



The extent to which hospital turnover limits affect healthcare production of hospitals in The Netherlands

“An exploratory sequential mixed-method study, consisting of a
grey literature review, interviews, and a systematic literature
review”

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Preface

This thesis is written in completion of the master Health Sciences, with a specialisation in 'Innovation in public health' at the University of Twente and is written on the topic of turnover limits within the Dutch healthcare funding system.

First, I would like to thank my supervisors Naomi van der Linden and Erwin Hans for the interesting topic, the educational discussions, and the overall support during this process.

Second, I would like to thank all the professionals I was able to speak to for the development of this research, and the professionals involved in the interviews. For anonymity reasons the names of the interviewees will remain unknown. Nonetheless, immense thank you to everyone involved.

I hope this research can provide a proper foundation for further research on the effects of turnover limits, and potentially provoke and contribute to a societal discussion on the effectiveness and ethics of turnover limits within the Dutch healthcare funding system.

Merel Bertens,
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Abstract

Background & Objective

In 2012, turnover limits were introduced in The Netherlands to limit national healthcare expenditures and to decrease the production incentives created by the introduction of the DBC-system in 2005. When a turnover limit is included in a contract between a health insurance company and a hospital, the health insurance company will reimburse every invoiced DBC-product, until a maximum amount for that year, the turnover limit, has been reached. Whilst turnover limits could act as an incentive to reduce care provision when a hospital is approaching the limit, it also acts as a financial stimulus to provide healthcare up to the limit, which does not necessarily equal the best suitable healthcare for patients. In addition, healthcare costs, waitlists, and admission stops are still rising. However, the extent to which turnover limits contribute to these developments, and thus affect patients, remains unknown. Therefore, the following research question will be answered: “How do turnover limits affect healthcare production of hospitals, and therefore patients, in The Netherlands?”.

Method(s)

This study is an exploratory sequential mixed-method study, consisting of a grey literature review, interviews, and a systematic literature review. Initially a quantitative analysis would be performed as well. However, when assessing data availability, it became known that information on the height of turnover limits for each hospital had not been recorded consistently and gathering this data would require an extensive contract analysis for each hospital. Instead, recommendations for a quantitative analysis were reported. Focussed interviews were held with several organisations through convenience sampling. For the systematic literature review, a search strategy was developed for the databases PubMed and ScienceDirect, after which relevant studies concerning medical specialist care, and the introduction of the DRG-system, prospective payment system or a capitation fee were included in the analysis. The results from the systematic literature review were used to inform the recommendations for the quantitative analysis.

Results

The grey literature review, systematic literature review, and interviews all showed that little is known about the effects of turnover limits in both literature and practice. From the eight main conclusions drawn from the interviews, the following three are the most significant. First, hospitals and health insurance companies have opposite opinions on the ethics and effectiveness of the application of turnover limits. Second, healthcare providers adjust healthcare production to avoid reaching a turnover limit and having to bear the financial risk. However, this could ultimately result in the manifestation of negative effects for patients, such as longer waitlists, deferred treatments, or referrals to other hospitals. Third, healthcare providers currently are not transparent about adjusting healthcare production to avoid reaching a turnover limit and having to bear the financial risk. The systematic literature review showed that towards the end of the year, turnover limits can lead to a shift in the distribution

of provided DBCs, decrease admission rates, and in return, increase deferrals, waitlists, and the number of referrals to other hospitals.

Recommendations

If a quantitative analysis were to be performed in future research, the Difference-in-Differences approach, or a multiple linear regression analysis would be most suitable. In addition, it is recommended that a societal discussion be held on the ethical boundaries of adjusting healthcare production to limit national health care expenditures.

Conclusion

There currently is a lack of information on turnover limits and its effects. Further, healthcare providers adjust healthcare production to avoid reaching a turnover limit, from which five potential effects can emerge: a shift in the distribution of provided DBCs, a decrease in admission rates, and in return, an increase in deferrals, waitlists, and in the number of referrals to other hospitals.

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1. Research design

1.1 Cause/Motivation

In 2019 a news source reported that the Ikazia hospital in Rotterdam enforced an admission stop for all patients insured at VGZ. In a statement the hospitals' director stated that the hospital is expanding and has become responsible for a larger patient group, yet VGZ will not increase the turnover limit. Ultimately, an expected 4.000.000-euro reimbursement shortage in 2019 led the hospital to enforcing an admission stop. Following the enforcement of the admission stop, the director stated: "One group is affected most by this conflict, and that is the patient." (1) In response to this news article, another article expressed concerns on how an admission stop could affect waitlists and the distance patients must travel to a healthcare provider. (2) Earlier in 2018 members of congress already acknowledged negative effects, such as admission stops, turnover limits could lead to. (3) Yet, a year later the Ikazia hospital still felt the necessity to avert to an admission stop. (1) Even so, as of September first, 2022, Orthoparc, a clinic associated with the Jeroen Bosch hospital, had to enforce an admission stop for patients insured at VGZ due to the turnover limit being reached. (4) Additionally, earlier that year on July 10th, sleepclinic Ruysdael announced an admission stop for patients insured at the Achmea concern as well. (5) To fully understand the issue and topic at hand, background information on the utilization of turnover limits and its possible consequences will be provided first.

As the aging population and the prevalence of chronic diseases increases, the demand for healthcare and the complexity of care rises as well. (6–8) On top of that, the advancements in healthcare increase the demand even further. (6) As a result, healthcare costs are rising. In 2021, costs for specialist medical care (SMC) amounted to a total of 25.5 billion euros, whereas in 2017, this total was still 22.3 billion euros. (9) According to the National Institute for Public Health and the Environment (RIVM), until 2060, healthcare expenditures are expected to increase by 2.8 percent annually. (10) To limit this increase in healthcare costs a shift is being made from volume-based to value-based healthcare. (8,11) An example of this shift is the initiative: 'Juiste Zorg Op de Juiste Plek' (JZOJP). (12) JZOJP is an initiative from the Dutch funding organisation ZonMW, which aims to create a more patient centred healthcare system that delivers care in a patients' close environment, contributing to a more value-based healthcare system. (13)

Several steps were taken to reduce healthcare costs and create a more value-based system. First, the 'diagnosis treatment combination' (DBC) system was developed. Through the DBC-system a price is predetermined for all healthcare services, also known as a DBC-product, concerning secondary care. By means of the DBC-system all healthcare services provided to a patient during a certain period will be combined into one DBC. This allows for one total payment rate to be invoiced to a health insurance company. Whilst the DBC-system was intended to improve efficiency, it provides an incentive to deliver excessive care as well. Because the total payment rate of a DBC is dependent on which activities are performed, this could be a stimulus to perform activities that lead to a larger DBC and thus a higher payment rate. In addition, the DBC-system mainly rewards the provision of care, which does not necessarily equal value for patients. (14) Second, considering the increasing healthcare costs,

several parties, such as ‘Zorgverzekeraars Nederland’ (ZN) and the Ministry of Health, Welfare and Sport (VWS) came to an agreement to limit this growth. (15) This administrative outline agreement includes both substantive and financial conditions. To limit costs and volume growth of medical specialist care, maximum volume growth percentages for the years 2019 to 2022 were included in the agreement. This percentage decreases over 4 years from 0,8 percentage in 2019 to a 0.0-percentage volume growth in 2022. It is up to health insurance companies to assure this decrease in volume growth, by negotiating prices and volume of care with providers and including this in contracts. (15) Both the production stimulus for providers and the financial risk for health insurance companies (16) the DBC-system created, and the conditions set by the administrative outline agreement have led to the inclusion of turnover limits in contracts between health insurance companies and hospitals. (14)

When a turnover limit is included in a contract between a health insurance company and a hospital, the health insurance company will reimburse every invoiced DBC-product, until a maximum amount for that year, the turnover limit, has been reached. The turnover limit is intended to act as a stimulus to reduce care provision when a hospital is approaching the limit, (17) thus restricting expenditures. Another method is to determine a contract price that provides the hospital with a set budget, regardless of the total provision of care. (18) In 2018 83 percent of contracts included turnover limits, whilst only 16 percent of contracts included a contract price. (19) Therefore, this report will solely focus on turnover limits.

1.2 Problem

Whilst turnover limits could act as an incentive to reduce care provision when a hospital is approaching the limit, it also acts as a financial stimulus to maximise healthcare production, (17) which does not necessarily equal the best suitable healthcare for patients. A report from the Dutch Healthcare Institute (ZIN) and the Dutch Healthcare Authority (NZa) states that: “The financial incentives resulting from funding methods must be in line with the interests of the patient and the intrinsic motivation of the medical specialist to do what best suits the patient”. (8) It is therefore important this production incentive gets reduced, (17) and the effects turnover limits have on patients get identified. In addition, a report by the Authority for Consumers and Markets (ACM) shows an increase in waitlists and admission stops over the past years. Compared to 2014, the report shows a 21 percent increase in waitlists for diagnostics and 24 percent for treatments in 2018. An even larger increase is visible for admission stops. In 2018 the number of admission stops had doubled compared to 2015. The increase in healthcare demand, staff shortages, and most importantly, financial limitations were listed as reasons for this growth in both waitlists and admission stops. (20) Moreover, according to the NZa, as a way of lowering the financial burden for hospitals, reaching a turnover limit can result in longer waitlists or even admission stops as well. (12) This, however, could lead to patients having to avert to a different hospital than their hospital of choice, (3) and is therefore contradictory to turnover limits’ intended use of limiting healthcare expenditures and specifically, its added objective of centralizing care for patients, through JZOJP. (12) On top of that, this is conflicting with a patient’s right to a healthcare provider free of choice. (3) In summary, turnover limits can result in a higher production incentive, and healthcare costs, waitlists, and admission stops are still rising. However, the extent to which

turnover limits contribute to these developments, and thus affect patients, remains unknown.

1.3 Objective

The Netherlands prides itself on having an efficient healthcare system in which all patients should have quick access to quality healthcare. (21) Yet, as stated before, healthcare costs and demands are increasing and forming a threat to this standard. It is therefore not only important to assess the effectiveness of turnover limits in terms of cost reduction and centralization of care, but also whether turnover limits negatively influence for example waitlists and admission stops, as this can have a negative effect on a patients' wellbeing. (21) And, in a value-based healthcare system, patients' wellbeing should be on the forefront. Therefore, the following research question will be answered: "How do turnover limits affect healthcare production of hospitals, and therefore patients, in The Netherlands?".

1.4 Research questions

To answer the research question, several sub-questions were answered in the process. Chapter 2, "Utilization of turnover limits in The Netherlands", will answer the question: "How are turnover limits utilized in The Netherlands?". This Chapter explores the utilization of turnover limits both in theory and in practice. In addition to a detailed explanation of turnover limits and their history, experiences with turnover limits in practice will be collected through interviews. In Chapter 3, "Global effects of turnover limits", a systematic literature review will be conducted to answer the question: "How do turnover limits affect healthcare production of hospitals, and therefore patients?". The potential effects of turnover limits assessed in Chapter 3 will inform Chapter 4 "Quantification of the effects of turnover limits in The Netherlands", in which we planned to quantify these potential effects.

