-2013 two regression will be performed and for the 2014 sample one regression model is chosen. These three models are presented below.

Model 1

$$HospitalQuality_i 2009\text{-}2013 = \alpha + \beta_1 FIN_i + \beta_2 \sum CONTROLS_i t + \varepsilon_i t$$

Model 2

$$HospitalQuality_i 2009\text{-}2013 = \alpha + \beta_1 FIN_i t + \beta_2 \sum CONTROLS_i t + \varepsilon_i t$$

Model 3

$$HospitalQuality_i 2014 = \alpha + \beta_1 FIN_i t + \beta_2 \sum CONTROLS_i t + \varepsilon_i t$$

Model 1 is a multivariate linear regression with three quality variables regression with two financial variables and about 10 control variables. Model 2 is a similar regression. Different to

model 1 all variables, which are available for at least 1 and up to 5 years, will be combined to an average for each hospital. This in order to eliminate extreme values which could benefit the statistical power of the model. Finally, the third model is a regression is performed for the 2014 sample. This will also be a multivariate linear regression, but uses six (6) quality variables instead of three and like models 1 and 2 with two financial variables and about 10 control variables. The financial and control variables for all samples will be discussed in the following sections. Below the models can be found as equation.

3.2. Data variables

This chapter will describe which variables are used in the literature and will match this with the available data. It describes which variables will be chosen to measure financial performance and hospital quality.

3.2.1. Financial performance

This section will describe many papers which used financial performance in hospitals as a variable in their research. Per article it will be described which measures of financial performances were used and why they were used, what their research entailed and if relevant the results will be discussed. Firstly, a short introduction into financial ratios for hospitals.

The most common method of analysing financial performance is based on financial statements. From these statements, usually several ratios on profitability, liquidity and solvability among other ratios are calculated. These ratios could give an indication of the financial performance of any institution. Ratio analysis is an accepted method for measuring financial measurement in healthcare too (Chu, Zollinger, Kelly, & Saywell, 1991; Watkins, 2000; Zeller, Stanko & Cleverley, 1996). The number of ratios that can be derived from financial statements is endless, and a set of ratios must be reduced to a manageable, yet representative set of variables (Chu, Zollinger, Kelly, & Saywell, 1991). The first model that pops to mind when measuring financial performance is the Altman-Z model. The well-known, widely accepted Altman Z-model measures an organisation's likelihood to go bankrupt based on a set of financial ratios (Altman, 2000). However, there is plenty of research proving that the model is not applicable to every sector and also that time has caught up with it. The Altman Z-model is from 1967 and meant for manufacturing companies originally, which is acknowledged by its original author in a later article (Altman, 2000). Plenty of alternatives have emerged since the development of the model, but none of as widely accepted as the Altman Z-model (Grice & Ingram, 2001). The Altman Z-model has been updated by its original author in 2012. However, it is still mainly intended for manufacturing companies. Another limitation is that the model is originally meant to measure financial distress, which is not necessarily the same as financial performance. Therefore, this research will look in the literature for financial performance regarding healthcare and hospitals in general. In the early days of hospital financial analysis, the financial ratios for retail and manufacturing were used, despite the large differences with hospitals (Watkins, 2000). However, assessment of the financial performance of hospitals has progressed since (Watkins, 2000).

In the literature, at first sight most authors use a small set of financial ratios and margins to determine financial performance of hospitals. Early literature from the 90s did attempt to analyse purely the use of financial ratios in hospitals (Cleverley, 1993; Chu, Zollinger, Kelly & Saywell, 1991; Zeller, Stanko & Cleverley, 1996), but did not define a general set of ratios. They took a very large set of ratios, and analysed which ratios could be used for hospitals. Bazzoli, Fareed & Waters (2014) considered operating margin and financial margin, splitting a hospitals primary line of activity and secondary activities. In another article, financial performance was evaluated by calculating total margin, return on equity and financial leverage for a five-year period (Whitcomb & Cleverly, 1993). Enough cause to look in the literature which financial measures are found to be important regarding the financial performance of hospitals nowadays.

In the literature, several ratios were found that are considered measures of financial performance in hospitals. Table 2 summarizes all ratios that were found and used commonly. All papers are on US based hospitals. In a paper by Collum, Menachemi, Kilgore and Weech-Maldonado (2014) three of the discussed ratios are used to measure financial performance for hospitals: total margin, operating margin and return on assets. As their research focuses on the relationship between management involvement on the board of directors and hospital financial performance, there is less focus on the primary line of activities of hospitals. As this research focuses on quality of hospital service, total margin might not be a useful ratio to use as it is also affected by non-patient services. Singh & Song (2013) found that merely 6% of total revenues are generated from non-patient services, at least in California, which could be generalized to the Netherlands since there is a high percentage of non-profit hospitals in that state. They also found there is a large difference there between for-profit and non-profit hospitals, a difference which does not exist in the Netherlands. Total margin might therefore be redundant when operating margin is also included. Singh & Song (2013) also distinguish the difference between patient care margin and operating margin. Examples of non-patient operating activities are the cafeteria or parking fees. Unfortunately, that data is not available for this research. Collum, Menachemi and Sen (2016) examined whether implementing Electronic Health Records improves financial performance. In order to measure financial performance, they use three profitability ratios: total margin, operating margin and return on assets. If that is compared to Palepu, Healy & Peek (2013), it is found they identify a couple of ratios to analyse financial performance in their book Business Analysis and Valuation Tools: return on equity (ROE), return on assets (ROA), return on business assets (ROBA), and return on operating assets (ROOA). Interestingly, they do not used total or operating margin, two ratios which are used very often.

As was mentioned, *total margin* is often used in literature regarding financial performance in hospitals (Collum, Menachemi & Sen, 2016; Reiter, Sandoval, Brown, & Pink, 2009; Whitcomb & Cleverly, 1993). Total margin is the percentage of revenue that is left after subtracting all costs. Total margin and operating margin were found to be highly correlated (Kane, Clark & Rivenson, 2009; Zeller, Stanko & Cleverley, 1996) and operating margin seems gives a more

specific look on the financial performance related to a hospital's primary activity, taking care of patients. *Operating margin* is the operating income divided by revenue. The largest part of a hospital's revenue is earned from their primary line of business, providing health care services (Singh & Song, 2013). Singh & Song find that 40% of Californian hospitals between 2003 and 2007 lost money on patient care, and that of these only 25% was able to offset losses with revenues generated from their non-primary line of business. If hospitals from their sample had not engaged in non-patient care activities, total margins would have been 2.4 percentage points lower than they actually were. However, it could also be argued that hospitals that are willing to put efforts into generating extra revenues outside their primary line of business are doing a very good job, as this allows to spend more money on providing healthcare.

Return on assets tells how much profit a company is able to generate for each euro of invested assets (Palepu, Healy & Peek, 2013). ROA is the net profit divided by a firm's total assets. Return on business assets which is net profit divided by operating assets plus investment assets and return on operating assets are two closely related ratios. Either for ROE and ROA, ROBA, ROOA net profit is used to calculate the return. It is important to distinguish the difference between net profit (and total profit) and operating profit. Net profit includes investment activities and interest income and expense, which come down to financial policies (Palepu, Healy & Peek, 2013). Operating profit is thus closer related to financial performance as a result of a hospitals' primary activity. *Operating profit margin* is the percentage of revenue that is left after subtracting cost of operating and production, basically costs from the primary line of activity of an organisation. It is used by many authors as a measure for financial performance in hospitals (see Collum, Menachemi & Sen, 2016; Bazolli et al., 2014; Jha, Joynt, Orav, & Epstein, 2012; Kane, Clark, & Rivenson, 2009; Noles, Reiter, Boortz-Marx, & Pink, 2015; Zeller, Stanko & Cleverley, 1996; Zhao et al., 2008) and could be regarded as a financial measure in the literature.

Return on equity provides an indication of how well funds are invested to generate returns (Palepu, Healy & Peek, 2013). It is net profit divided by shareholders' equity. Cleverly & Cameron (2007) write in their book 'Essentials of Health Care Finance' that Return on Equity (ROE) is the single most important measure in measuring long-term financial success in any business entity, including hospitals. This originates from Cleverley's original paper in 1993, which was revisited by Zeller, Stanko & Cleverley in 1996. Although, probably not everyone would agree with the statement that ROE is the single most important measure of the financial performance of healthcare organisations, Cleverley and Cameron (2007) make an excellent point that health care organisations that want to remain viable must add new investments. With a low ROE, that is certainly more difficult.

In Table 2 the most important measures found are summarised.

Table 2: Summary of financial measures used in literature		
Measure	**Calculation**	**Sources**
Total margin	Net income / revenue	(Singh & Song, 2013; Nguyen, Halm & Makam, 2016; Collum, Menachemi & Sen, 2016; Everhart et al., 2013; Collum, Menachemi, Kilgore & Weech-Maldonado, 2014; Reiter, Sandoval, Brown & Pink, 2009; Holmes, Pink & Friedman, 2013; Bazzoli, Fareed & Waters, 2014)
Operating margin	Operating income / revenue	(Singh & Song, 2013; Nguyen, Halm & Makam, 2016; Collum, Menachemi & Sen, 2016; Collum, Menachemi, Kilgore & Weech-Maldonado, 2014; Bazzoli, Fareed & Waters, 2014; Bazzoli, Chen, Zhao & Lindrooth, 2008)
Return on assets	Total assets / revenue	(Collum, Menachemi & Sen, 2016; Collum, Menachemi, Kilgore & Weech-Maldonado, 2014; Palepu Healy & Peek, 2013)
Return on equity	Equity /revenue	(Palepu Healy & Peek, 2013)

Merely one research (Holmes, Pink & Friedman, 2013) opts to use liquidity and capital structure ratios, next to profitability ratios. As their research focuses solely on the financial status of a certain group of hospitals, it is logical they choose to use more types of financial ratios. Total margin is used in all but one paper and operating margin in all but three. Other used ratios are patient care margin which is not often available, return on assets which is described by Palepu, Healy & Peek (2013) as a vital ratio in determining a firm's financial performance, and current ratio which is a liquidity ratio. As mentioned, the research by Nguyen, Halm & Hakan is in the way it is set up similar to this research. However, they hypothesized absolute amount of revenue is positively associated with investments in quality improvement programs they used net revenue as a financial measure. In the Netherlands, the absolute number a certain procedure is performed by a hospital is associated with quality. However, there is no evidence absolute amount of revenue has a positive effect on quality improvement investments. Therefore, net amount of revenue is not deemed usable as a measure of financial performance for Dutch hospitals.