2. Utilization of turnover limits in The Netherlands

The Dutch healthcare system, and specifically, the funding system for hospitals has been a continuing development. To gather a full understanding of turnover limits and the place they hold within this system, grey literature was searched. Initially, a search strategy was developed for a systematic literature review on the Dutch hospital funding system, and the utilization of turnover limits. However, after searching several databases, such as PubMed and NARCIS, little information was found. Therefore, grey literature was used instead, and when possible complemented by scientific literature. In addition, interviews were held with actors within the system to detect possible discrepancies between the utilization of turnover limits in theory and in practice. This Chapter provides an overview of the evolution of the Dutch hospital funding system, an explanation of the five main payment methods, the current utilization of turnover limits, the actors involved, and it provides a description of actors' experiences with turnover limits.

2.1 History of the Dutch hospital funding system

2.1.1 Origins of the current funding system

The current funding system for Dutch hospitals originates from a complete change of the system in 1983 and has been a continuous development ever since. Prior to 1983 no cost-reduction method was in place, which meant all costs generated by a hospital would be covered, resulting in an annual increase in healthcare costs. To lower healthcare costs, from 1983 onwards, hospitals were granted an annual budget based on the performance in the previous year, resulting in a volume-based approach to funding. Meaning, higher healthcare expenditures in 1982 resulted in a larger budget in 1983, leading to a skewed funding method towards the more economical hospitals in 1982. When the introduction of discounts in 1985 and 1986 led to financial issues for the more economical hospitals, this imbalance grew even further, eventually leading to another reform of the system in 1988. On the first of January 1988 a functional budgeting approach developed by the 'Centraal Orgaan Tarieven Gezondheidszorg' (COTG), was introduced to resolve this imbalance. In this new approach the budget got derived from three parameters: the adherent population level parameter¹, the capacity parameters, and the production parameter. After an evaluation of the system by the national hospital institute in 1991, several changes were made to the system, such as reducing the importance of the adherent population level. The renewed functional budgeting approach came into force on January first, 1992. (22)

¹ Adherent population level: the number of inhabitants in the geographical area, a hospital would extract patients from. (70)

2.1.2 Introduction of the DBC-system

Towards the end of the 1990s, a lack of innovation, a divide between the healthcare fund and the private sector, and long waitlists, prompted the development of a new system. Its purpose to prioritise quality, availability, and affordability of care during negotiations between health insurance companies and hospitals. (14) As part of this new funding system for hospitals, the diagnosis-treatment combination (DBC)-system, which is currently still in use, was introduced in 2005. The DBC-system was introduced to offer a uniform language for negotiations between providers and health insurance companies. In addition, it provides a standardized method for claiming provided healthcare to health insurance companies. (14) In the years following its introduction, several adjustments were made to improve the system. Initially, one DBC-product covered the entire care process, from consult to final appointment. However, this led to 35.000 possible DBC-products, which impeded efficiency and negotiability. This inefficiency prompted the development of the '10-point DBC-enhancement plan', which was followed by the start of the project: 'DBC op weg naar transparantie' (DOT). DOT, which was officially introduced in 2012, enabled DBC-products to be centrally derived and reduced the number of DBC-products to 4000. Furthermore, the percentage of freely negotiable DBC-products between health insurance companies and hospitals increased.

Meanwhile, in 2006 two laws were adopted further adjusting the budgeting system, namely, the 'Healthcare Market Regulation Act' (WVG) and the 'Dutch Healthcare Act' (Zvw). These laws introduced regulated competition to the Dutch healthcare system, leading to a new organisation of the healthcare market. (23) The WVG solidified the role of health insurance companies in contracting providers, (14) as prior to 2006 hospitals were granted an annual budget determined by the NZa. (24) Section 2.5 of this report provides further explanation on the current roles of actors in the Dutch healthcare system. The Zvw divided medical specialist care into an A-segment and B-segment. The A-segment is also considered the regulated segment, for which the NZa determines a maximum tariff. This means that health insurance companies and hospitals are only allowed to negotiate the tariff up to that maximum. Tariffs of DBC-products that are part of the B-segment, also considered the free segment, are freely negotiable. (25) Through the years the B-segment has expanded exponentially. In 2005 the percentage of DBC-products in the B-segment was 10 percent. This expanded to 20 percent in 2008, (26) 34 percent in 2009, and eventually 70 percent in 2012. (27) Meaning, in 2012 30 percent of DBC-products was included in the A-segment.

Final minor adjustments to the system were made in 2014 and 2015. First, specialists became obligated to include the code of DBC-products in invoices, to improve transparency. Second, the duration of one DBC was set at 120 days, after which a new DBC should be opened in case of a continuing care process. (14) After a DBC of 120 days is closed, the provider can invoice the total payment rate of the DBC to a health insurance company. The opening date of a DBC is the guiding factor for which yearly budget the DBC is included in. Meaning, all healthcare services or DBC-products that are included in a DBC that lasts from December 2021 to March 2022, are to be withheld from the budget of the year 2021. Figure 1 depicts the full evolution of the Dutch hospital funding system.

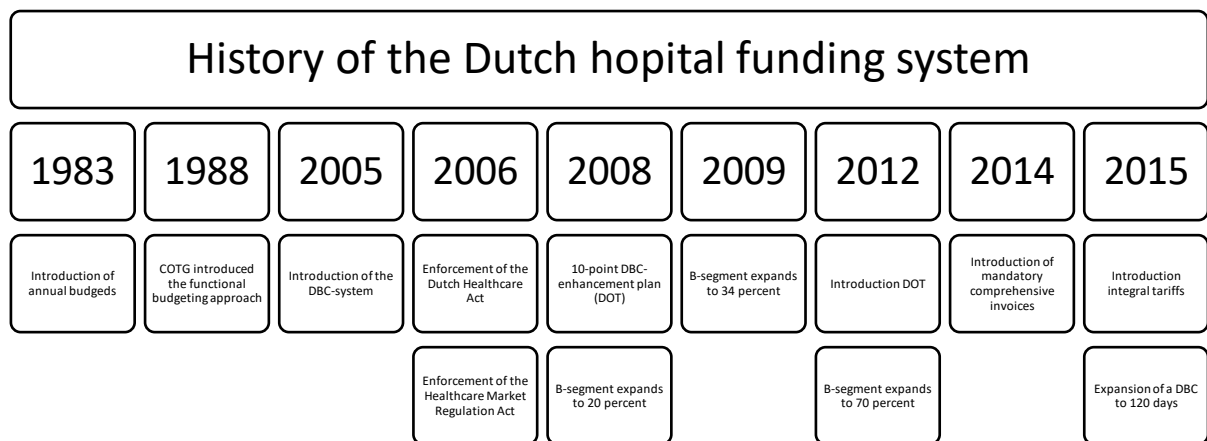


Figure 1 Evolution of the Dutch hospital funding system

2.2 The DBC-system within the five main payment methods

In an article from 2012, Frakt A. and Mayes R. (16) discriminated between five separate healthcare payment methods, namely, cost-based reimbursement, fee-for-service (FFS) reimbursement, per-diem payments, per-episode (bundled) payments, and capitation. Definitions of the various payment methods are given below in Table 1. In The Netherlands, medical specialist care is organised and paid through the DBC-system, which is a type of diagnosis-related group (DRG)-system. (16,23) In turn, DRG is a version of per-episode (bundled) payment.

Table 1 Definitions payment methods (11)

Payment method	Payment (per patient)
Cost-based payment	All costs incurred by a provider will be paid
Fee-for-service payment	A fixed tariff for each service a provider delivers will be paid
Per-diem payment	A day-tariff will be paid
Per-episode (bundled) payment	A fixed tariff for each episode of provided care will be paid
Capitation	A fixed tariff for a specified time period will be paid

The different payment methods come with associated risks for both provider and payer. Figure 2 shows the shift in financial risk for payers and providers for different payment methods. Through the cost-based method, the payer bears most financial risk, whereas through the capitation method, this financial risk shifts to the provider. Through cost-based payments, all costs incurred will be paid. Therefore, payers have no control over the volume or total costs of the provided care. However, this control increases for FFS and bundled payments since these methods include fixed or negotiated prices. Nevertheless, unlike figure 2 suggests, as total provision of care is not controlled for in these methods, payers still bear most financial risk. (16) To potentially limit this financial risk for payers, turnover limits can be included in contracts.

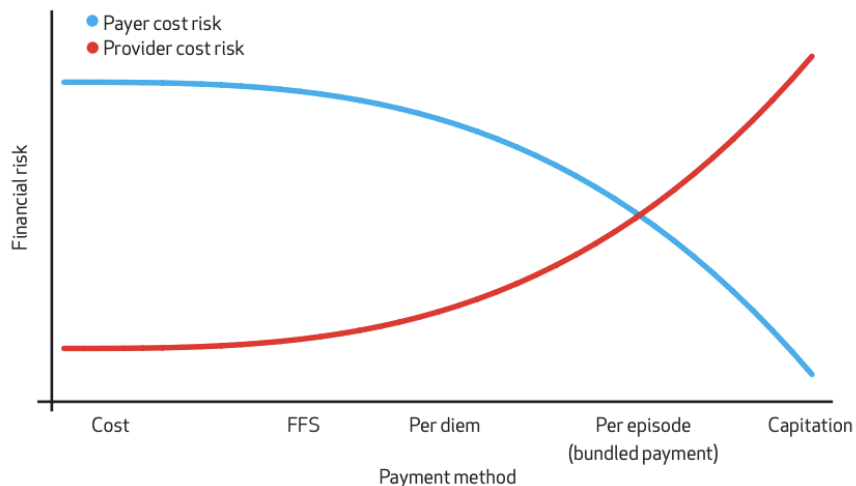


Figure 2 Financial risk compared to payment method (16)

2.3 The current use of turnover limits

As mentioned in the introduction, when a turnover limit is included in a contract between a health insurance company and a hospital, the health insurance company will reimburse every invoiced DBC-product, until a maximum amount for that year, the turnover limit, has been reached. (17) Nine out of the ten health insurance concerns establish turnover limits with their contracted hospitals. Only the health insurance concern EUCARE does not include turnover limits in contracts. Depending on several variables, such as the size of a hospital, each hospital has an individual turnover limit. There are three instances for which turnover limits do not apply, namely, emergency care, essential obstetric care, and if a treatment has already started when the turnover limits is reached. The latter is called a continuing obligation, which means that a hospital is required to continue providing care to a patient after the turnover limit is reached. A continuing obligation can be included in a contract in addition to the turnover limit, further expanding the financial risk for hospitals. (28)

There is one other instance in which case turnover limits generally do not apply, that is, if a patient has a restitution policy. Patients with a restitution policy are not bound to providers that their health insurance company has a contract with. Meaning, they have complete free choice of providers, and thus, patients with a restitution policy are usually not affected by turnover limits. (28) Yet, the Dutch consumers association warns patients that whilst this holds true for most health insurance companies, the application of turnover limits for patients with a restitution policy could differ per health insurance company. Therefore, patients should inquire about this with their health insurance company. (29) However, all health insurance concerns that offer a restitution policy, state that these patients will not be affected when a turnover limit has been reached. One exception is CZ, which states on their website that if a healthcare provider informs a patient that they cannot receive treatment because of a turnover limit, the patient should contact CZ. (30) Whilst a phone call with the health insurance company confirmed that patients with a restitution policy are unaffected by turnover limits, this is unclear from their website alone. In addition, it is presumable that a percentage of patients with a restitution policy is unaware that they should contact the health

insurance company. As a result, these patients potentially experience the negative effects of turnover limits as well.