3.2.2. Financial ratios from ZorgRating

Financial data for this research is gathered from 'ZorgRating' (which literally translates to CareRating). ZorgRating is a database which contains financial reports of all healthcare organisations in the Netherlands in a standardized framework. It is created and maintained by Finance Ideas. Besides the data, which allows to calculate ratios that are discussed before, ZorgRating also calculates 8 financial and 8 operational scores for each organisation. ZorgRating is a tool which uses financial measures as described to assign a score to healthcare institutions. Each score has a different weight and is measured in steps. By this is meant that the top 25% per variable is assigned the same score (100 points), the next 25% is assigned a score of 75, and so on. This means the financial score does not move linearly with the 8

variables. Basically, it throws data away by not including the variance of each variable, which is not relevant for its original purpose, but is for this paper. In order to compute 1 single score for 8 variables, which ZorgRating means to do, it seems necessary to do use this technique, which justifies doing it for the purpose the database has. Table 3 provides an overview of the available data and ratios. The data is instantly usable as it is obliged for Dutch healthcare organisations to deliver the data to the government. Therefore, it is also checked and approved by accountants. On the data, certain calculations are performed by Finance Ideas. These financial ratios are considered in this research, as they were chosen carefully by Finance Ideas. However, the main purpose is to examine financial performance, and thus profitability ratios. It must be noted that the ratios from ZorgRating serve a different purpose than the chosen ratios in this research do. Their tool serves for clients to make investment decisions based on multiple areas such as financial performance, but also capital structure and liquidity. In Table 3 the ratios from ZorgRating are explained briefly.

Table 3: Financial ratios ZorgRating

Ratio	Calculation	Explanation
	Profitability ratios	
• Result ratio	Net income / total revenue	Percentage of revenue that is left after costs
• Efficiency ratio	Costs / revenue	Shows how efficient a hospital operates
	Liquidity ratios	
• Current ratio	Current assets / current liabilities	Ability to pay of short-term debt directly
• Debt/EBITDA ratio	Debt/EBITDA	Ability for a company to pay off incurred debt
• Debt Service Coverage ratio (DSCR)	EBITDA / total debt service	Income available to pay current debt services
	Capital Structure Ratios	
• Solvency ratio	Equity / Total assets	An organisation's ability to meet liabilities
	Other financial indicators	
• Revenue (mln)	Revenues	Revenues for the year
• Growth insured healthcare	[Insured healthcare (t=0)/insured healthcare (t=-1)]-1	Growth of insured healthcare compared to the year before

3.2.3. Healthcare quality

In chapter 2.3 several measures of quality in hospitals were identified, and for each method advantages and disadvantages were described. This section will consider literature on Dutch hospitals, which used quality variables, which are similar to this research. Firstly, van Ineveld

et al. (2015) looked to analyse the difference in productivity and quality of Dutch hospitals since the reform in 2005. The reform introduced in 2005 was introduced without an intervention group, nor is there data available from before 2005. Therefore, they perform a Data Envelopment Analysis (DEA). DEA is mainly used to estimate productivity based on multiple inputs and outputs and enables cross-sectional as well as longitudinal analysis. In a research also using DEA, Blank and van der Hulst (2011) examine the relationship between governance and performance of Dutch hospitals. They used number of discharges and first-time visits as output and salaries of regular personnel as input. Their governance variables were size of the board, and remuneration of board members. Botje, Klazinga & Wagner (2013) analysed the orientation of hospital governance towards quality in care and investigated the relationship with hospitals performance. The data on orientation was collected through a survey. More importantly to this research, Botje, Klazinga & Wagner (2013) also recognize the difference between process measures and outcome measures. They chose to focus on process measure as hospital leadership is more likely to influence processes. Their data is similar to the data used in this paper, but received from a predecessor of the "Quality Window" which was introduced in 2014. They accept the limitation that process measure do not completely capture the quality of care. Also prior to the introduction of the "Quality Window" Anema et al. (2013) researched the construction of Dutch hospital information systems. Opposed to countries such as the United States, Denmark and Germany, Dutch hospitals self-report the data for quality information. In the US, Denmark and Germany the coordinating organisations are responsible for data collection (Anema et al., 2013). They found that nationally organised systems such as in the US lead to better plausibility and increases comparability between hospitals. However, for this research measures exclusively from the Dutch Association of Hospitals are used. It should be accepted the data might be limited, as it uses self-reported data. According to Dutch Association of Hospitals president Yvonne van Rooy, the "Quality Window" is a response to the growing demand for transparency (van Rooy, 2014). The data is delivered by hospitals, but developed not only with hospitals, but also patients and other stakeholders.

Table 4 provides an overview of all the quality indicators. Afterwards, each indicator will be described in detail. These descriptions are mostly derived from a report from Yvonne van Rooy, president of the Dutch Association of Hospitals (NVZ). As was mentioned, this data is only available for 2014. The data that will be used to determine hospital quality in 2009-2013 are described after this section.

Table 4: quality indicators NVZ Kwaliteitsvenster		
Indicator	**Sub-indicators**	**Measurement**
• Patient score	Score	Score 1-10
	Complaints	Absolute number
• Doctors	Feedback	Percentage
• Waiting times	Policlinic	Weeks
	Treatment	Weeks
• Risky operation	Norm	Yes/no
• Medicine	Admission	Percentage
	Discharge	Percentage
• Infections	Knee replacement	Percentage
	Hip replacement	Percentage
	Sepsis	Percentage
• Pain	Pain after surgery	Percentage
• Mortality	HSMR	Index (100 = expected)
• Elderly	Severe confusion	Percentage

Patient score

Most hospitals ask patients to give a department or the entire hospital a score on a scale from 1 to 10. Also, patients can file complaints and hospitals also ask their patients what they think is important. That way, the hospital knows what could be improved and what is going well.

Patients that are unsatisfied with their treatment, can file a complaint with a commission. The commission examines the complaint and decides if it is founded. Only well-founded complaints are considered with this quality indicator. Obviously, size of hospitals has to be taken into consideration as well.

Feedback for doctors

Many doctors receive elaborate feedback bi-annually from co-workers or patients in order to improve themselves. Dutch hospitals developed a method for this: Individual Functioning Medical Specialists (IFMS). The method allows doctor to find out how other thinks they should act and behave on the job. The feedback is documented in a personal development plan. IGZ checks this indicator annually.

Waiting times

Waiting times are an indicator of operational performance. These waiting times do not include emergencies, as patients should be hospitalised immediately. Waiting times for the policlinic as well as treatment are separated and measured in weeks. Hospitals in the Netherlands agreed it should take no longer than four weeks before patients are admitted into the policlinic and it should take no longer than seven weeks before treatment. If a patient requires a very specific treatment, or prefers a certain doctor, waiting times might be longer.

Risky operations
It is assumed that risky surgery is performed better when hospitals get more experienced with it. An operation is defined as risky, if serious complications may arise from it. The IGZ establishes a norm for how often a hospital should perform a risky operation annually. Hospitals have to publish for 15 risky operations if they made the norm, or not performed the operation at all.

Medicine
In order to prevent damage to a patient, it should be clear what medication a patient uses and how much. Hospitals also have the responsibility to update a patient's medicine record once he is discharged from the hospital. This variable measures how often a patient's medicine is checked at two points of their stay: when they are admitted, and when they are discharged. Checking medicine requires medical knowledge from medical specialists. Hospitals are also working with computers to ensure good medication for their patients.

Infections
Hospitals are expected to record how often infections occur and how it happened. The probability a patient gets infected depends on the hygiene, and how the treatment went, but also on the age and the health of the patient. Infections can happen on many more treatments, but in the NVZ database it is measured after replacing a knee, replacing a hip and after a sepsis.

Pain
Almost every hospital measures how much pain patients experience after surgery. Pain is measured by letting patients 'grade' in how much pain they are. 0 means no pain, 10 is extreme pain. Hospitals want to prevent patients from having pain scored higher than 7. This indicator measures how many patients score their pain 7 or lower.

Mortality
Mortality, and the HSMR, were explained in depth in the theoretical framework. The HSMR that is required for Dutch hospitals is used in several countries around the world. It gives in an indication of mortality rates in hospitals opposed to mortality rates that were expected.

Elderly
Elder people have an increased risk at sudden severe confusion. Hospitalization increases that risk even more. Severe confusion negatively influences recovery from treatment. Hospitals check for severe confusion using a checklist, used by all hospitals. This measure is the percentage of departments throughout a hospital that checks at least 80% of admitted elders for sudden severe confusion.

Quality indicators from ZorgRating
All other data comes from ZorgRating. Although the data in annual reports from healthcare organisations is mostly financial, they also report some data which is relevant regarding healthcare quality. The 8 financial measures in ZorgRating were explained in detail in the

previous chapter. However, ZorgRating also contains eight operational measures from these annual reports, which, to some extent, give an indication about the quality of provided healthcare. Table 5 provides the operation ratios from ZorgRating.

Table 5: operational ratios ZorgRating

Ratio	Explanation
– Absenteeism	Percentage of absenteeism due to illness
– Outflow of personnel	Outflow of personnel in percentage
– Complaints	Percentage of complaints relative to number of patients
– Date annual report	Number of days between 1st of January and publication annual report
– Board of Directors	Number of years current Board of Directors is heading the organisation
– Competition	Ratio of clients and number of organisations in the area
– Unbilled revenue	Percentage of revenue that has not been billed yet
– Book value /acquisition value	Current book value divided by acquisition value

ZorgRating

From the eight original variables on quality in ZorgRating, this study will merely use the absenteeism, outflow of personnel and complaints. These three have the closest link to actual healthcare quality. Absenteeism and outflow of personnel indicate the continuity of the staff which produces care for the patients. The percentage of complaints indicates if patients are satisfied with received care. The remaining 5 variables are related to non-primary activities, such as management. The 3 variables which will be used are explained in detail.

Absenteeism

Low absenteeism is a potential indication of a healthier and more stable organisation. This check is for all medical and operational personnel. According to the Central Bureau of Statistics (CBS in Dutch), absenteeism in healthcare was 4,8%, which lies above the national average of all organisations of 3,8% in 2015 (CBS, 2015). Larger companies tend to have more absenteeism, which explains the increased number for healthcare. Among subsectors in the healthcare, hospitals have the highest percentage of absenteeism.

Staff turnover

Also personnel related, a low staff turnover can indicate stability and continuity within an organisation. Teams that work together for an extended period might have better performance.

Complaints

The percentage of complaints relative to the number of patients can also be an indicator of quality. It might be limited in the sense that the intensity of healthcare is different per sector. For example, an organisation that provides 24-hour intramural care has less patients than a hospital, but a single patient receives a lot more care and there is basically more to potentially

complain about. In order to correct for that limitation, a score on complaints will be assigned per sector.

3.2.4. Control variables

The used control variables are size, academic or non-academic hospital, and urban or rural. Also some variables from ZorgRating are used to see if there are any influences. A selection was made for solvency, DSCR, EBITDA margin and current ratio. Efficiency ratio, identical to total margin, was excluded as it strongly correlates to Return on Assets. Revenue was excluded as size is already included in the sample. Growth was excluded due to the fact that this is also included by the sample, considering it uses data from consecutive years.

3.3. Sample

Dutch healthcare consists of four main subsectors; hospitals (ZKH), care for mentally ill (GGZ), care for disabled (GHZ) and nursing and home care (VVT). The analysis in this research will only focus on hospitals, as it was concluded from the theory that hospitals play the most important role in healthcare. As a result, the other three subsectors receive little to no attention in academic research. In the Appendix certain tables regarding these three subsectors can be found. For the remainder of this thesis sample refers to merely hospitals.

Data is collected from two databases: ZorgRating and NVZ Kwaliteitsvenster. Data on financial performance consists of a full sample of maximum 114 unique hospitals in 2011 and minimal 110 unique hospitals in 2009 in the Netherlands for the years 2009-2014 and is collected from ZorgRating. This results in a sample size of 674 hospital years. Data on the quality of healthcare in hospitals is collected from both databases. ZorgRating provides data on quality for the years 2009-2013. For the year 2014 new quality measures for Dutch hospitals became available. This data, collected from the NVZ database, is still incomplete. As a consequence, the sample for 2014 consists of 73 hospitals, while there were 111 Dutch hospitals active in 2014. The next sections will explain the variables that the databases contain.

This subchapter will provide descriptive information of the dataset that is used for this research. The descriptive statistics are presented in Table 6. An academic hospital is tied to a university. Whether an organisation operates in an urban or non-urban area is determined through zip code. It must be noted that these zip codes are on concern level, meaning the location of an organisation's main address is used. It could be that not all locations of a healthcare organisations actually operate in the urban area the organisation is located. However, the number of hospitals which have multiple locations in different areas is very limited. All organisations located in the very strong urbanized cities received the urban tag. The degree of urbanity per city was defined by CBS (CBS, 2014).

Table 6: Frequency table hospital sample 2009-2014			
2009-2014	Hospital years	Percentage	Cumulative percentage
Sample	674	100,0%	100,0%
Academic	48	7,1%	7.1%
Non-academic	626	92,9%	100.0%
Urban	203	30,1%	30.1%
Rural	471	69,9%	100.0%
2009	110	16,3%	16.3%
2010	113	16,8%	33.1%
2011	114	16,9%	50.0%
2012	113	16,8%	66.8%
2013	113	16,8%	83.6%
2014	111	16,5%	100.0%

One hospital year is the equivalent of one unique hospital and the financial data of 1 year. So a certain hospital could be equal to 6 hospital years in this sample. Approximately 7% per cent of the hospitals are academic. About 30% of the hospitals in the total sample are located in the most urban areas of the Netherlands. Finally, the number of hospitals each year rose to 114 in 2011, but declined again to 111 in 2014. This is mostly due to mergers. Due to new quality regulations hospitals had to reach minima for certain procedures. Combined with other large scale advantages this lead to mergers.

3.4. Descriptive statistics

In Table 7 the descriptive statistics for the 2009-2013 sample are presented. The first four financial performance measures in the table are derived from the literature. The remaining financial and quality indicators are derived from ZorgRating. On the right side of the Table, differences between academic & non-academic, and urban & rural hospitals are presented.

Table 7: Descriptive statistics sample 2009-2013

	Full sample						Means for subsamples			
	Mean	Med	Std	Min	Max	N	Academic	Non-academic	Urban	Rural
ROA	0,022	0,018	0,038	-0,412	0,283	563	0,015	0,022	0,023	0,021
Total Margin	0,022	0,019	0,036	-0,444	0,171	563	0,015	0,023	0,022	0,022
EBITDA margin	0,134	0,125	0,066	-0,407	0,527	563	0,091	0,137	0,125	0,138
ROE	0,098	0,110	0,202	-0,813	0,865	563	0,080	0,110	0,117	0,104
Absenteeism	0,044	0,044	0,010	0,000	0,084	563	0,040	0,044	0,042	0,045
Outflow of personnel	0,129	0,098	0,281	0,000	6,137	563	0,102	0,131	0,122	0,132
Complaints	0,002	0,001	0,010	0,000	0,159	563	0,005	0,002	0,002	0,002
Solvency	0,181	0,169	0,114	-0,364	0,807	563	0,186	0,181	0,192	0,177
DSCR	2,703	2,091	4,159	-34,217	68,898	563	3,106	2,672	3,163	2,503
Result Ratio	0,022	0,019	0,036	-0,444	0,171	563	0,015	0,023	0,021	0,022
Efficiency ratio	0,765	0,777	0,070	0,509	1,321	563	0,796	0,763	0,774	0,761
Current Ratio	1,017	0,906	0,617	0,058	8,573	563	1,052	1,014	1,002	1,024
Debt/EBITDA	6,994	6,513	5,581	-46,626	71,03	563	8,826	6,854	6,750	7,100
Insured care growth	7,999	0,052	93,199	-0,106	1135,36	563	0,057	8,617	12,880	5,856
Competition	71277	67011	36479	0	372976	563	65605	71711	65540	73759
Unbilled revenue	0,049	0,032	0,073	-0,231	0,506	563	0,053	0,049	0,039	0,054
B/A	0,554	0,562	0,160	0,000	0,992	563	0,576	0,552	0,556	0,553

Table 7 reports descriptive statistics for all hospitals in the Netherlands in the period 2009-2013. The right part of the Table shows means for subsamples split based on subsectors. *ROA* is return on assets. *EBITDA* is earnings before interest, taxes, depreciation and amortization. *ROE* is return on equity. *DSCR* is debt service coverage ratio. *B/A* is book value divided by acquisition value ratio.

In the period 2009-2013 several observations can be made. When looking at the financial ratios, it can be observed that hospitals have an average of 2,2% on Return on Assets and total margin, about 13,4% on EBITDA margin and their Return on Equity is approximately 9,8%. A research by Collum et al. with a sample of American hospitals between 2007-2010 of which 88% are not-for-profit found an average total margin of 3% (SD = 0.09) and a ROA of 3% (SD = 0.16). Nguyen (2016) also used total margin in their analysis and found 4,5% in 2012, up from 2,5% in 2008. However, their sample consisted for more than 55% of private hospitals. Dutch hospitals seem to have lower margins than their American counterparts. The comparing samples both included some for-profit hospitals, which would be expected to have higher margins.

The quality ratios as found in this sample cannot be compared to hospitals in other countries. However, absenteeism can be compared to the Dutch average. According to CBS (Central Bureau of Statistics) this percentage lies at 4%, slightly lower than in hospitals. This small difference could be attributed to the fact that hospitals can be high pressure work environments.

One observation that could be made is the fact that academic hospitals show consistently poorer margins than non-academic hospitals. This is caused by the many complex cases academic hospitals treat and spending on innovation medically and technologically. There seems to be little difference between urban and rural hospitals, regarding their margins. Either between academic and non-academic and between urban and rural large difference in growth is found. The difference between academic and non-academic hospitals can be explained by the fact the group of academic hospitals consists of the 8 largest hospitals in the Netherlands with hardly any capacity to grow. On the other hand, the difference between urban and rural hospitals, where urban show a much stronger growth than rural hospitals is explained by the fact that the largest cities in the Netherlands are still growing explosively.

Table 8 presents the descriptive statistics for the 2014 sample. Only hospitals that were available in the Quality Window are used. Waiting times in academic and urban hospitals is longer than in non-academic and rural hospitals, respectively. Also, their HSMR score is higher than their counterparts'. A variable which stands out is surgery experience in the way that the median is equal to the max: 1.0. Surgery experience tells us for how many a hospital performs the minimum number of procedures, and is presented as a percentage. Fourteen types of surgeries are included in this score. A large part of the hospitals scores 100%.

Table 8: Descriptive statistics sample 2014

	Full sample						Means for subsamples			
	Mean	Med	Std	Min	Max	N	Academic	Non-academic	Urban	Rural
ROA	0,018	0,021	0,034	-0,139	0,155	73	0,024	0,017	0,030	0,012
Total Margin	0,019	0,021	0,026	-0,081	0,114	73	0,023	0,019	0,028	0,015
EBITDA margin	0,114	0,117	0,037	-0,021	0,224	73	0,095	0,117	0,118	0,113
ROE	0,081	0,086	0,096	-0,479	0,277	73	0,095	0,079	0,106	0,069
Patient grade	8,2	8,2	0,2	7,5	9,1	73	8,1	8,2	8,2	8,2
Waiting time	6,1	5,8	1,5	3,2	9,2	73	7,8	5,9	6,8	5,8
Surgery experience	0,939	1,000	0,176	0,0	1,000	73	0,971	0,935	0,962	0,928
Infections	0,007	0,006	0,007	0,0	0,041	73	0,010	0,007	0,007	0,007
Pain	0,933	0,936	0,035	0,803	0,993	73	0,894	0,938	0,925	0,937
HSMR	96,4	97,0	14,7	63,0	137,0	73	101,9	95,6	98,9	95,1
Solvency	0,224	0,216	0,092	-0,043	0,561	73	0,244	0,221	0,256	0,208
DSCR	2,172	2,008	1,199	-0,944	8,520	73	3,061	2,057	2,698	1,915
Efficiency ratio	0,774	0,787	0,084	0,184	0,929	73	0,779	0,773	0,785	0,768
Current ratio	1,175	1,143	0,416	0,474	3,142	73	1,349	1,153	1,281	1,124
Debt/EBITDA	6,372	6,464	5,541	-33,304	18,407	73	7,501	6,227	6,139	6,487
Growth insured healthcare	0,021	0,018	0,080	-0,147	0,511	73	0,009	0,023	0,033	0,016
Competition	71925	64964	34967	0	188147	73	58899	73606	57028	79215
Unbilled revenue	0,029	0,013	0,055	-0,124	0,215	73	0,009	0,032	0,017	0,035
B/A	0,543	0,544	0,130	0,165	0,883	73	0,565	0,540	0,551	0,539

Table 8 reports descriptive statistics for all hospitals, which are available in the Quality Window in the Netherlands in the period 2014. The right part of the Table shows means for subsamples split based on subsectors. *ROA* is return on assets. *EBITDA* is earnings before interest, taxes, depreciation and amortization. *ROE* is return on equity. HSMR is human standardized mortality ratio. *DSCR* is debt service coverage ratio. *B/A* is book value divided by acquisition value ratio.