2.4 Actors in the Dutch healthcare system

As mentioned before, in 2006 regulated competition was introduced to the Dutch healthcare system, leading to a new organisation of the healthcare market. Figure 3 depicts the actors involved in the healthcare market, since 2006. (23) Actors' roles in the healthcare market and the purchasing process, will be explained below.

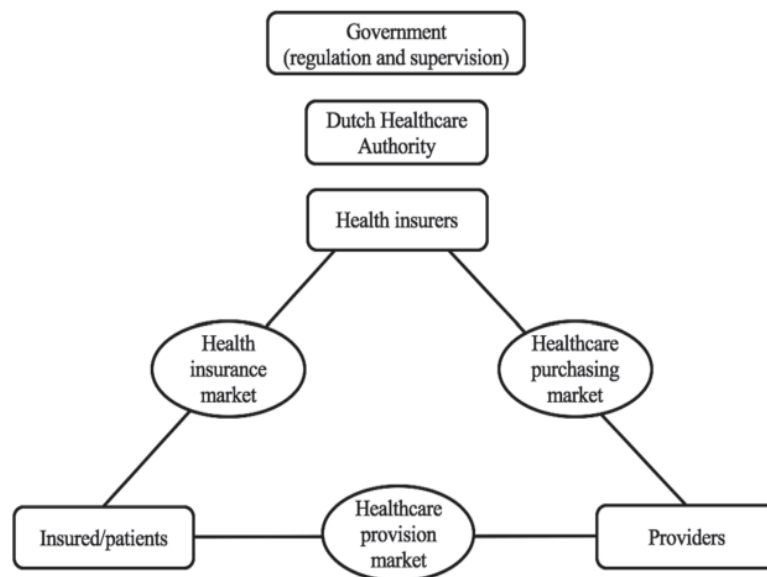


Figure 3 Actors' in the Dutch healthcare system (23)

2.4.1 The Government

The introduction of regulated competition caused a major change in the role of the government in the healthcare market. Whereas prior to 2006 the government had full control of the healthcare market in terms of tariffs and volume of care, it's now charged with regulation and supervision. The ministry of Health, Welfare and Sport (VWS) holds most of these responsibilities. Their main task is developing policies to assure the populations' wellbeing and a high-quality healthcare system. For instance, based on advice from the NZa, the content of the basic health insurance package and tariffs of non-negotiable DBC-products are determined by the government. (23) In addition, congress can hold the ministry of VWS responsible through debates. For example, in response to a debate in 2019, then minister Bruins, send congress a letter regarding the possibility of admission stops due to a turnover limit being reached. The main takeaway from the letter being that health insurance companies have a duty to provide patients with healthcare when necessary. However, when a patient has an in-kind policy, which will be explained in Section 2.4.3, they do not have the right to healthcare at a specific healthcare provider. On the other hand, patients with a restitution policy have the right to full reimbursement from any healthcare provider of their

choice, regardless of a potential contract or turnover limit. (31) Another example is from 2018 when several members of congress voiced their concerns about admission stops in response to, for example, turnover limits being reached. (3)

2.4.2 The Dutch Healthcare Authority (NZa)

The NZa is an independent governing body, which is charged with a multitude of tasks, included in the Healthcare Market Regulation Act (WMG). (32) Amongst others, the NZa is responsible for market supervision, market development, and regulating tariffs of DBC-products. (32) Within the purchasing market this means that the NZa regulates the tariffs and the negotiability of DBC-products. Additionally, the NZa is responsible for assuring health insurance companies abide by the Health Insurance Act (Zvw). (23) The NZa has two macro-level instruments available for regulating the healthcare market, namely, administrative outline agreements (BHA), such as the agreement mentioned in the introduction, and macro-management instruments (MBI). A system made available to ensure transparency ('DBC's op weg naar Transparantie', DOT), is accessible to the NZa as a micro-level instrument. (11) Recently, together with the ZIN, the NZa has started to view the effectiveness of turnover limits more critically, putting its utilization under pressure. Both the ZIN and NZa have recommended that parties involved start researching other possible financial agreements to include in contracts. (8,17)

2.4.3 Insured/patients

As mentioned before, patients have freedom of choice for both health insurance companies and providers. Through the Dutch Healthcare Act, all Dutch citizens are obligated to get insured with a basic health insurance package. (33) When choosing a health insurance policy, consumers generally have the option to choose between an in-kind policy or a restitution policy. With an in-kind policy, to get a full reimbursement, consumers are bound to healthcare providers that are contracted by their health insurance company. A restitution policy allows consumers to choose their providers freely, regardless of whether the provider is contracted by their health insurance company. To what amount a non-contracted provider will be reimbursed in case of an in-kind policy differs per health insurance company. (11) As mentioned before, turnover limits were introduced as a way of lowering healthcare expenditures (14) However, this is not the first attempt at controlling healthcare costs, as in 2008 the deductible was introduced. Because patients were fully insured prior to the introduction of deductibles, which reduced patients' financial burdens, it was presumed that patients were more likely to consume healthcare. Deductibles could restore the awareness of healthcare costs and act as an incentive to reduce healthcare consumption, and therefore healthcare costs. (34) To gather more insight in patients' views on turnover limits, an interview was held with the Dutch Patient Federation. The results of the interview are reported in Section 2.5.2.

2.4.4 Health insurance companies

Health insurance companies are charged with purchasing more cost-effective healthcare from providers. To do so, health insurance companies negotiate the tariffs of DBC-products with

providers. (15) In addition, a turnover limit is predetermined, which, as mentioned before, is intended to reduce healthcare expenditures. (14) Moreover, this also reduces the financial risk for health insurance companies. (16) In 2021 The Netherlands accounted for a total of 10 health insurance concerns and 20 health insurers. (35) For example, the concern Achmea holds the following 5 health insurance companies: Zilveren Kruis, FBTO, Interpolis, Pro Life Zorgverzekeringen, and De Friesland. (36) Additionally, a total of 57 policies are available, of which 37 are in-kind policies, 15 are restitution policies, and 5 are combination policies. (35) As a result of regulated competition, health insurance companies can compete for patients through several means. First, whilst the content of the basic health insurance package is universal, health insurance companies are able to compete on the cost of these health insurance policies. Second, health insurance companies can assemble unique complementary health insurance policies to attract patients. (23) Health insurance companies have a healthcare providing obligation, which means that health insurance companies should provide budget, so that all patients have healthcare accessible within a reasonable time-period. Yet, according to the minister of VWS it is possible turnover limits lead to admission stops at certain healthcare providers. This, however, does not mean the providing obligation is not being abided by, as patients could get treated at other healthcare providers in the area. When health insurance companies do not abide by this healthcare providing obligation, the NZa will hold the insurance company accountable. Even so, the health insurance company holds great autonomy when purchasing healthcare. (3) Health insurance companies' experiences and views on turnover limits are reported in Section 2.5.2 as well.

2.4.5 Healthcare providers

Freedom of choice is an integral aspect of the Dutch healthcare system, meaning that patients are free in their choice of provider. (23) In The Netherlands a division is made between general, academic, and specialised hospitals. In 2020 The Netherlands accounted for 57 general hospitals, 8 academic hospitals, and 17 specialised hospitals. (37) Whilst the introduction of turnover limits decreased financial risk for health insurance companies, this risk increased for healthcare providers. (16) In addition, whereas the DBC-system merely controls the costs of DBC-products, turnover limits also control the total provision of care, limiting healthcare providers in the total provision of care. Further, as mentioned before, turnover limits could act as an incentive to reduce care provision when approaching the limit. However, it could also act as an incentive to deliver care to the maximum. (17) Due to regulated competition and freedom of choice, the primary aim of hospitals is to provide quality healthcare for an appropriate price. Thereby, attracting new patients, and bettering their position in negotiations with health insurance companies. (11,23) Alongside health insurance companies' experiences, healthcare providers' experiences and views on turnover limits are included in Section 2.5.2 as well.

2.5 Actors' experience with turnover limits in The Netherlands

To gather a full understanding of turnover limits and to detect possible discrepancies between the utilization of turnover limits in theory and in practice, interviews were held with different actors in the system.

2.5.1 Methodology interviews

Throughout several stages of this research, focused interviews were held to get a full understanding of turnover limits, the effects, and how they are established within contracts between health insurance companies and hospitals. Additionally, interviews were held to detect potential discrepancies between theory and practice. To gather insights from a diverse range of views, through convenience sampling, interviews were held with two sales managers from two different hospitals, a capacity management team from a hospital, a senior intelligence analyst from a health insurance company, a healthcare purchaser from a health insurance company, and a representative from the Dutch patient federation. Each interview lasted between 45 minutes to an hour. Because each of the interviews was set up to get insight in that parties' perspective of turnover limits and the effects they experienced, different questions were asked to each of the parties. However, the following topics were discussed in all interviews: experience with turnover limits, the effects of turnover limits, quality of the Dutch funding system, and the future of turnover limits within the Dutch funding system. The complete list of the questions developed per interview is depicted in Appendix A. After each interview a report was made, which was then compared to literature and reports from the other interviews. For privacy purposes the specific sources remain undisclosed.

2.5.2 Experiences with turnover limits

The Dutch Patient Federation's experiences

The interview with the Dutch Patient Federation confirmed that little is known about the effects turnover limits have on patients. Whilst it is clear that turnover limits have a positive effect on lowering healthcare costs and volume, the negative effects for patients are unclear. However, the interviewee mentions that it is possible turnover limits result in longer waitlists, deferred treatments, and referrals to other hospitals. These however remain speculations, as the patient federation does not have data available on the effects turnover limits have on patients. In terms of effects, the interviewee also mentions that patients already receiving treatments should not experience effects of turnover limits when a continuing obligation is included. In addition, patients with a restitution policy do not experience negative effects of turnover limits.

When asked about the initiative JZOJP the interviewee expresses their concerns that the Dutch healthcare system is not built for a system such as JZOJP. The interviewee's first concern is the effect on social equality regarding access to healthcare. Because in principle we want each citizen to have equal access to healthcare, the government determines the nature and content of the basic health insurance package. However, JZOJP aims to provide required healthcare based on the healthcare infrastructure, and potentially social infrastructure, of a region. According to the interviewee this could lead to increasing disparities of access to healthcare between regions, which would be acceptable if healthcare outcomes remain equal. Therefore, according to the interviewee it is crucial that if JZOJP gets introduced nationally, this is controlled for and regulated by the government. Second, the introduction of JZOJP is complicated by the fact that the regional involvement of citizens and

healthcare users in the healthcare system is hardly organised. Currently, the provincial government no longer takes part in organising the healthcare system. Instead, this responsibility is allocated to congress and municipal councils.