3.5. Correlations

In this section the correlations for all variables will be presented. A correlation is performed for multiple reasons. Firstly, it helps prevent selecting variables which are biased. Multicollinearity is when two or more variables are high correlated and can severely harm the statistical power of a model. There will be two tables, Table 9 for the years 2009-2013 and Table 10 for 2014, in correspondence with the sample. Both correlations will contain the financial variables derived from the literature: return on assets, total margin, EBITDA margin and ROE. Also either sample contains the financial variables from ZorgRating. The 2009-2013 correlation will contain absenteeism, outflow of personnel and complaints as quality indicators. Only 2014 will contain the quality indicators from the Quality Window.

Table 9: Correlation matrix 2009-2013

	ROA	*Total Margin*	*EBITDA margin*	*ROE*	*Absenteeism*	*OoP*	*Complaints*	*Solvency*	*DSCR*	*Efficiency ratio*	*Current ratio*	*Debt/EBITDA*	*Growth*	*Competition*	*Unbilled revenue*	*B/A*
ROA	1,000															
Total Margin	0,914**	1,000														
EBITDA margin	0,427**	0,612**	1,000													
ROE	0,623**	0,590**	0,312**	1,000												
Absenteeism	-0,102	-0,148**	-0,127**	-0,111	1,000											
OoP	-0,024	-0,037	-0,040	0,074	-0,001	1,000										
Complaints	0,045	0,099	0,130**	0,008	-0,145**	-0,014	1,000									
Solvency	0,247**	0,217**	0,005	0,050	-0,039	-0,013	0,003	1,000								
DSCR	0,313**	0,326**	0,188**	0,199**	-0,096	-0,021	-0,013	0,090	1,000							
Efficiency ratio	-0,464	-0,582**	-0,743**	-0,480*	0,138*	0,027	-0,114**	-0,057	-0,252	1,000						
Current ratio	0,106*	0,093	-0,049	0,058	-0,094	-0,054	0,043	0,660**	0,088	-0,026	1,000					
Debt/EBITDA	-0,228**	-0,221**	-0,210**	-0,055	0,090	0,036	0,027	-0,464**	-0,066	0,167	-0,234**	1,000				
Growth	0,036	0,073	0,152**	0,144**	-0,009	0,035	0,000	-0,002	0,049	-0,039	-0,042	-0,018	1,000			
Competition	0,020	0,073	0,146**	-0,227**	0,115**	-0,079	0,000	-0,098	-0,052	-0,039	-0,138**	0,021	0,021	1,000		
Unbilled revenue	0,049	0,108*	0,088	0,009	-0,031	-0,006	-0,020	-0,105	-0,038	-0,052	-0,006	0,063	0,031	0,017	1,000	
B/A	-0,089	0,000	0,221**	0,023	0,083	0,044	0,004	-0,231**	-0,150**	-0,068	-0,249**	0,104	0,046	0,133**	0,078	1,000

* and ** represent significance levels of 5 and 1 percent, respectively

ROA – Return on Assets

EBITDA – Earnings before Interest, Taxes, Depreciation and Amortization

ROE – Return on Equity

OoP – Outflow of Personnel

DSCR – Debt Service Coverage Ratio

B/A – Book value / acquisition value ratio

The first observation from this correlation matrix is on the financial measures. In order to run an unbiased regression, the chosen financial measures should not correlate strongly as to prevent multicollinearity. Return on Assets (ROA) and total margin show a very strong correlation of 0.914. Either uses revenues on one side of the equation, while the other sides are total assets and profit respectively. Clearly, in this sample these indicators move very strongly in the same direction. The lowest correlation among the first four (financial) indicators in the correlation is between ROA and EBITDA margin, with a correlation of 0.427.

The second observation that can be made is the correlation among the three quality indicators from ZorgRating; absenteeism, outflow of personnel and complaints. Absenteeism and complaints are negatively correlated, which is not in line as both would expectedly resemble high quality with a low value. It would be expected that these would move in the same direction, as for either measure a low score indicates higher quality. Among the rest no strong correlations exist. Thirdly, the correlation between the aforementioned financial measures and quality indicators are observed. It is found that absenteeism is negatively correlated to all financial measures, although the correlation is weak in most instances. Complaints is positively correlated to Total Margin and EBITDA margin, but also not very strongly.

Two correlation matrixes are presented for the 2014 sample. In Table 10, the 2014 quality indicators are correlated with the financial measures at hand. In Table 11 the new quality measures are correlated with the old quality measures, to give an indication to which extent the same quality aspects are measured.

Table 10: Correlation 2014 sample

	ROA	*Total Margin*	*EBITDA margin*	*ROE*	*Patient grade*	*Waiting time*	*Surgery experience*	*Infections*	*Pain*	*HSMR*	*Solvency*	*DSCR*	*Efficiency ratio*	*Current ratio*	*Debt/EBITDA*	*Growth*	*Competition*	*Unbilled revenue*	*B/A*
ROA	1,00																		
Total Margin	0,97**	1,00																	
EBITDA margin	0,55**	0,65**	1,00																
ROE	0,60**	0,67**	0,47**	1,00															
Patient grade	0,12	0,08	0,09	-0,15	1,00														
Waiting time	-0,13	-0,16	-0,24*	-0,15	-0,22*	1,00													
Surgery experience	0,09	0,11	0,01	0,00	0,06	0,19	1,00												
Infections	0,06	0,08	0,21*	0,06	0,11	-0,11	0,08	1,00											
Pain	0,04	0,05	0,07	-0,05	0,15	-0,10	0,03	0,04	1,00										
HSMR	-0,05	-0,05	-0,10	0,07	-0,36**	0,09	-0,09	-0,13	-0,03	1,00									
Solvency	0,60**	0,54**	0,15	0,36**	0,30**	-0,03	0,16	0,07	0,00	-0,09	1,00								
DSCR	0,68**	0,63**	0,12	0,40**	0,18	0,08	0,09	0,10	-0,06	-0,05	0,66**	1,00							
Efficiency ratio	-0,12	-0,13	-0,22*	0,02	-0,08	0,09	0,04	-0,03	0,25*	0,11	-0,13	-0,13	1,00						
Current ratio	0,49**	0,50**	0,13	0,41**	0,16	-0,13	0,02	0,02	0,05	0,04	0,52**	0,56**	-0,12	1,00					
Debt/EBITDA	0,12	0,11	0,15	-0,18	0,05	0,03	0,26*	0,02	-0,05	-0,07	0,16	0,06	-0,10	0,04	1,00				
Growth	0,34**	0,37**	0,34**	0,31**	0,11	0,09	-0,05	0,00	0,13	-0,10	0,27*	0,27*	-0,09	0,16	0,07	1,00			
Competition	-0,04	-0,07	-0,06	-0,35**	0,14	-0,01	0,08	0,00	0,22	-0,13	-0,27*	-0,06	0,10	-0,19	0,12	-0,11	1,00		
Unbilled revenue	-0,18	-0,18	-0,04	-0,25*	0,25*	-0,04	0,09	0,02	0,11	-0,07	0,03	-0,19	0,04	0,09	0,13	-0,09	0,00	1,00	
B/A	0,02	0,10	0,25*	0,06	-0,08	0,01	0,09	0,20*	-0,05	0,09	-0,13	-0,34**	0,14	-0,01	0,29	0,00	0,01	0,01	1,00

* and ** represent significance levels of 5 and 1 percent, respectively

ROA – Return on Assets

EBITDA – Earnings before Interest, Taxes, Depreciation and Amortization

ROE – Return on Equity

OoP – Outflow of Personnel

DSCR – Debt Service Coverage Ratio

B/A – Book value / acquisition value ratio

Similar to table 9, in table 10 the first four financial indicators are strongly correlated. ROA and total margin are again extremely strongly correlated and are therefore not usable in a multivariate regression simultaneously. No strong correlations are found between the 'new' quality measures and the financial indicators. Waiting time is consistently negatively correlated with all four financial measures. Unexpectedly, the percentage of infections increases when financial performance increases. Among the quality measures, only a mild correlation of -0.36 is found between HSMR and patient grade. The Quality Window quality indicators seems to capture all different areas of hospital quality.

Based on the correlation between ROA, Total Margin, EBITDA margin and ROE it was elected to use ROA and EBITDA margin as financial indicators in the regression.

Table 11: Correlation quality indicators 2014

	Absen-teeism	*OoP***	*Com-plaints*	*Patient grade*	*Waiting time*	*Surgery experience*	*Infections*	*Pain*	*HSMR*
Absenteeism	1,00								
OoP****	0,12	1,00							
Complaints	-0,10	-0,02	1,00						
Patient grade	-0,11	-0,14	-0,27*	1,00					
Waiting time	0,01	0,12	0,04	-0,22*	1,00				
Surgery experience	0,05	0,05	0,03	0,06	0,19	1,00			
Infections	-0,24*	-0,07	-0,14	0,11	-0,11	0,08	1,00		
Pain	0,06	0,05	-0,14	0,15	-0,10	0,03	0,04	1,00	
HSMR	-0,06	0,05	0,15	-0,36***	0,09	-0,09	-0,13	-0,03	1,00

*, **, and *** represent significance levels of 10 percent, 5 percent and 1 percent, respectively

**** Outflow of personnel

The correlation among the indicators from Quality Window were discussed in Table 10. Table 11 presents the correlations between the ZorgRating and Quality Window quality indicators. A negative correlation of -0.27 is found between complaints and patient grade. Although the correlation is not very strong, it is the strongest in this matrix. The negative relation between the percentage of complaints and patient grade also seems to be the most obvious at first sight. Patients who have no complaints will be less likely to give a lower grade. Other than that, absenteeism and infections are negatively correlated with -0.24 and waiting time and patient grade with -0.22. The quality indicators from ZorgRating are not strongly related to those from NWZ Quality Window.

The correlation between the quality indicators tells something about how strongly indirect quality indicators such as absenteeism, outflow of personnel and complaints can say something about quality in hospitals. Based on this correlation matrix, that would be little.

The correlation tells which variables should not be combined to prevent multicollinearity. Additionally, it gives an indication on the association between the two sets of quality indicators. The correlation suggests these are not strongly related.

4. Results

This section will show the results of this research. Firstly, in Table 12 the 2009-2013 sample in a multivariate linear regression (Model 1) using the quality variables from ZorgRating: absenteeism, outflow of personnel and complaints.

Table 12: Regression 2009-2013

	Absenteeism	Outflow of personnel	Complaints
ROA	-0.009	-0.064	-0.001
	(0.013)	(0.375)	(0.013)
EBITDA margin	-0.023	-0.215	0.023
	(0.007)***	(0.209)	(0.007)***
Solvency	0.009	0.118	-0.003
	(0.005)*	(0.146)	(0.005)
DSCR	-0.000	-0.000	-0.000
	(0.000)	(0.003)	(0.000)
Current Ratio	-0.002	-0.039	0.002
	(0.001)*	(0.027)	(0.001)*
Urban	-0.002	-0.010	-0.001
	(0.001)**	(0.027)	(0.001)
Academic	-0.004	-0.023	0.005
	(0.002)**	(0.052)	(0.002)***
Year	-0.001	-0.005	-0.001
	(0.000)***	(0.009)	(0.000)**
Medium	0.000	-0.012	-0.001
	(0.001)	(0.030)	(0.001)
Large	0.001	-0.024	-0.001
	(0.001)	(0.032)	(0.001)
_cons	2.202	9.830	1.355
	(0.622)***	(18.202)	(0.613)**
R^2	0.08	0.01	0.05
N	563	563	563

- *, **, and *** represent significance levels of 10 percent, 5 percent and 1 percent, respectively
- Variable "Year" is set up as follows: 2009 equals 1, 2010 equals 2, and so on

In Table 12 some evidence that good financial performance leads to better hospital quality is found. A significant effect of EBITDA margin on absenteeism is found as well as on complaints. It should be noted that EBITDA margin has a significant positive effect on complaints, insinuating that if EBITDA margin goes up, so does the percentage of complaints, which is reversed to the hypothesis. Additionally, ROA does not seem to be associated with hospital quality. Although ROA and EBITDA have the smallest correlation among financial variables, their correlation of 0,43 in this sample might still have affected the outcome. Therefore, in Tables 13, 14 and 15 this analysis was run again, but separately for these variables. The highest correlating control variables were also eliminated.

Table 13: Regression 2009-2013 absenteeism

	Absenteeism	Absenteeism
ROA	-0.026	-
	(0.011)**	
Current Ratio	-0.001	-
	(0.001)	
Urban	-0.002	-0.002
	(0.001)**	(0.001)**
Academic	-0.004	-0.005
	(0.002)**	(0.002)***
Year	-0.001	-0.001
	(0.000)***	(0.000)***
Medium	0.000	0.001
	(0.001)	(0.001)
Large	0.001	0.001
	(0.001)	(0.001)
EBITDA Margin	-	-0.026
		(0.007)***
Solvency Ratio	-	0.001
		(0.004)
_cons	1.972	2.412
	(0.625)***	(0.614)***
R^2	0.05	0.07
N	560	560

- *, **, and *** represent significance levels of 10 percent, 5 percent and 1 percent, respectively
- Variable "Year" is set up as follows: 2009 equals 1, 2010 equals 2, and so on

In Table 13 ROA was paired with Current Ratio as control variables and EBITDA margin was paired with solvency based on lowest correlation. The control variables Urban, Academic, Year and size were used for either. In Table 13 it is found that separately, ROA and EBITDA margin have a significant positive effect on absenteeism. The signs are negative, but in this case, low absenteeism indicates higher quality. In Table 14 the same regression, but with outflow of personnel as quality indicator is presented.

Table 14: Regression 2009-2013 outflow of personnel

	Outflow of personnel	Outflow of personnel
ROA	-0.167	-
	(0.318)	
Current Ratio	-0.024	-
	(0.021)	
Urban	-0.006	-0.007
	(0.027)	(0.027)
Academic	-0.014	-0.027
	(0.051)	(0.052)
Year	-0.003	-0.007
	(0.009)	(0.009)
Medium	-0.012	-0.007
	(0.030)	(0.030)
Large	-0.026	-0.018
	(0.032)	(0.032)
EBITDA Margin	-	-0.216
		(0.187)
Solvency Ratio	-	-0.017
		(0.112)
_cons	7.071	14.396
	(18.055)	(17.910)
R^2	0.01	0.01
N	554	554

- *, **, and *** represent significance levels of 10 percent, 5 percent and 1 percent, respectively
- Variable "Year" is set up as follows: 2009 equals 1, 2010 equals 2, and so on

Similar to the results in Table 12, financial variables have no significant effect on outflow of personnel. Table 15 presents the same regression, but with complaints as quality variable.

Table 15: Regression 2009-2013 complaints

	Complaints	Complaints
ROA	0.010	-
	(0.011)	
Current Ratio	0.001	-
	(0.001)	
Urban	-0.001	-0.001
	(0.001)	(0.001)
Academic	0.004	0.005
	(0.002)**	(0.002)***
Year	-0.001	-0.001
	(0.000)**	(0.000)*
Medium	-0.001	-0.001
	(0.001)	(0.001)
Large	-0.001	-0.001
	(0.001)	(0.001)
EBITDA Margin	-	0.021
		(0.006)***
Solvency Ratio	-	0.001
		(0.004)
_cons	1.527	1.169
	(0.614)**	(0.604)*
R^2	0.03	0.04
N	563	563

- *, **, and *** represent significance levels of 10 percent, 5 percent and 1 percent, respectively
- Variable "Year" is set up as follows: 2009 equals 1, 2010 equals 2, and so on

Unlike in Table 13 where ROA has a significant effect on absenteeism when it is split up in the regression with EBITDA margin, ROA does not show a significant effect on complaints.

In the Tables 16 and 17 the same regressions will be run as in Tables 12 through 15, but the outcomes per year will be combined in an average for each hospital. This will mitigate outliers, which could lead to significant results, despite the decreased number of observations. A disadvantage is a decrease of the number of observations.

Table 16: Regression 2009-2013 average

	Absenteeism	Outflow of personnel	Complaints
ROA	0.026	-0.791	0.009
	(0.032)	(0.812)	(0.020)
EBITDA Margin	-0.026	-0.347	0.035
	(0.015)*	(0.369)	(0.009)***
Solvency	0.024	0.436	-0.010
	(0.011)**	(0.273)	(0.007)
DSCR	-0.000	-0.004	-0.000
	(0.000)	(0.008)	(0.000)
Current Ratio	-0.003	-0.088	0.003
	(0.002)*	(0.048)*	(0.001)**
Urban	-0.002	-0.022	-0.001
	(0.002)	(0.043)	(0.001)
Academic	-0.005	-0.029	0.005
	(0.003)	(0.081)	(0.002)***
Medium	0.001	-0.042	-0.001
	(0.002)	(0.048)	(0.001)
Large	0.002	-0.044	-0.001
	(0.002)	(0.048)	(0.001)
_cons	0.046	0.255	-0.004
	(0.003)***	(0.074)***	(0.002)*
R^2	0.11	0.05	0.20
N	117	117	117

*, **, and *** represent significance levels of 10 percent, 5 percent and 1 percent, respectively

In this regression found in Table 16, no additional significant results are found when compared to the regular 2009-2013 regression. The adjusted R-squares are significantly higher, especially complaints, due to the fact that outliers were mitigated by taking the average of all years. In Table 17 the same regression as in Table 13 is performed, but with averages.

In Appendix B the tables for 'absenteeism' and 'outflow of personnel' can be found. These quality variables yielded no significant results. These regressions are identical to the regression in Table 17, except for the quality variable. For this those quality variables mitigating outliers does not increase the statistical significance of the results. In Table 17 the effect of ROA and EBITDA margin separately on complaints is presented. Like Table 16 the results over the years are taken as an average.

Table 17: Regression 2009-2013 average complaints

	Complaints	Complaints
ROA	0.025	-
	(0.018)	
Current Ratio	0.001	-
	(0.001)	
Urban	-0.001	-0.001
	(0.001)	(0.001)
Academic	0.004	0.005
	(0.002)*	(0.002)**
EBITDA Margin	-	0.030
		(0.008)***
Solvency Ratio	-	0.004
		(0.004)
_cons	0.000	-0.003
	(0.001)	(0.001)*
R^2	0.07	0.13
N	117	117

*, **, and *** represent significance levels of 10 percent, 5 percent and 1 percent, respectively

From these regressions, it can be concluded that financial performance has very little effect on quality. However, there are limitations to this analysis to consider. Firstly, the quality indicators are not directly relevant to quality in hospitals. Absenteeism, outflow of personnel and complaints are indirectly linked to hospital quality. These indicators are likely stronger indicators of organisational quality, which, hypothetically, could influence hospital quality.

Lastly, Table 18 presents the regression with the quality variables from the Quality Window that is recently introduced.

Table 18: Regression 2014 sample

	Patient grade	Waiting time	Surgery experience	Infections	Pain	HSMR
ROA	-1.383	-0.254	-0.071	-0.023	0.326	2.501
	(1.309)	(7.130)	(1.027)	(0.043)	(0.675)	(85.087)
EBITDA Margin	0.900	-7.998	-0.073	0.058	-0.235	-44.030
	(0.934)	(5.086)	(0.733)	(0.031)*	(0.481)	(60.695)
Solvency	1.032	0.063	0.420	0.013	0.039	-20.663
	(0.413)**	(2.247)	(0.324)	(0.014)	(0.213)	(26.817)
Current Ratio	0.047	-0.804	-0.040	-0.001	0.004	4.040
	(0.081)	(0.443)*	(0.064)	(0.003)	(0.042)	(5.281)
Urban	-0.050	0.771	0.003	-0.001	-0.053	0.491
	(0.061)	(0.335)**	(0.048)	(0.002)	(0.032)*	(3.995)
Academic	-0.097	1.381	0.005	0.006	-0.007	4.149
	(0.097)	(0.528)**	(0.076)	(0.003)*	(0.050)	(6.296)
Medium	-0.000	0.725	-0.028	0.001	-0.022	-8.125
	(0.084)	(0.455)	(0.066)	(0.003)	(0.043)	(5.434)
Large	-0.047	0.919	0.028	-0.002	-0.037	-3.276
	(0.081)	(0.439)**	(0.063)	(0.003)	(0.042)	(5.237)
_cons	7.920	6.813	0.896	-0.001	0.972	104.440
	(0.162)***	(0.883)***	(0.127)***	(0.005)	(0.084)***	(10.542)***
R^2	0.18	0.34	0.05	0.11	0.08	0.09
N	72	72	72	72	72	72

*, **, and *** represent significance levels of 10 percent, 5 percent and 1 percent, respectively

The results of this regression are separated per quality variable. Afterwards, limitations and conclusions will be discussed.

Patient grade

Regarding patient grade, no significant effects are found for the financial variables. Only solvency has a significant effect, at 90% confidence, on the patient grade. Other than that, urban, academic and large hospitals have poorer patient grades, albeit insignificant.

Waiting time

Return on assets and EBITDA margin have a negative effect on waiting times, which in essence would indicate a positive effect of financial performance on quality. However, these effects are not significant. If a hospital is situated in an urban area, academic or large waiting times are also higher. Obviously, there is a lot of overlap here as all academic hospitals are considered large and in urban areas in this sample. These control variables do move in the expected direction.