Ultimately, the interviewee states that the main concern from the patient federation is that patients do not take turnover limits into account when selecting a health insurer. Simultaneously, due to the complicated nature of turnover limits, its exceptions, and patients' priorities when choosing a health insurer, the interviewee questions whether turnover limits should become part of a patients' selection process. In addition, turnover limits only apply for a limited type of care and do not affect each patient in need of healthcare. Thus, increasing the awareness of turnover limits would require an analysis of which groups of patients are affected by turnover limits and where these groups acquire their information for selecting a health insurer. In conclusion, the interviewee states that healthcare users should not be bothered with turnover limits and its workings. Healthcare providers and health insurance companies should commit to doing what is right for patients and keep information as straightforward and accessible as possible. If this objective aligns with the utilization of turnover limits, then that is fine. This statement especially relates to a news article from 2021 reporting on a conflict between the health insurance companies Menzis and VGZ and the Haaglanden Medical Center (HMC). The negotiations between the parties for the 2022 contracts reached a point of difficulty, which ultimately drove the HMC to call upon patients to search for a different health insurer. Whilst the parties eventually came to an agreement, the HMC received a fair amount of critique. The health insurance companies themselves stated that the hospitals' announcement caused unnecessary trepidation amongst patients. (38)

Hospitals' experiences

Salesman hospital 1

Early in the research process a conversation was held with a salesman from a general hospital. Aside from the effects of turnover limits, the history of turnover limits, and how turnover limits are established was discussed. The conversation was focused on gathering insight in how turnover limits are established and the potential effects turnover limits could have on patients. The interviewee mentions that the hospital funding system has been a continuing development since the eighties. In addition, the negotiability of DBC-products' tariffs have increased over time as well. Hence, as the introduction of turnover limits increased gradually, it is difficult to analyse a direct effect on healthcare production after its introduction.

In preparation for negotiations the hospital is informed on healthcare costs, by means of benchmark research from various institutions, such as: Logex, Performance, Value Care, and DHD (Dutch Hospital Data). Based on this the hospital provides the health insurance company with a pricelist for approximately 1500 DBC-products, after which the negotiations start.

When asked about the effects turnover limits have on patients, the interviewee states that there are no negative effects for patients. When asked specifically whether turnover limits could possibly lead to deferred treatments, the interviewee explains that this is not the case

either. In addition, the interviewee states that there is not a difference between patients in general, and patients from different health insurance companies. However, when asked about the difference in health insurance policies, the interviewee states that there is a difference in effects between patients with an in-kind policy and a restitution policy, because patients with a restitution policy can always call upon a continuing obligation. This contradicts the interviewee's first statement that there are no negative effects for patients, and that effects should not differ per patient. Upon further clarification, the interviewee explained that whilst reaching a turnover limit would allow hospitals to enforce an admission stop for patients with an in-kind policy, the agreed upon continuing obligation and offset agreements practically removes the difference in healthcare access between patients with an in-kind and a restitution policy. Further, according to the interviewee healthcare demand currently exceeds hospital capacity. Hence, issues regarding the Dutch healthcare market currently outweigh the challenges of the utilization of turnover limits.

Capacity management hospital 2

This interview further explored the possible changes in healthcare production in anticipation of reaching a turnover limit. The interviewees started out by explaining the difficulty of adjusting healthcare production in anticipation of reaching a turnover limit. Based on cases from previous years, the maximum budget (the turnover limit) for that year will be divided over all departments. However, because healthcare demands fluctuate, there are no set numbers for total treatments that can be carried out per department, which makes it hard to steer on demand. When asked about the application of a continuing obligation the interviewees mention that these are applied. However, they also mention that there is no rule that states that a hospital cannot wait three weeks until a new DBC can be opened in the new year. The Dutch consumers association reports on this possibility as well, as they state that reaching a turnover limit could incentivise hospitals to postpone care to the new year, so they do not have to carry the financial burden. (39) Still, the interviewees state that methods like these, to keep costs under the turnover limit, are rarely utilized. Yet, the interviewees state that it would be valuable to gather more insight into which treatments are most profitable for the hospital. They mention that for example hip and knee surgeries are more profitable than a complicated robotic treatment. In addition, a two-day clinical admission is more economical than a same-day procedure. It is therefore more economical for hospitals to have multiple day clinical admissions, whereas this is less preferable for patients and health insurance companies. According to the interviewees the health insurance company is not aware of what the so-called feeders and bleeders are for the hospital. This knowledge of the so-called feeders and bleeders of a hospital can be useful when a hospital is approaching the end of the year and is reaching or has not yet reached the turnover limit. For example, when a hospital has reached a turnover limit, it is imaginable that the hospital will continue to carry out the more profitable treatments, as this will generate more revenue and reduce the financial burden created by the turnover limit being reached. This presumption that turnover limits incentivise hospitals to adjust healthcare production based on revenue, is further in this research confirmed by the systematic literature review. Finally, the interviewees also mention that when a new patient enters the hospital, the hospital is not aware which health insurance company the patient is insured by. In addition, the hospital is mostly unaware of how close they are to reaching the turnover limit. According to the interviewees, it is therefore nearly

impossible to adjust healthcare production for a specific health insurance companies' turnover limit.

According to the interviewees several external variables which, like turnover limits, influence healthcare production and volume of care, should be included in the statistical analysis when quantifying the effects of turnover limits. First, due to Covid-19, healthcare demand and healthcare production still deviates from regular years. The interviewees mention that turnover limits are far from being reached, because fewer patients come to the hospital. Second, as a result of a decrease in general practitioners, patients are being referred to the emergency room (ER) more frequently. Third, an increase in patients in the ER is often visible before a vacation, long weekend, or holiday, because more patients decide to make a quick visit to the general practitioner, after which they might be referred to the hospital. Often the general practitioner will not have capacity during the weekend, which means these patients will be in the care of the hospital for four days, influencing volume of care. Fourth, due to vacations and holidays, there are 36 weeks the hospital operates at full capacity, and 10 weeks it operates on lower capacity. When analysing the effects of turnover limits, the different regions should be considered, as vacations differ per region. Finally, the interviewees mention that unforeseen variables, such as a delay on the delivery of prosthetic knees, will always occur.

Salesman hospital 3

When asked about the frequency of the utilization of turnover limits, the interviewee mentioned a correlation between size of a health insurance company and the type of agreement. Whereas larger health insurance companies usually include turnover limits in contracts, smaller health insurance companies do not, as they tend to fluctuate more in volume. The interviewee also mentioned that it is important to differentiate between the method the NZa uses, and the method hospitals use to calculate the ratio of turnover limits, contract prices, and volume free agreements in contracts. Whilst the NZa counts the number of contracts including a certain agreement, hospitals look at total revenue. For example, suppose a hospital generates 100.000 euros in revenue and eighty percent of this revenue came from a large insurance company with a turnover limit, a hospital would conclude their contracts consist for eighty percent of turnover limits. In contrast, when eight out of ten contracts include a turnover limit, the NZa states that 80 percent of contracts include turnover limits, regardless of their market share. Based on the interviewee's statements, it is expected that the frequency of the utilization of turnover limits is larger when measured by market share. This expectation is based on the statement that larger health insurance companies often include turnover limits in contracts, whereas smaller health insurance companies do not. Larger health insurance companies will produce higher revenues than smaller health insurance companies, and in turn have a larger market share. This would accumulate to a higher percentage of turnover limits in contracts, and therefore a higher frequency of the utilization of turnover limits, compared to when the NZa's method is applied.

In terms of negotiations on the height of a turnover limit, the interviewee states that this is only slightly negotiable, because these are based on previous years. As the final costs for the previous year will not yet be available during negotiations, turnover limits are determined

based on two years prior. This could lead to an incorrect estimate of healthcare demand, and consequently a turnover limit being too high or too low. In addition, the interviewee states that the possibility of increasing the turnover limit, if necessary, is not discussed during initial negotiations. Further, when asked whether contracts usually include a continuing obligation, the interviewee explained that the inclusion of continuing obligations are not standard. The interviewee clarifies this by explaining that, whilst this is preferable for a health insurance company, it is not for a hospital. Therefore, this is always included in negotiations. Further, the interviewee explained that certain specialisms or treatments can have separate turnover limits or other agreements. For example, the introduction of public screenings for colon cancer, caused a spike in endoscopic research. Because initially no one knew to what extent this was going to affect healthcare demands, hospitals did not want this included in the overall turnover limit. Therefore, a separate turnover limit was agreed upon. Uncertainties like these, pose financial risks for both hospitals and health insurance companies.

When asked about whether a hospital follows how close it is to reaching the turnover limit throughout the year, the interviewee explained that hospitals certainly have an advantage in this respect compared to health insurance companies, because hospitals are aware of the amount of healthcare they produce. However, hospitals do not have the exact total throughout the year. Several times throughout the year, based on the information hospitals do have, they send health insurance companies a prognosis of the final costs expected for that year. The interviewee mentions one factor that can have a significant impact on a turnover limit suddenly being too high or low, namely, policyholder mutation. When a collective insurance policy is moved from one insurer to another, and a large part of the patients with this collective insurance are part of your patient pool, this may have consequences for the turnover limit. Suppose the patients who have already been treated, suddenly transfer to another insurer with their collective insurance, then a turnover limit may suddenly be much too high or low. The main issue is that a hospital is unaware whether this will happen. Therefore, an insurance mutation model can be used. Regarding a difference between patients with an in-kind policy and a restitution policy, the interviewee does not believe there is much of a difference, as most health insurance companies will have contracts with all larger sized hospitals.

When asked whether there are ways in which hospitals can avoid turnover limits being reached, and if so, in what ways, the interviewee explained that from a financial point of view it would be manageable. However, the interviewee states that as a hospital they have agreed that they do not want to cross that ethical boundary. The interviewee goes on to explain that it is especially unfair to patients that several years ago hospitals felt compelled to take measures, such as patient stops, because they did not get any rapprochement from health insurance companies. Finally, the interviewee was asked how they view the utilization of turnover limits, and whether they think of it as an effective method. In response, the interviewee explained that it really depends on what is considered effective. Yes, in terms of cost reduction it might be an effective method. On the other hand, whilst turnover limits are in line with the administrative outline agreement, it mostly benefits health insurance companies. Moreover, hospitals are simply not prepared to take the next step to, for example, apply patient stops when a turnover limit has been reached.

The health insurance company first started using turnover limits or other additional agreements in 2012/2013 after performance funding was fully implemented. Similar to what the interviewee of hospital one said about the gradual utilization of turnover limits, this interviewee mentions that turnover limits were not incorporated in contracts immediately. Initially, to remove the production incentive for hospitals, contract prices were utilized. Because a contract price provides the hospital with a set budget, regardless of the total provision of care, additional care production will not increase revenues. Taking away the production incentive for hospitals. On the other hand, as this could also lead to an incentive to determinate a treatment prematurely, and to reduce the provision of follow-up care, contract prices are rarely utilized anymore. Instead, turnover limits started to be included more frequently in contracts. Another reason for the shift to turnover limits, is the fact that turnover limits provide an indication of the development of healthcare demands.