Surgery experience

Also for surgery experience no significant effects are found between the financial variables. At 90% confidence, only the debt/EBITDA has a significant effect on surgery experience. Large

and urban hospitals have more surgery experience, despite the effect that academic has less. These results are insignificant, but could perhaps be explained by the fact that academic hospitals usually perform more complex surgeries, whereas more routine surgeries are measured.

Infections

EBITDA margin has a significant positive effect on the infections quality variable. However, it is a positive regression, which would indicate a negative effect of financial performance on quality. ROA does move in the expected direction, but this effect is insignificant. Academic has a significant effect on infections as control variable, indicating infections happen more often in academic hospitals.

Pain

Between ROA and EBITDA margin no significant effects on quality variable pain are found. Either for efficiency ratio as well as for the dummy 'academic' significant results are found. Perhaps conclusions could be drawn on pain medicine used in academic hospital opposed to non-academic, but this is not the scope of this thesis.

HSMR

Finally, for HSMR no significant effects are found between the financial variables. Also for other variables no significant effects are observed. The HSMR is already corrected for variables such as size, type of hospital (academic or non-academic) and other factors which could influence the expected number of deaths. The control variables, urban, academic and size all move in the same direction for this variable, as these kinds of hospital have higher HSMR's. However, these effects are insignificant.

If ROA and EBITDA margin are separated no significant results are yielded. These analyses can be found in Appendix C.

These results do not suggest a positive effect from financial performance on quality in Dutch hospitals. There are some signs to such an effect, but these effects are insignificant. In fact, the only significant effect of financial performance on quality is in the opposite direction. This sample is limited to only one year and does not include all Dutch hospitals in 2014. Also, the reporting system of these quality variables is still in development. In future years, more hospitals will be included as well as the reporting system and the quality variables have further developed. Also, the ongoing changes in the Dutch healthcare system might not be visible in the results yet. The changes were announced by the government in 2012. A large part of the sample contains data before that date. Hospitals are still adjusting to the changed which could explain why no effect from financial performance on quality is yet observed. Additionally, operating margin which is often used in literature on American hospitals to measure financial performance was not available for this sample. Operating margin is a more direct indication of how well a hospital performs their primary activity. Total margin includes secondary activities too. EBITDA margin excludes interest, taxes, depreciation and amortisation and is

therefore more usable than Total Margin, but still includes some secondary activities. Examples are parking, restaurant and gift shop profits.

5. Discussion and limitations

The Dutch healthcare sector finds itself in a transition. From this given, as well as from literature on financial performance and hospital quality for American hospitals this thesis hypothesised that financial performance has a positive effect on quality in Dutch hospitals. The hypothesis was not confirmed by the data. Financial performance showed no consistent, significant effect on quality. This is inconsistent to some papers on U.S. hospitals (Bazzoli et al., 2008; Encinosa & Bernard, 2005; Ly, Jha & Epstein, 2011) but consistent with another (Nguyen, Halm & Makam, 2016). Some of the other papers that were discussed did not directly research the relationship between quality and financial performance and cannot be compared as such. Consistent with nearly all papers which found a relationship, financial performance is not associated with (adjusted) mortality rates (Bazzoli et al., 2008; Encinosa & Bernard, 2005; Ly, Jha & Epstein, 2011; Nguyen, Halm & Makam, 2016). Adjusted mortality rates are a commonly used, convenient method of measuring quality in hospitals. In practice, it is often not strongly related to quality. The lack of a significant relationship between the financial and quality indicators could have arisen, because of certain limitations.

The quality indicators from both sample each have their limitations. Firstly, the quality indicators for the 2009-2013 sample can be strong indicators of how well an organisation is run, but are less relevant regarding patient care. The 2014 sample has some strong indicators of patient care quality, however are still in development and not publicly reported by all Dutch hospitals yet. Also, reporting systems from hospitals that do report are still in development. Another limitation is the fact that one of the most commonly used financial measures for American hospitals, operating margin, was not available for Dutch hospitals. Additionally, the Dutch healthcare system finds itself in a transit to a more competitive and pay-for-performance system. These circumstances would, from a theoretic standpoint, feed a relationship between financial performance and quality. However, this transit only started in 2012, while a large part of the data comes before 2012.

Another limitation could be that the used models were incorrect. Other regressions models, not used variables or control variables that were not used could play a large role. Multicollinearity and other biases could have affected the results.

For future research, it might also be useful to document the differences between academic and non-academic hospitals in the Netherlands. Considering the large differences, it should be reconsidered if academic hospitals should be accounted for analyses regarding financial performance and quality. Due to several factors, academic hospitals show poorer quality than non-academic hospitals.

To the author's knowledge, this paper is a first attempt at researching the relationship between financial performance and quality for Dutch hospitals. In consideration that several limitations are evident, no relationship between financial performance and hospital quality in the Netherlands was found. However, some papers found such relationship for U.S. hospitals which have better quality data available. In the Netherlands, data similar to the data for U.S.

hospitals will becoming increasingly available in the coming years. It will be important to analyse how these changes regarding quality, as well as ongoing financial changes will influence Dutch hospitals and what the implications are for patients and insurers. Dutch hospitals will have to deal with an increased amount of financial pressure, as well as a changing system which might gradually change to a pay-for-performance system.

In conclusion, no relationship between financial performance and quality for Dutch hospitals is found yet. However, due to limitations that exist for this thesis and due to the fact that the Dutch hospital system is transitioning to a system that is more similar to the American system, where such results are found, it is not unlikely such a relationship can be found in the future. There are also certain factors which are still very different to the American system, which might mitigate such relationships. Also, researchers are still not certain on the relationship between quality and financial performance. However, it will be interesting for future research to research the consequences of the ongoing changes in the Dutch healthcare sector.

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7. Appendices

Appendix A

Dutch healthcare institutions only have access to public funding if they are non-profit (Raad voor de Volksgezondheid en Zorg, 2002). The healthcare sector is basically divided into five categories in the Netherlands, which are generally used when referring to healthcare in the Netherlands. They are described shortly below.

1. Hospital care (Ziekenhuis [ZKH] in Dutch)

The largest part of the healthcare budget is spent in hospitals. It is mostly financed through the Care Insurance Act (ZVW in Dutch) which obliges Dutch citizens to have at least basic care insurance and also obliges insurers to accept anyone applying for insurance in the Netherlands. The other main funding source is the Long-Term Care Act (WLZ in Dutch), which is funded through taxes.

2. Primary or first line healthcare

Primary healthcare is accessible for anyone in the country. It is mostly financed through the Care Insurance Act. Examples of first line care are the general practitioner, dentist and physiotherapist. First line healthcare in the Netherlands receives only 4% of the total budget, but handles 90% of all care in the Netherlands (Wiegers, Hopman, Kringos & de Bakker, 2011). These organisations do not have to publish their financial reports as other healthcare organisations in this overview do and are therefore excluded from the rest of this thesis.

3. Care for mentally ill (Geestelijke gezondheidszorg [GGZ])

Care for mentally ill (or mental healthcare) includes intramural as well as extramural care. It involves either 24/7 care and supervision or weekly appointments with patients. It is mostly financed through the ZVW or WLZ.

4. Care for disabled (Gehandicaptenzorg [GHZ])

Care for disabled can also be either intramural or extramural. Includes anything from guidance of parents to admittance in a nursing home.

5. Nursing and homecare (Verpleging, verzorging, thuiszorg [VVT])

This includes care for mostly elderly, and others that require nursing or homecare, but are not mentally ill or disabled.

Nursing and homecare, care for disabled and care for the mentally ill can be categorized as long-term healthcare. This type of care is primarily financed through the Long-Term Care Act (WLZ in Dutch).

The subsectors described in this paragraph have remained, but the sector as a whole faces a long transition. Financial pressure is increasing and transparency has become increasingly important to patients and insurers. It is clear changes are required, but it remains unclear what implications it will have.

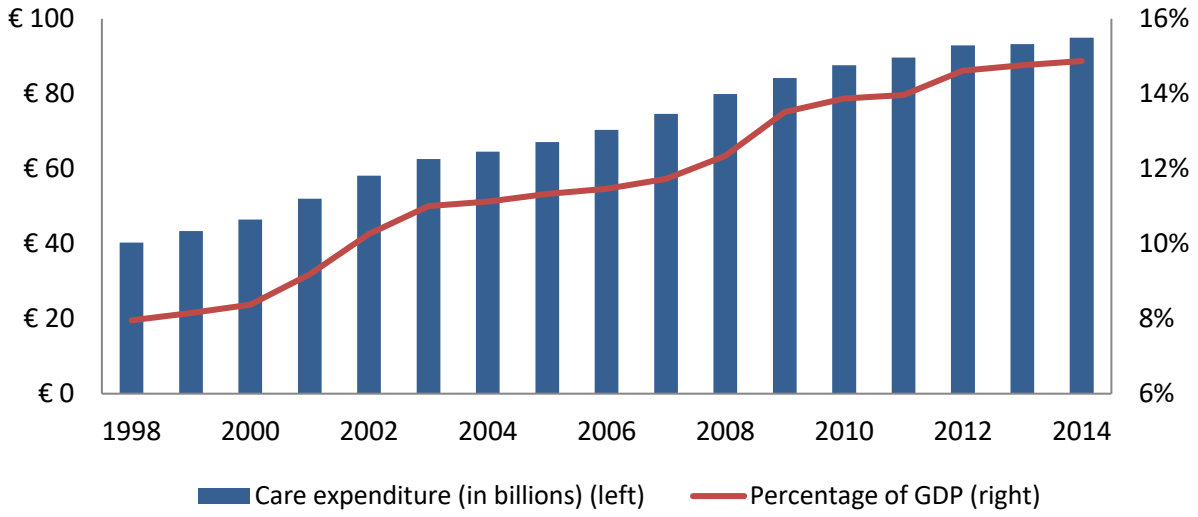
Developments Dutch healthcare

The Dutch healthcare system is regarded as one of the best in Europe. The Netherlands ranked first in the Euro Health Consumer Index (EHCI) in 2014. Since the EHCI was published for the first time in 2005 the Netherlands has reached the top 3 in each ranking as the only country to do so (Roberts, 2015). According to the EHCI report in 2015, the Dutch "*are characterized by a multitude of health insurance providers acting in competition, and being separate from caregivers/hospitals*" (Björnberg, 2016, p. 7). The report also credits the Dutch for having *"probably the best and most structured arrangement for patient organisation participation in healthcare decision and policymaking in Europe"* (Björnberg, 2016, p. 7). In 2006, the Dutch government chose for a unique healthcare system by implementing the Health Insurance Act (van de Ven & Schut, 2009). The Health Insurance Act is a mandate for everyone to buy basic private health insurance. The Health Insurance Act allowed for competition between healthcare insurers and has been praised ever since. However, there are challenges ahead.

The exceptional performance of the Dutch healthcare system comes at a cost. Rising health care expenditure is a worldwide trend. Dutch expenditure has increased by 4,5% per year on average since 2000, which is three times the growth of the Dutch economy (van Rooijen, 2013). According to CPB (the Dutch bureau for economic policy analysis), total spending in the healthcare sector is already 13,2% of national GDP, up from 8% in 1972, and estimated to grow to 19-31% of GDP in 2040 (CPB, 2011). McKinsey estimated Organisation for Economic Co-operation and Development (OECD, includes countries such as the Netherlands, other Western European countries, United States, Australia, Canada, Israel) countries will spend 20% of GDP on health care on average if the current growth rates for demand for healthcare do not change (Dixon-Fyle & Kowallik, 2010). Currently, Dutch expenditure is at the second highest percentage of GDP of countries in Europe, although the percentage of elderly among the population in the Netherlands is still relatively low (Björnberg, 2013; Verbeek-Oudijk et al., 2014). Björnberg (2013) found a relationship between percentage of long-term care and percentage of 75+ year olds among the population. The Netherlands scored the highest ratio of long-term care opposed to elderly, one of the largest reasons it spends a large percentage of the GDP on care. This is illustrated in Graph 1. The trend is upwards and it is rising faster than in many other countries in Europe. Taxpayers are carrying the load since most of it is funded through taxes. Among other reasons, the high tax rates are caused by the culture regarding elderly care. Between the government and family of elderly who need (permanent) care, the government has been mainly responsible. Unlike in many other European countries, where it is a shared responsibility between the government and family (Verbeek-Oudijk et al., 2014). An ageing population is a reason for increasing expenditure on healthcare. Currently,

every four people working provide for one person aged at least 65 through taxes. By 2040, this will be only two persons (van Rooijen, 2013). Other causes of an increasing demand for health care are more chronic diseases as a result of Western lifestyle (Dixon-Fyle & Kowallik, 2010; van Rooijen, 2009), the introduction of individual budgets (PGBs in Dutch) which allowed chronically ill or handicapped patients to afford more formal healthcare which was usually provided for free by the social network (van Rooijen, 2009). Additionally, the Dutch, and mainly well-educated persons, see healthcare as a right as they pay their monthly premium. They are thus not afraid to demand value for their money (van Rooijen, 2009). Mieke Aarts, epidemiologist, concluded that cancer patients with good education and above-average income receive more intensive care and live longer (Voormolen, 2012). Shortly, increasing expectations from patients increases demand (Philips, 2002) and this is likely to continue.

Graph 1: Care expenditures as a percentage of GDP (in € mln). Source: CBS



Schut & van de Ven (2005) argue that healthcare reform is similar in many countries and can be divided into roughly three consecutive phases. The first wave is usually ensuring access for the entire population. Dutch health policy has been focused on that for decades (van den Berg et al., 2010; Schut & van de Ven, 2005). The second wave consists of a number of controls in an attempt to contain growing care expenditures. The third wave entails reinforcing incentives and increasing competition. According to the authors, these waves overlapped in the Dutch healthcare system. However, they argue such a system requires a large role of the market and in 2005 they concluded that role was still limited in the Dutch healthcare landscape.

The Dutch government recognized this several years later and as a result, 2015 was a year of many changes for Dutch healthcare. With the coming adjustments the government is allowing the market to have a larger role. The government hopes that expenditures will be reduced through market mechanisms, or at least its growth will be slowed down, and on the other hand quality of healthcare is sustained. The government expressed it will not save healthcare organisations in financial distress anymore, something it used to do in the past. Via this way,

the government hopes that poorly performing healthcare organisations will either improve financially, or go bankrupt and be replaced by parties that perform better and more efficient (Nederlandse Zorgautoriteit [NZa], 2014).

In summary, the government is taking its hands off the healthcare sector and is allowing market mechanisms to have an impact and competition to be more of a factor. These changes come hand in hand with budget cuts throughout the sector. The process also includes an attempt to improve healthcare in the Netherlands. Healthcare providers that perform well will be able to offer more and better healthcare, the ones that do not will have to merge or might go into bankruptcy. In the past, healthcare would be able to rely on the government when experiencing financial distress. However, the recent changes cause more financial distress for many in the sector and additionally the government has clearly stated she will no longer offer financial support for these healthcare institutions. Consequently, the sector has to manage on their own financially, which has resulted in significant budget cuts throughout. Healthcare is now required to focus on their financial performance more than they were before. Increased financial pressure and more transparency regarding quality will have a significant influence on all its stakeholders financially as well as for the quality of healthcare.

Financing

Recently, the financing structure of healthcare in the Netherlands has changed. The Exceptional Medical Expenses Act (AWBZ in Dutch) has been replaced by the Long-term Care Act (WLZ in Dutch) and has come into force January 1st, 2015. The AWBZ has been the central funding act for a large part of long-term care provided in the Netherlands. The WLZ will mostly be limited to patients, who require permanent care and supervision, either at home or at healthcare facilities. Other long-term care is now the responsibility of local authorities. This new act, the Social Support Act (Wmo in Dutch), which gives local authorities more responsibilities has also come into force in 2015. Other care is funded through care insurers or paid by patients through the Care Insurance Act (ZVW) in Dutch, which can also be found in Table 1.

Table 1: Financing per funding source (in € mln). Source: *CBS*

Year	2014	2013	2012	2011	2010
Government	12.455	11.908	13.138	13.160	13.384
ZVW	40.920	39.990	37.207	36.698	36.090
AWBZ	27.758	27.398	27.851	25.250	24.321
Healthcare insurance	4.123	4.251	4.452	4.337	3.986
Personal contribution	8.217	8.269	8.671	8.588	8.136
Other financing sources	1.485	1.465	1.548	1.645	1.715
Total cost	**94.958**	**93.280**	**92.867**	**89.676**	**87.632**

As mentioned before the financing structure will be quite different in 2015. There are no actual numbers of 2015 yet, but there has been a budget prepared by the government. It is also interesting to see what the money is used for. Expenditures are still expected to grow in

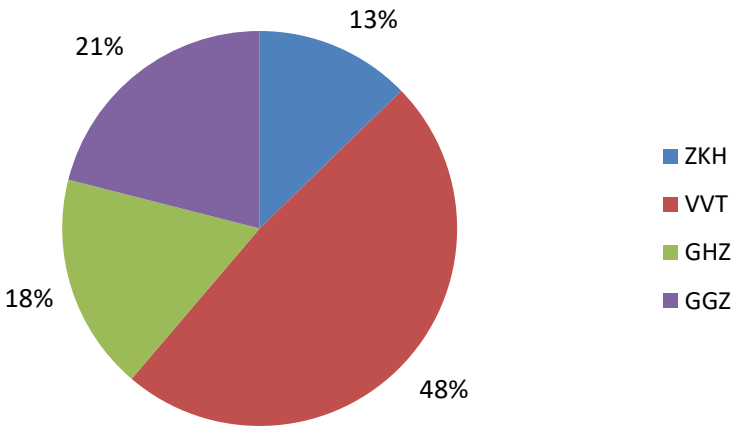
2015, by approximately 2,1% compared to 1,7% in 2014. Table 2 shows where healthcare capital is spent.

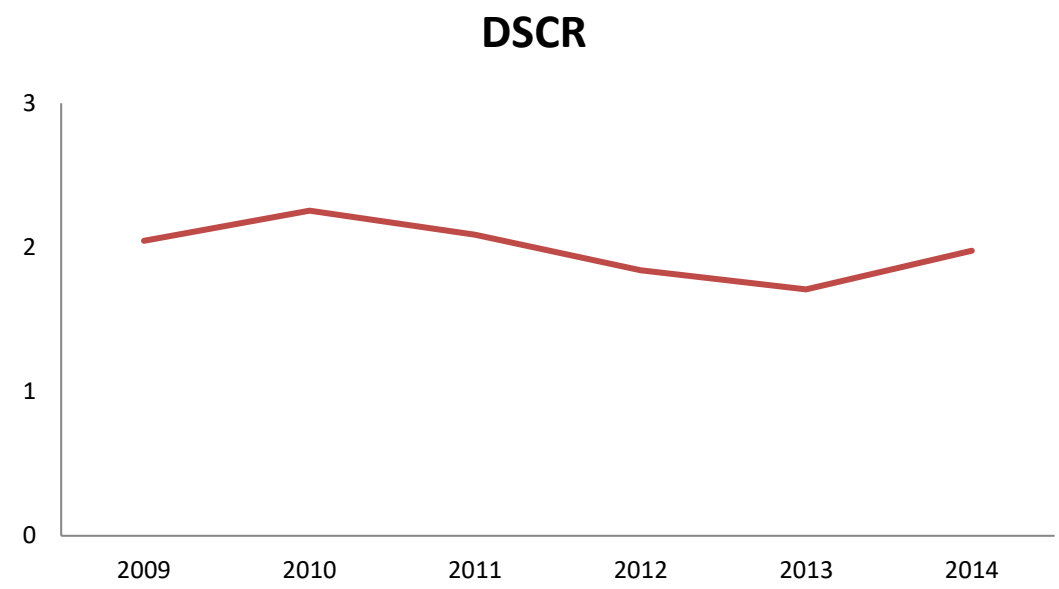
Table 2: Care expenditure budget for 2015 (in € mln). Source: *CBS*

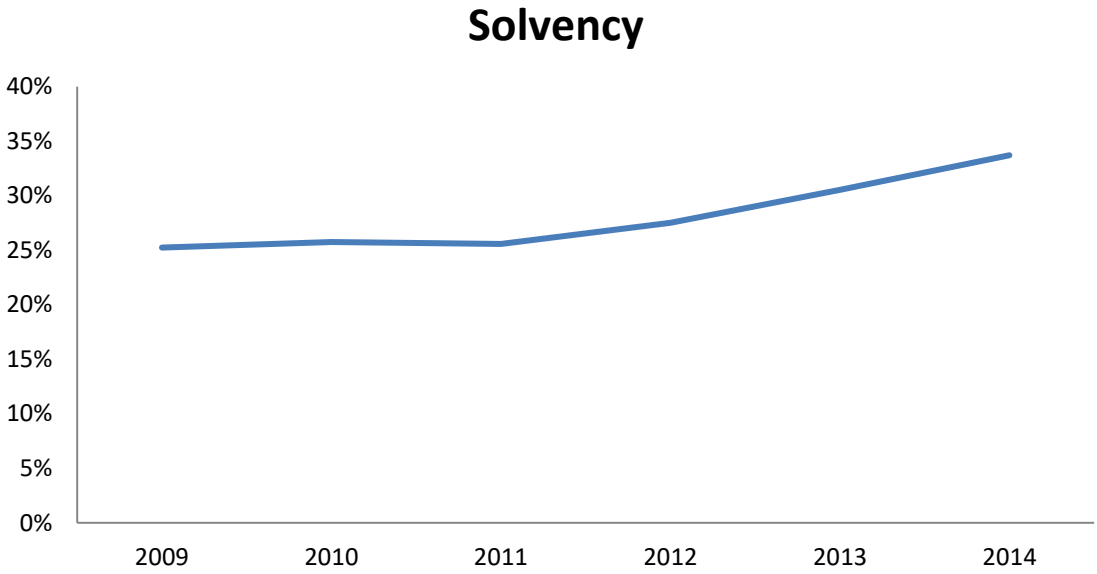
Year	Hospitals	Primary care	Long-term care	Policy- and management	Other care	Total
2015	24.500	18.500	26.300	3.400	24.300	**97.000**