The healthcare purchaser mentioned two main factors that inform the height of turnover limits. First, based on data from previous years a prognosis will be made for healthcare demand, which will inform the height of the turnover limit. Second, the previously mentioned administrative outline agreement that was established between all involved parties, is an important factor. This agreement includes conditions on volume growth and increasing healthcare costs. Such agreements will remain an important factor in the future as well.

The healthcare purchasing policy of this health insurance company also states that partial ceilings could be included in contracts. The interviewee stated that partial ceilings can be employed for certain care, without the inclusion of a continuing obligation. The utilization of this partial ceiling will ensure that the exclusion of these specific treatments in the overall turnover limit, will not be replaced by other treatments to maximise revenues. Apart for the possible exclusion of a continuing obligation in case of a partial ceiling, all other contracts containing a turnover limit, contain a continuing obligation as well. In addition, the interviewee mentioned that offset agreements are often agreed upon. Such an agreement is called upon when the healthcare demand has resulted in higher costs than the initial turnover limit. In this case, the offset agreement states that the financial risk will be shared for, for example, the first two percent of the additional costs. In such manner the hospital will not bear all financial risk. On the other hand, confirming hospital three's statement, the interviewee states that the possibility to increase the turnover limit, if necessary, is not up for discussion during initial negotiations. In contrast, due to the utilization of fixed ceilings for ZBCs, this possibility is discussed during those negotiations.

To follow up on the statements from hospital two and three, both stating that during the year they are unaware or not fully aware of how close they are to reaching the turnover limit, the interviewee was asked if the health insurance company tracks whether a hospital is approaching the limit. In response, the interviewee stated that the health insurance company does not track how close a hospital is to reaching the turnover limit throughout the year. According to the interviewee this is impossible due to DBCs getting invoiced far after the year has come to an end. Instead, they make a prognosis to provide a proximate.

Finally, when asked about the possibilities for hospitals to avoid reaching the turnover limit, the interviewee mentioned that hospitals do anticipate reaching a turnover limit. According

to the interviewee hospitals themselves also do this based on a prognosis, because they too are not aware of how close they are to the turnover limit being reached. Personally, the interviewee believes that as long as finances do not trump the needs of patients, turnover limits remain a suitable method to reduce healthcare expenditures.

2.5.3 Conclusion on experiences with turnover limits

All three healthcare providers state that they do not apply any methods, such as admission stops, to reduce healthcare production. Yet, as mentioned in the introduction, several news articles have reported on hospitals enforcing admission stops in response to turnover limits. (1,4,5) The Dutch consumers association shared a similar observation when in conversation with healthcare providers. Whilst a hospitals' financial interest appears an important factor for adjusting healthcare production, The Dutch consumers association states that healthcare providers do not dare to speak about this publicly, due to potential reputational damage and their dependence on health insurance companies. (39)

Therefore, based on the interviews and reports from grey literature, eight main conclusions were drawn:

1. As the grey literature research already suggested, little is known about the effects of turnover limits in both literature and practice.
2. Often patients do not take turnover limits into account when choosing a health insurance company.
3. Hospitals and health insurance companies have opposite opinions on the ethics and effectiveness of the utilization of turnover limits.
4. Healthcare providers adjust healthcare production to avoid reaching a turnover limit and having to bear the financial risk. However, this could ultimately result in the manifestation of negative effects for patients, such as longer waitlists, deferred treatments, or referrals to other hospitals.
5. Healthcare providers currently are not transparent about adjusting healthcare production to avoid reaching a turnover limit and having to bear the financial risk.
6. Whilst interviewees state they expect little difference in effects for patients, there is a potential difference between patients with an in-kind policy and a restitution policy.
7. The unawareness of both hospitals and health insurance companies on how close the hospital is to reaching a turnover limit, complicates a strategic adjustment of healthcare production.
8. When quantifying the effects of turnover limits, there are a multitude of hospital-specific external variables and contract characteristics that should be considered.

3. Global effects of turnover limits

3.1 Introduction

By means of this systematic review the potential effects of turnover limits will be studied. In the previous Chapter it was established that there are limited national documents available on the utilization and effects of turnover limits. Therefore, a more widespread systematic literature review was conducted. Results of the literature review were used to inform the outcome variables for the quantitative study design.

3.2 Methodology systematic literature review

The following sub-question was answered by means of the literature review: “How do turnover limits affect the care provision behaviour of hospitals, and therefore patients?”. Initially, a search strategy was developed for several scientific databases, namely, PubMed, Scopus, ScienceDirect, SpringerLink, NARCIS, and Wiley Online Library. However, after the initial search, it was concluded that only PubMed and ScienceDirect retrieved notable results. Therefore, only these two databases were searched for this systematic review. The following search query was constructed:

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((("Prospective Payment System"[Mesh] OR "Diagnosis-Related Groups"[Mesh]) AND ("Effect(s)" OR "Impact" OR "Influence")) AND ("Patients"[Mesh] OR "Hospitals"[Mesh])) OR ("Capitation Fee"[Mesh] AND ("Effect(s)" OR "Impact" OR "Influence")) AND ("Patients"[Mesh] OR "Hospitals"[Mesh]))
```

Instead of the term ‘turnover limits’, the terms ‘Prospective Payment System’, ‘Diagnosis-Related Groups’, and ‘Capitation Fee’ were used as search terms. The reason for this is that the term ‘turnover limits’ was seldom used in research and did not result in valuable hits. As mentioned in the theoretical framework, The Netherlands uses the DBC-system, a form of a DRG-system, which is also referred to as a prospective payment system. (40) Turnover limits are used in the context of these systems and aim to limit healthcare expenditures. (41) The DRG system is often transferred into from other systems, such as fee-for-service, leading to possible changes in hospitals’ care providing behaviour. (42) Since turnover limits are used in the context of these systems and serve a similar objective, it was assumed that publications on these topics could provide valuable insights into the potential impact of turnover limits on healthcare production of hospitals. Section 3.5 ‘Translating global effects’ will explain how these results are expected to translate to the potential effects turnover limits.

During the initial search, all duplicates were excluded, after which all documents were scanned for potential relevance based on the title and abstract. Following, the remaining full-text articles were assessed based on the inclusion- and exclusion criteria. Exclusively, documents written in English or Dutch were included. In addition, solely documents published after 2005 were included. Further, only documents reporting research on a DRG-system, a prospective payment system, or a capitation fee were included. Only document concerning medical specialist care were included. Documents regarding any other types of care were excluded. As mentioned before, there are two types of care for which turnover limits Do not

apply. Therefore, articles concerning emergency care and required obstetric care were excluded as well. Table 2 provides an overview of the inclusion and exclusion criteria. All documents fulfilling the selection criteria were included in the literature review. Additionally, a snowballing approach was used to check for valuable papers missed in the original search.

Table 2 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
1. Written in English or Dutch	Written in other languages
2. Published after 2005	Published prior to 2005
3. Concerns a DRG-system, prospective payment system, or a capitation fee	Concerns any other payment system or method
4. Concerns medical specialist care (secondary care)	Concerns any other type of care
5.	Concerns emergency care or required obstetric care

3.3 Results

As mentioned in the methodology, this review was conducted on the effects of the prospective payment system or the DRG-system and capitation, as these systems have a similar end goal to turnover limits, and turnover limits tend to be implemented in the context of these systems. Therefore, it is important to note that the results in this chapter are based on the assumption that turnover limits will affect the same outcome measures. This assumption will be further explored in Section 3.5 ‘translating global effects’.

3.3.1 Prisma diagram

Using the search strategy, 499 documents were retrieved from both PubMed and ScienceDirect, of which 24 documents met the inclusion criteria. PubMed yielded 465 documents on the prospective payment system or the DRG-system and 12 documents concerning a capitation fee. ScienceDirect listed 17 documents concerning the prospective payment system or the DRG-system and 5 documents on a capitation fee. No additional articles were included after the snowballing method was applied on the full-text articles. In addition, after the selection process zero articles concerning a capitation fee were eligible for inclusion. Finally, 11 articles were included in the systematic review. A complete overview of the selection process is depicted in Figure 4.

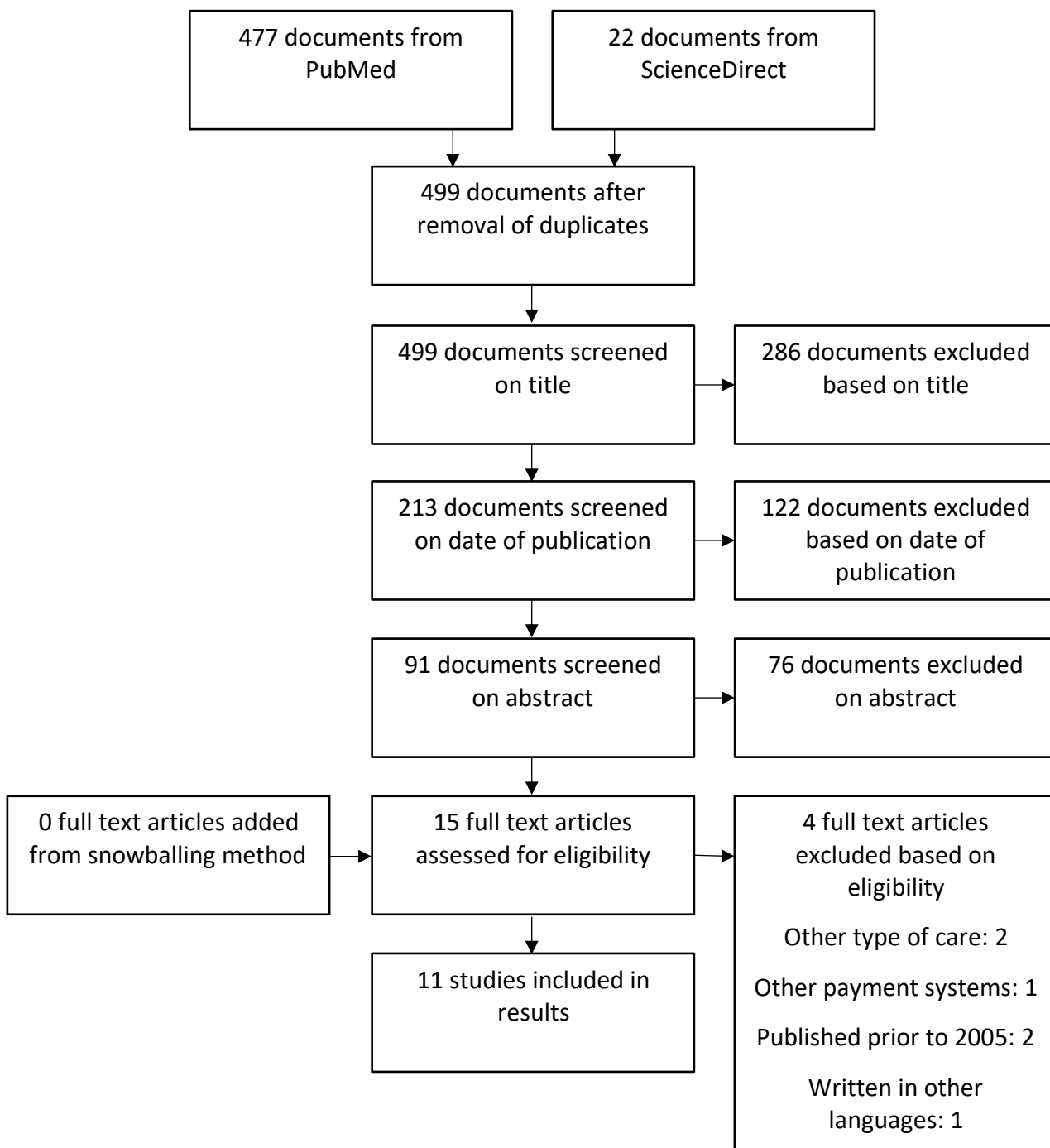


Figure 4 Prisma diagram: selection process

3.3.2 Global effects

The 11 included documents reported an effect on the following 9 outcomes from the introduction of a DRG-system or prospective payment system: average length of stay (ALOS) (1), (acute) bed capacity (2), bed occupancy rates (3), admission rates (4), type of procedure (5), hospital case mix index (CMI) (6), DRG-weighted inpatient output (7), readmission rates (8), and mortality rates (9).

Average Length of stay (ALOS)

In total six articles reported the effects of the payment system on ALOS. Whereas three studies did not find a significant change in ALOS, three other studies reported a decrease in ALOS to various extends. One study found long term effects on the ALOS regarding elective care. Measured in 2013, the study found a reduction of ALOS of 35 to 70 percent compared to 2002. This translates to a decrease between -0.4 days to -1.4 days. The reasoning being that a decrease in length of stay saves resources and results in financial gains for hospitals. (43) A second study reporting the effects on ALOS after the introduction of a DRG-system, showed a decrease of 14 percent. (44) The third study, which focussed on dermatology departments, found a continuous decrease from an ALOS of 8.4 in 2003 to 6.3 in 2006. This translates to a 25 percent decrease. (45)

Despite not finding a significant change in ALOS, research on the Swiss DRG-system did find that hip fracture patients had the longest ALOS. In addition, they stated that the insignificant effect was expected due to the short time horizon of one year. Further, they stated that the early trends they did find, might indicate further long-term changes. (46) Articles by Shin (47) and Chok et al. (48) added to the evidence that the introduction of a DRG-system had no significant effect on ALOS. Yet, the article by Chok et al. (48) did find some evidence that the DRG-system resulted in more rational and quick decisions on admitting patients to the intensive care unit (ICU) and whether patients require to stay in the ICU.

Volume of care

Volume of care was studied through several outcome variables, namely, (Acute) bed capacity, Bed occupancy rates, admission rates, and type of admissions. (Acute) bed capacity and bed occupancy rates were measured by only one article. The decrease they witnessed in ALOS was accompanied by an average decrease in acute bed capacity of 12 percent. In addition, a reduction was found in bed occupancy rates by on average 9 percent. (44)

Three documents reported the effects on admission rates, each of which showing different results. One article reported an increase in admission rates, accompanied by a reduction in ALOS. (45) Another article found a decrease in admission rates. The report states that whilst the exact reason for this reduction is unknown, the rise in same-day procedures could be a contributing factor. (44) The third article did not witness a significant change in admission rates based on aggregated data. However, when data was divided into the two categories medical and surgical, a significant increase was reported for elective surgical admission rates. According to the report this can be explained by the higher weights of surgical DRGs compared to medical DRGs. (47)

A total of three articles elaborated on the type of admissions after the introduction of the DRG system. An article analysing the introduction of the Swiss DRG system, compared the type of admissions to the ICU before and after the DRG-system was introduced. They found that there was an increase in admissions from internal units, whereas a decrease was witnessed for external admissions. According to the report this could potentially be explained by the movement of patient populations, and the imbalance between demand and availability of ICU capacity. (48) Another possible change in type of admissions is the increase in the number of same-day procedures associated with the decrease in admission rates. (44) Likewise, another study found an increase in outpatient visits both before and after surgery due to the introduction of a DRG-system. In addition, the volume of pre-surgery examination increased as well. Yet, in the discussion of the report it is stated that other systematic changes to Korean hospitals also affect the increase in outpatient visits, concluding that the DRG-system did not severely affect hospitals. Finally, the report states that however small the spill over effects of the DRG-system are, an increase of outpatient expenditures contrast with the DRG-system's intended objective to control healthcare expenditures. (49)

Hospital case mix index (CMI) & DRG-weighted inpatient output

Informed by the DRG-system the CMI provides an indication of the average case complexity in hospitals. (44) Therefore, the effect on CMI is strongly associated with the effect on type of procedure. Of the 2 articles that reported effects on CMI, one article witnessed a decrease in CMI, (44) whereas the other article did not find a significant change. (45) The first study showed an average decrease in CMI from 1.03 in 2009 to 0.93 in 2018. Consequently, the DRG-weighted inpatient output decreased by 17 percent on average as well. Evidently, both CMI and DRG-weighted inpatient output are dependent on the type of hospital. As a result, more specialised hospitals have a higher CMI and DRG-weighted inpatient output, compared to general hospitals. According to the report, the decrease in DRG-weighted inpatient output is expected due to its correlation to the decrease in admissions and case severity. (44) Whilst there appeared to be a slight increase in CMI towards the beginning of the time horizon, CMI subsequently declined to the baselevel. However, during the time horizon there was a general trend of reducing the weights of dermatological DRGs. Meaning, the witnessed results are presumably a result of the modification of the relative weights instead of the DRG-system itself. (45)

Type of procedure

To elaborate further on the CMI and the DRG-weighted inpatient output, six articles reported on the utilization of DRGs and a shift in case complexity in response to the introduction of a DRG-system. First, an article by Hof et al. (50) mentioned that with the widespread introduction of prospective payment systems, case mix planning could become an important strategy for hospitals. In addition, the growing economic pressure and competition could contribute to the incentive to utilize case mix planning. Case mix planning requires selecting patients or DRGs to find a suitable mix and volume of patients, which could have a significant effect on hospital revenues. However, the article highlights two main problems resulting from case mix planning, namely, local shortages and the deferral of high-risk patients. Other studies shared similar results on the use of DRGs after the introduction of a DRG-system.

A second article by Shin. E. (47) found evidence that the introduction of a prospective payment system could incentivise hospitals to admit more patients with a higher paying DRG or to shift patients to higher paying DRGs, also known as upcoding. This would result in greater revenues for hospitals. The study also found evidence that surgical procedures are more prone to upcoding. The third study (51) found some evidence of upcoding as well. However, rather than price incentives, other variables such as age, mortality and morbidity, LOS, and readmission rates, appeared to influence upcoding. Meaning, when the model controlled for patient characteristics, the association between price incentives resulting from the DRG-system and upcoding was diminished. (51)

The fourth article studied the incentives resulting from the introduction of the DRG-system and stated that to improve economy of scope between alike DRGs, hospitals could modify the combination of DRGs. The study showed that when a certain DRG became more profitable, hospitals expanded the share of that DRG. However, the issue with such specialisation is that it may reduce access to care. Meaning, when a hospital increases the production of DRGs with scope of economy, whether a patient will be able to receive treatment at their hospital of choice, relies on the provided DRGs. Whilst this would not be an issue when various hospitals produce different DRGs, it is an issue when the prices of DRGs are the same for all hospitals, potentially resulting in a shortage of the production of the systematically lower priced DRGs. (52) A fifth article that studied the type of treatment, reported similar results, namely, that the introduction of DRG-systems could lead to a change in type of procedures that are provided most. For example, the study showed a growing importance for inflammable skin diseases and dermatological oncology within a dermatological in-patient setting. In addition, the article states that the witnessed increase in age, might indicate that case complexity and co-morbidities are increasingly focussed on for in-patient admissions. Further, whilst the study did not show any obvious long-term effects, it did reveal an increase in medical treatments and a decrease in surgical in-patient procedures. However, the report states that the shift in surgical in-patient procedures could also be a result of regulatory changes. (45) Finally, one article specifically studied the incentive for hospitals to specialise after the introduction of the DRG-system. Overall, they were able to weakly verify a positive association between the introduction of a DRG-system and the specialisation of hospitals. However, they found that private or smaller size hospitals were more likely to specialise after the introduction of a DRG-system, than public or larger hospitals. According to the report, this is likely due to public hospitals' responsibility of providing a large variety of care to its community, and its limited managerial and strategic autonomy compared to private hospitals. (53)

Readmission & mortality rates

A total of three articles studied readmission rates in correlation with the introduction of a DRG-system. All reported an insignificant effect. (45–47) Whilst reporting an insignificant effect on readmission rates, the first article states the following in the discussion: “It is likely that the case-related revenues associated with DRG reimbursement will enforce the incentives for splitting treatment periods and earlier discharges leading to higher re-admission rates”, which is in contrast with their own findings. The report does not provide a clear reason for this believe. (45)The second study reporting in readmission rates, expected this to be the result of premature discharges. However, neither evidence of premature

discharges nor a significant change in readmission rates were found. (46) The third study did not provide any additional explanation for this result. Instead, it focussed on the previously mentioned occurrence of upcoding. (47)

In addition, the effect on mortality rates were reported to be insignificant by two articles. (47,48) Whilst not significant, one study did find a decrease of ICU mortality the year the DRG-system was introduced. However, the article states that further research should confirm that the DRG-system does not have a negative effect on mortality rates. (48) Again, the second article did not provide a potential explanation for the witnessed result. (47)

3.4 Conclusion