Quality of healthcare

The quality of Dutch healthcare is globally praised and perceived as very good. However, there is little known about quality within the healthcare industry in the Netherlands. Usually, patients go to the closest doctor, hospital or nursing home. Until recently, there was little transparency on the quality delivered by Dutch healthcare organisations. Currently, patients and insurers are looking for more transparency. In fact, an insurer in the Netherlands recently closed a deal in which it pays a hospital for its performance (Reijn, 2015) and not solely on quantity, being the first deal of its kind in the Netherlands. The hospital receives more money when it performs well. Nowadays, patients value quality more and are sometimes even willing to travel longer distances. However, health care in the Netherlands is never more than a car drive away due to the intensity in which health care organisations are located (van den Berg, 2010). Due to the density of healthcare organisations and increasing transparency, the performance of poorly performing healthcare organisations could be accelerated downwards. If quality is poor, patients will stay away and healthcare organisations could go bankrupt, since they will receive less money. It suggests a relationship between financial performance and quality might arise, if there is not one already, but also emphasizes the importance of understanding the implications of the ongoing changes. In this case, the developed relationship would be poor quality leading to declining financial performance due to a loss of clients.

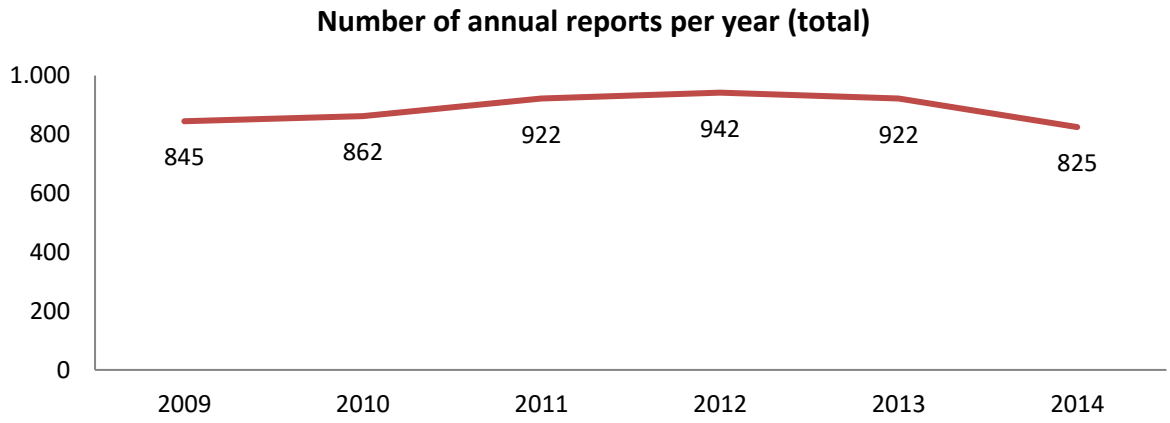


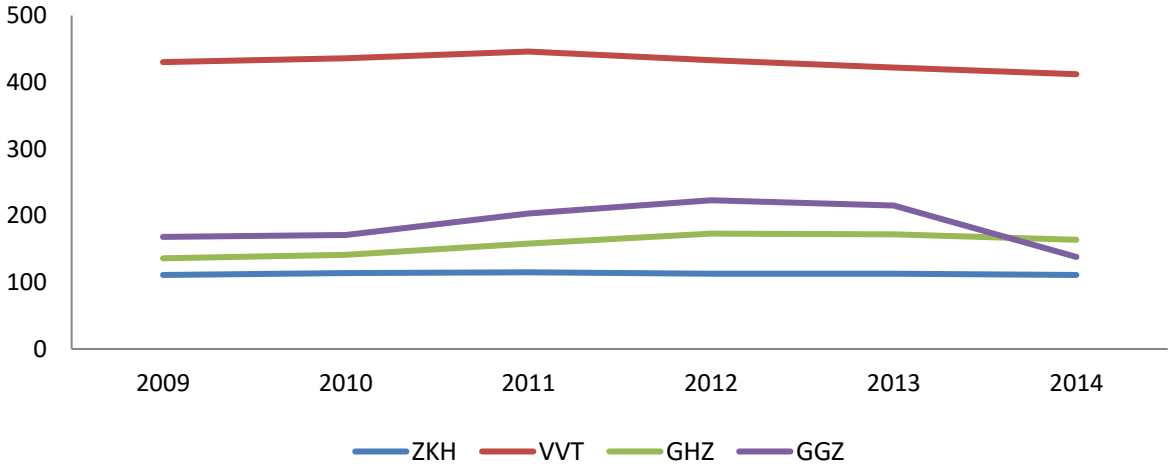




Care expenditures 2014-2010 (in € mln). Source: *CBS*					
Year	**2014**	**2013**	**2012**	**2011**	**2010**
Hospitals	25.967	25.421	24.344	23.018	23.040
Mental healthcare	6.552	6.604	6.551	6.330	6.063
First line healthcare	7.366	7.334	7.532	7.395	7.061
Nursing and elderly care	17.751	17.354	17.163	15.854	15.246
Care for disabled	9.636	9.525	9.532	8.624	8.398
Youth and child care	9.849	9.489	9.842	9.901	9.812
Policy- and management costs	3.344	3.290	3.226	3.286	3.129
Other[1]	14.164	14.063	14.490	14.992	14.666
Total cost	**94.958**	**93.280**	**92.867**	**89.676**	**87.632**

[1] Remaining providers of health and long-term care





Appendix B

	Absenteeism	Absenteeism
ROA	0.030	
	(0.028)	
Current Ratio	-0.000	
	(0.001)	
Urban	-0.002	-0.002
	(0.002)	(0.002)
Academic	-0.003	-0.003
	(0.003)	(0.003)
EBITDA Margin		-0.013
		(0.013)
Solvency Ratio		0.009
		(0.007)
_cons	0.044	0.044
	(0.002)***	(0.002)***
R^2	0.03	0.04
N	117	117

Appendix C

	Patient grade	Waiting time	Surgery experience	Infections	Pain	HSMR
ROA	0.532	-6.102	0.482	0.028	0.266	-39.774
	(0.952)	(5.119)	(0.722)	(0.031)	(0.469)	(60.629)
CurrentRatio	0.099	-0.577	-0.017	-0.001	0.006	2.066
	(0.078)	(0.422)	(0.060)	(0.003)	(0.039)	(5.000)
Urban	-0.039	0.694	0.010	-0.001	-0.051	0.975
	(0.062)	(0.335)**	(0.047)	(0.002)	(0.031)	(3.969)
Academic	-0.109	1.599	0.013	0.004	-0.000	5.171
	(0.096)	(0.517)***	(0.073)	(0.003)	(0.047)	(6.121)
Large	-0.063	0.377	0.036	-0.002	-0.026	2.070
	(0.061)	(0.326)	(0.046)	(0.002)	(0.030)	(3.865)
_cons	8.162	6.272	0.928	0.008	0.937	92.192
	(0.093)***	(0.501)***	(0.071)***	(0.003)***	(0.046)***	(5.932)***
R^2	0.10	0.29	0.03	0.05	0.07	0.03
N	72	72	72	72	72	72

	Patient grade	Waiting time	Surgery experience	Infections	Pain	HSMR
EBITDA Margin	0.361	-8.751	-0.135	0.048	-0.097	-39.734
	(0.763)	(4.233)**	(0.595)	(0.025)*	(0.391)	(49.381)
Solvency	0.841	-1.758	0.316	0.006	0.116	-11.249
	(0.295)***	(1.638)	(0.230)	(0.010)	(0.151)	(19.109)
Urban	-0.051	0.743	0.002	-0.001	-0.052	0.632
	(0.061)	(0.338)**	(0.048)	(0.002)	(0.031)*	(3.948)
Academic	-0.100	1.267	-0.001	0.006	-0.005	4.731
	(0.095)	(0.530)**	(0.074)	(0.003)*	(0.049)	(6.179)
Medium	0.022	0.667	-0.031	0.002	-0.026	-7.852
	(0.081)	(0.448)	(0.063)	(0.003)	(0.041)	(5.222)
Large	-0.038	0.867	0.025	-0.001	-0.038	-3.022
	(0.080)	(0.441)*	(0.062)	(0.003)	(0.041)	(5.149)
_cons	8.043	6.423	0.881	0.000	0.950	106.313
	(0.117)***	(0.647)***	(0.091)***	(0.004)	(0.060)***	(7.551)***
R^2	0.17	0.31	0.05	0.10	0.07	0.08
N	72	72	72	72	72	72

Appendix D

Nursing homes have shown some evidence that high quality of care can lead to increased financial performance. The literature on quality and financial performance of nursing homes is far less extensive than for hospitals. However, there has been some research on the

relationship between profit and quality at nursing homes in the United States. O'Neill, Harrington, Kitchener and Saliba (2003) found a negative relation between profit and quality in privately owned nursing homes in the U.S. They were not able to find that relationship for public nursing homes. On the other hand, Weech-Maldonado, Neff & Mor (2003) found that nursing homes that provide better care were able to achieve lower costs and better financial performance. Nursing homes have been looking to improve their financial performance by improving quality. Weech-Maldonado, Neff & Mor (2003) found that improved quality can attract more privately paying patients which is more lucrative. The authors acknowledge that high-quality care might result in higher costs, but it is not surprising they come to a different conclusion. According to Park & Werner (2011), the literature on the financial performance-quality relationship in nursing homes has been debated for a while and results have been mixed. Certain studies find high profit is associated with quality problems (see O'Neill, Harrington, Kitchener and Saliba, 2003), other studies find strong financial performance is associated with high quality (Weech-Maldonado, Neff & Mor, 2003; Blank & Eggink, 2001). Blank & Eggink (2001) found it for Dutch nursing homes. Anyhow, due to a different characteristic between nursing homes and hospitals empirical results are likely not applicable to hospitals.