Overall, the included articles reported effects of the introduction of a DRG-system or prospective payment system on nine possible outcomes. The largest effect could be found on a hospitals' utilization of the type of procedure, the case mix, and the type of DRGs. Several articles reported that the introduction of a DRG-system could incentivize hospitals to utilize strategies, such as upcoding and case mix planning. However, whilst this suggests turnover limits would affect these outcomes, it also solidifies the importance of policies like turnover limits. As Frakt and Mayes (16) stated in their 2012 article, methods such as the prospective payment system do not control for total provision of care. Therefore, it could still be possible for hospitals to generate higher revenues by applying these other strategies, such as upcoding and case mix planning. Methods like turnover limits can be employed to decrease these production incentives. Tied to the type of procedure is the change in type of admissions, which according to the articles could also be the result of the introduction of a DRG-system. Inconsistent effects were reported on both the effects on ALOS and admission rates. Therefore, we can conclude that the introduction of a DRG-system could potentially affect ALOS and admission rates, but the exact extent to which remains unknown. Finally, all articles reporting on readmission rates and mortality rates, reported an insignificant change. In conclusion, results from this systematic review suggest that turnover limits could result in a change in the type of procedures, case mix, and type of DRGs. In addition, it could affect the type of admissions, ALOS, and admission rates.

3.5 Translating global effects

In the methodology for the systematic literature review it was explained that the DRG-system and capitation fees serve a similar objective to turnover limits, namely, to limit healthcare costs. In addition, it has previously been established that turnover limits are utilized to reduce the production incentives that result from the DRG-system. (14) Hence, the effects resulting from the DRG-system will generally be the opposite for turnover limits. However, because the DRG-system was initially introduced to improve quality of care, it is important to note the difference between the positive effects related to quality of care and the negative effects due to price or production incentives.

When justified, reduced length of stay could potentially be a positive effect in terms of effectiveness and quality of care. However, financial gains were reported by one of the articles as reasoning for the reduction of ALOS. (43) From the literature it is not certain a reduction in ALOS is indeed a positive or negative effect of the DRG-system. Yet, in case that ALOS was

reduced as part of a production incentive, it is expected that turnover limits would return ALOS to regular levels according to patients' needs. Nevertheless, Dutch hospitals have a continuing obligation, which means that no treatments are allowed to be terminated prematurely in case of a turnover limit being reached. Therefore, a change of ALOS when a hospital is reaching or has reached the turnover limit is unexpected.

The effects of the DRG-system on readmission and mortality were found insignificant by all articles. Hence, turnover limits will likely not affect these outcome measures.

On the effects of the DRG-system, two articles reported an increase in admission rates. (45,47) Whilst the third article first reported a decrease in admission rates, it also reported an increase in same-day procedures. (44) Hence, based on these three articles it can be assumed the DRG-system could lead to an increase in admission rates. Because turnover limits are utilized to combat these effects, it is expected that admission rates will decrease when a hospital is reaching or has reached the turnover limit.

In the three articles that reported on the effect of the DRG-system on the type of admissions a shift was witnessed. (44,48,49) For example, the article in the previous paragraph reported an increase in same-day procedures alongside a decrease in admission rates. (44) Whilst this might not be a direct effect of the DRG-system or turnover limits, it would be valuable to stratify on the different types of admissions when quantifying the effects on admission rates.

Finally, associated with the outcome measures CMI, DRG-weighted output, and type of procedures are several behavioural responses of hospitals to the DRG-system and turnover limits. All articles that reported on either of these three outcome measures, are referring or alluding to the possibility of utilizing DRGs for financial gains.

Whilst the two articles (44,45) reporting on CMI and DRG-weighted output did not provide enough evidence to conclude whether CMI is automatically affected by the DRG-system, it can be concluded that, if wanted, hospitals have the power to adjust CMI. Because turnover limits provide the hospital with a limit of total revenue, hospitals cannot adjust CMI infinitely, as they would inevitably reach the turnover limit at a certain point. However, this does not mean hospitals cannot use CMI to their advantage. This was pointed out by the article by Hof et al. (50) that stated that the DRG-system could increase the importance of case mix planning, which means selecting patients or DRGs to find a suitable mix and volume of patients, which could have a significant effect on hospital revenues. In addition, three other articles also reported on the behavioural responses of hospitals to specialise on certain DRGs after the introduction of the DRG-system. (45,52,53) Further, one article found evidence of upcoding, which means shifting patients to a higher DRG in return for greater revenues. (47) If upcoding were to occur in The Netherlands, it is expected that turnover limits would reduce this incentive, because again, at a certain point the turnover limit would be reached, and hospitals would have to carry the financial burden themselves. Yet, based on these articles it is expected that there could be a shift in the distribution of the types of care provided towards the end of the year when a turnover limit is being reached or has been reached. For example, when a hospital is reaching the turnover limit towards the end of the year, certain non-emergency procedures might be deferred, or patients will have to be referred to other hospitals, to avoid any additional financial burden. The potential occurrence of deferrals and

referrals is supported by two articles. (50,52) One article reported that local shortages and the deferral of high-risk patients could result from case mix planning. (50) Another article shared a similar sentiment, namely, that the expansion of certain DRGs could reduce access to care. (52) It is therefore expected that the number of referrals to other hospitals and length of waitlists increase towards the end of the year when hospitals are reaching or have reached the turnover limit.

In summary, it is expected that turnover limits will not affect ALOS, readmission rates, and mortality. On the other hand, it is expected that towards the end of the year, turnover limits could lead to a shift in the distribution of provided DBCs, decrease admission rates, and in return, increase deferrals, waitlists, and the number of referrals to other hospitals.

4. Quantification of the effects of turnover limits in The Netherlands

4.1 Introduction

Initially this Chapter sought out to quantify the effects of turnover limits on healthcare production of Dutch hospitals. However, based on the conclusions drawn in the previous Chapters, preliminary research on the feasibility and method for quantifying the effects, should be conducted first. The initial proposal suggested to perform the analysis on data from a health insurance company. However, upon preparation for the analysis, two main issues were identified. First, doing such an analysis would require hospital specific contract details to determine the height of the turnover limits and other agreements made. However, when further assessing data availability, it became known this information has not been recorded consistently and would require an extensive contract analysis for each hospital. Second, based on the interviews, it was concluded that many, sometimes hospital specific, variables need to be controlled for in the analysis. However, several of these external variables are not reported, and cannot be included in the analysis. Hence, if a shift in healthcare production is measured, it is not yet certain this can be attributed to turnover limits. Therefore, the following research question is established for this Chapter: “What alternate way(s) of quantifying the effects of turnover limits in The Netherlands could be used?”. This chapter will include recommendations for a quantitative research design and for any further preliminary research required.

4.2 Additional preliminary research

To first confirm there is a shift in healthcare production visible, various small analysis should be performed. First, the total amount of invoiced costs should be plotted throughout the year. An increase or decrease would mean that healthcare production varies throughout the year. Whilst this does not mean this is due to turnover limits, if these initial analyses indicate a shift in healthcare production towards the end of the year, it could be of value to perform a complete quantitative analysis. In addition, additional preliminary research should be conducted on data availability. For example, the possibilities for execution of the required contract analyses should be researched. All required data, for both the outcome measures and the external variables, are listed with potential sources and required preliminary research under Section 4.3. Based on the preliminary research, the following recommendations on research method(s), primary outcome measures, and external variables should be considered.

4.3 Recommendations

This Section contains recommendations for primary outcome measures, external variables, and research method(s). In addition, Table 4 contains a list of the required data to measure the primary outcome measures. Further, through grey literature, scientific literature, and interviews with specialists, a list of the potential external variables and sources was curated. Table 5 depicts the external variables and the associated source(s).

4.3.1 Primary data source

As the primary data source, data from a health insurance company would be most suitable. This was confirmed in a conversation on data availability with a health insurance company. In addition, when datamining is required, the health insurance companies' codebook provides insight in all available data with associated fieldnames. Data from a health insurance company will secure a variety of data on invoiced DBCs, patients, and contract details for all or most hospitals. However, when partnering with a health insurance company, it should be ensured the health insurance company utilizes turnover limits, as other agreements can still be employed. (19) In addition, some data will have to be gathered through other data sources.

As mentioned in the introduction of this chapter, the height of turnover limits has not been recorded consistently by the health insurance company in question. Therefore, an extensive contract analysis needs to be carried out. However, in a conversation with a health insurance company, it was stated that the NZa possesses all contracts between health insurance companies and hospitals as well, on which they possibly perform their annual analysis. (19) Accordingly, the NZa might have a more structured record of the height of turnover limits than the health insurance company. Assessing this possibility as an alternative for a contract analysis is recommended.

4.3.2 Primary outcome measures

When the additional preliminary research suggests a shift in healthcare production due to turnover limits, several primary outcome measures, based on grey literature searches, the interviews, and the systematic literature review, should be considered. Table 3 lists these outcome measures with suggested operationalizations and their source. Table 4 lists the required variables for the outcome measures. The Sections below report the hypotheses developed for each outcome measure.

DBC's opened

The number of DBCs opened is meant to give insight in the number of non-emergency patients receiving care at a hospital, both in anticipation of reaching a turnover limit and after the limit has been reached. It is recommended that this is measured by the number of DBC's as patients could have two, parallel, DBC's opened at the same time. Hence, the number of DBC's being opened is a better representation of total amount of care being produced and delivered.

It is recommended the number of opened DBCs are measured per day. To explain, suppose a multiple linear regression is used to determine the effects of the extent to which the turnover limit has been reached on the number of DBCs opened. In this case the extent to which the turnover limit has been reached would be the independent variable, and the number of opened DBCs the dependent variable. However, whilst the number of opened DBCs could be dependent on the extent to which a turnover limit has been reached, the opposite is also true. Meaning, the extent to which a turnover limit has been reached is dependent on the number

of DBCs opened as well. Therefore, as the influence of the daily number of DBCs opened on the extent to which a turnover limit has been reached is smaller compared to that of the weekly or monthly number of opened DBCs, this outcome measure, and the other four outcome measures, should be measured daily. This would require data on the opening date of all DBCs, which can then be sorted by date, and aggregated to determine the total number of opened DBCs per day. The data required for this part of the analysis can be gathered through a health insurance company.

Three different hypotheses were developed for this outcome measure. However, it should be mentioned that through both (grey) literature and the interviews, no insight was acquired on how often turnover limits are currently being reached, and at what time of the year. Therefore, once the contract analysis has determined the height of the turnover limit for each hospital, this should be compared with the total invoiced costs for the year, for each hospital. Because this information on the frequency of hospitals reaching a turnover limit is currently not available, whether it is expected most hospitals do or do not reach a turnover limit, has not yet been included in the hypothesis. However, it is expected that the hospitals that are approaching the turnover limit, decrease the daily number of DBCs opened, and the hospitals that are not yet approaching the turnover limit, provided that these hospitals have enough capacity, increase the daily number of DBCs opened.

Hypothesis 1: “it is expected that the total number of opened DBCs per day decreases towards the end of the year when a hospital is in anticipation of reaching a turnover limit.”.

Hypothesis 2: “It is expected that the total number of opened DBCs per day decreases further after a hospital has reached a turnover limit and the year has not yet come to an end.”.

Hypothesis 3: “It is expected that the total number of opened DBCs per day increases towards the end of the year when a hospital is not yet reaching the turnover limit.”.

If these hypotheses are not supported, this could indicate two things. First, it could be perceived as a confirmation that hospitals, as stated in the interviews, are not fully aware of how far along they are to reaching a turnover limit. Second, as invoiced DBCs will not or only partially be reimbursed after a turnover limit has been reached, this could indicate that hospitals valued the interests of patients over financial gains, which would support the statements from hospital three, stating that they will not cross the ethical boundary of applying, for example, patient stops after the turnover limit has been reached.

Distribution of type of DBCs

In Section 3.5 the global effects of the DRG-system were translated to potential effects of turnover limits. It was concluded that towards the end of the year, turnover limits could lead to a shift in the distribution of provided DBCs. The articles included in the literature review provided some information on which types of treatments were most likely to be affected by the DRG-system. For example, a study by Shin (47) reported that surgical procedures are more prone to upcoding. Further, a study by Liang (52) reported that hospitals expanded the care of more profitable DRGs in response to the DRG-system. However, these studies were conducted in countries with different healthcare systems and healthcare tariffs than in The Netherlands. In the interview with hospital number two it was stated that for example hip

and knee surgeries are more profitable than a complicated robotic treatment. In addition, a two-day clinical admission is more economical than a same-day procedure. It is therefore more economical for hospitals to have multiple day clinical admissions. Therefore, additional preliminary research, in the form of interviews, should be conducted to determine the DBCs most or least likely to be affected by the healthcare system.

Once the interviews have determined which DBCs or treatments are most or least likely to be affected when a hospital is reaching or has reached the turnover limit, and the previous outcome measure 'DBC opened' has shown whether the number of opened DBCs changes at the end of the year, it should be studied whether this effect differs for various DBCs. This should be studied using the same method as for 'DBC opened', except, only the DBCs most or least likely to be affected should be included separately in the analysis. An article by Anessi-pessina, Nieddu, and Rizzo (53) reported that private or smaller size hospitals were more likely to specialise after the introduction of a DRG-system, than public or larger hospitals. Meaning, it could be the case that the results vary based on the size of a hospital. Therefore, it is recommended to stratify based on hospital size and type of hospital. Section 4.3.3 provides further explanation on the proxy for the variable hospital size.

Because it is not yet known which DBCs are most or least likely to be affected, this is not included in the current hypothesis. Yet, the following hypothesis was developed:

Hypothesis 4: "It is expected that certain DBCs will experience a larger decrease or increase in number of opened DBCs than others, when a turnover limit is being reached or has been reached."

Deferrals

In the interview with hospital two it was stated that there is no rule that states that a hospital cannot wait three weeks until a new DBC can be opened in the new year. Yet, they also state that methods like these, to keep costs under the turnover limit, are rarely utilized. Hence, the effects of turnover limits on both the average number of days between a referral from a general practitioner and the opening of a DBC, and the average number of days between one DBC closing and the opening of a new DBC should be measured. This would require data on the opening date of a DBC, the closing date of a DBC, and the date of an appointment at the general practitioner, which could all be acquired through a health insurance company. The average days between a referral and the opening of a DBC should be compared throughout the period when the hospital is gradually approaching the limit, potentially reaching the limit, and starting the next year with a new turnover limit. The same approach should be taken for the number of days between one DBC closing and another DBC opening. As mentioned in the previous outcome measure 'distribution of type of DBCs', it is expected that certain DBCs are affected more or less by turnover limits than others. Therefore, once these specific DBCs have been determined, the effects on these specific DBCs should be measured as well. Based on the interview with hospital two it is expected that when a turnover limit has already been reached, hospitals might delay the opening of a new DBC to the new year, to avoid additional costs. Therefore, it is important to include the following year when counting days between the referral or the closing of a DBC and the opening of a (new) DBC. Many other variables, such as vacations and national holidays, could influence the average days between a referral

or one DBC closing and a (new) DBC opening. These variables are reported on in Section 4.3.3. The following hypotheses were developed:

Hypothesis 5: “It is expected that after the turnover limit has been reached, the days between a referral from a general practitioner to the opening of a DBC increases compared to the rest of the year when the turnover limit has not yet been reached. This to avoid additional costs for the year, by delaying the opening of new DBCs to the next year with a new turnover limit.”.

Hypothesis 6: “It is expected that after the turnover limit has been reached, the days between one DBC closing to the opening of a new DBC increases compared to the rest of the year when the turnover limit has not yet been reached. This to avoid additional costs for the year, by delaying the opening of new DBCs to the next year with a new turnover limit.”.

Waitlists

Through the systematic literature review, interviews and grey literature, it was concluded that an increase in the length of waitlists could result from hospitals reaching or having reached a turnover limit. It is expected that when the average number of days between a referral from a general practitioner increases the length of waitlists increases as well. Therefore, the length of waitlists throughout the year could potentially support the hypothesis that reaching a turnover limit, leads to deferred planned care. Every week each hospital is required to notify the NZa on the current waiting times for planned outpatient visits, diagnostics, and treatments. (54) Following, the website ‘Zorgkaart Nederland’ will provide an overview of the waiting times in days per department or most demanded treatments for each hospital. (55) To measure a potential increase in waitlists, per hospital, the average length of waitlists in days should be compared throughout the year when a hospital is reaching and has potentially reached a turnover limit. However, like measuring the days between the referral or the closing of a DBC and the opening of a (new) DBC, many variables can influence an increase in waitlists and should therefore be included in the analysis. As mentioned in the outcome measure ‘distribution of type of DBCs’, it is expected that certain DBCs are affected more or less by turnover limits than others. Therefore, once these specific DBCs have been determined, the effects on the length of waitlists for these specific DBCs/treatments should be measured as well. The following hypothesis was developed:

Hypothesis 7: “It is expected that after the turnover limit has been reached the (average) length of waitlists for planned care increases.”.

Referrals

The systematic literature review as well as the interviews and grey literature indicated that turnover limits could lead to an increase in referrals between hospitals. Based on the assumption that patients’ hospital of choice is the hospital closest to their home, whether patients had to attend a hospital different than their hospital of choice due to the turnover limit being reached, could potentially be measured by distance between the patients and hospitals address. Because, based on this assumption, patients would have to travel further to a hospital that has not yet reached the turnover limit, it is expected that the average distance travelled by patients increases at the end of the year at hospitals that have not yet reached their turnover limit. Because of the continuing obligation after a hospital has reached the turnover limit, the distance patients travel to a hospital is expected to remain equal for

hospitals that have reached the turnover limit. Once more, as mentioned in the outcome measure ‘Distribution of type of DBCs’, it is expected that certain DBCs are affected more or less by turnover limits than others. Therefore, once these specific DBCs have been determined, the effects on referrals for these specific DBCs should be measured as well. All data required for this proxy can be acquired through the health insurance company. Again, several other variables, such as the specialisation of a hospital, can influence the average distance patients are prepared to travel to a hospital. These variables will have to be included in the analysis as well. The following hypothesis were developed:

Hypothesis 8: “It is expected that at the end of the year, when a hospital has not yet reached the turnover limit, the average distance patients travel to the hospital increases compared to the rest of the year.”.

Hypothesis 9: “It is expected that at the end of the year, when a hospital has reached the turnover limit, the average distance patients travel to the hospital remains equal compared to the rest of the year.”.

Table 3 Outcome measures

Outcome measure	Proxy	Derived from
1. DBCs opened	Number of opened DBCs per day	Systematic literature review, interviews, and grey literature
2. Distribution of type of DBCs	Number of opened DBCs per day per type of DBC	Systematic literature review and interviews
3. Deferrals	Number of days between referral from general practitioner and the opening of a DBC Number of days between closing of a DBC and opening of a new DBC	Systematic literature review, interviews, and grey literature
4. Waitlists	Length of waitlists in days	Systematic literature review, interviews, and grey literature
5. Referrals	Distance between the patients’ house and the hospital	Systematic literature review, interviews, and grey literature

Table 4 Required variables for outcome measures

Required variables for each hospital (per day)	Source
1. Height of turnover limit	Contracts health insurance company/NZa
2. Total invoiced costs	Health insurance company
3. Total reimbursed costs	Health insurance company
4. Height of waitlists	Health insurance company/NZa/’Zorgkaart Nederland’
5. Total number of referrals to another hospital	Health insurance company

6.	Date of appointment with general practitioner per patient	Health insurance company
7.	Postal code & city	Health insurance company
	Per invoiced DBC	Health insurance company
8.	Opening date of DBC	Health insurance company
9.	Closing date of DBC	
10.	Total invoiced costs	Health insurance company
11.	Total reimbursed costs from total invoiced costs	Health insurance company
12.	Type of DBC/type of visitation/type of admission (consultation, outpatient visitation, day admission, 2-5 days, 5+ days)	Health insurance company
	Per patient	
13.	Postal code & city	Health insurance company

4.3.3 Other (confounding) variables

When analysing the effects of turnover limits on the healthcare production of hospitals, the potential effects from other variables on healthcare production, such as vacations and national holidays, should be considered as well. Through grey literature, scientific literature, and interviews with specialists a list of control and potential confounding variables and sources was curated. Table 5 depicts the variables and the associated source(s). The variables are divided into patient characteristics, hospital characteristics, contract analysis, and other variables.

First, the following patient characteristics should be controlled for: age category, gender, presence of chronic diseases or comorbidities, number of annual hospital appointments, and In-kind or restitution policy. Due to the required data on both hospital level and patient level, it is recommended further research be performed on the multilevel modelling approach. In a conversation with a data analyst from a health insurance company it was recommended that the presence of chronic diseases should be expressed through Diagnosis Costs Groups (DKG). By means of certain specialism codes, patients receiving specialist medical care are divided into groups. Based on severity, complexity, and comorbidities, patients get classified in different groups, which gives an indication of the presence of chronic diseases or comorbidities. In addition, it was recommended that codes DKG 1 to 15, 98, and 99 be used for the analysis. (56) Both grey literature (28), explained in Section 2.3 ‘The current use of turnover limits’, and the interviews have confirmed that patients with a restitution policy will likely not experience any negative effects from turnover limits, whereas patients with an in-kind policy will. All non-identifiable patient level variables can be gathered through the health insurance company.

Second, alongside patient characteristics, hospital characteristics should be controlled for as well. The following variables should be included in the analysis: type of hospital, hospital size, specialism, and the presence of collaborations with clinics or other hospitals. It is recommended that hospital size is measured by the number of beds, as this will also give an indication of hospital capacity. The presence of collaborations with clinics or other hospitals,

as mentioned in this (4) news article, can offer hospitals a way to reduce healthcare production when necessary and should therefore be included in the analysis. The best data source for this information should be further researched.

Third, as mentioned before, a contract analysis needs to be performed to gather the following contract specific details, alongside the height of turnover limits: agreements on partial ceilings, additional agreements, such as offset agreements, and agreements on a continuing obligation. These contract details were derived from the interviews, but the contract analysis will likely expand on these variables. As mentioned in the interviews, partial ceilings can be agreed upon for specific treatments or specialisms. In that case the DBC-products associated with a partial ceiling should be analysed separately, as these do not count towards the general turnover limit. The same should be done for potential additional agreements. Further, the presence of a continuing obligation, meaning that a hospital is not allowed to terminate a treatment, should be reported, and included in the analysis, as this will influence the effects.

Lastly, the influence of several variables should either be included in the analysis or discussed after the analysis. The following variables should be included in the analysis: vacations and national holidays, number of general practitioners in the country, and the presence of public healthcare screenings. The potential influence of these other variables should be discussed with the involved parties, such as the hospital, after the analysis has been performed: the delivery of resources, hospital staff shortages, policyholder mutation, and depending on the time-period any remaining capacity effects of the pandemic. The interview with hospital two disclosed that the hospital differentiates between low-capacity and high-capacity weeks. Specifically vacations and national holidays lead to a low-capacity week. As vacations differ per region, per hospital, it should be assessed what region it belongs to, and regions specific holidays, such as carnival, should be included as well. Further, the interviewees stated that various hospital specific variables can influence capacity, and therefore healthcare production. Specifically, the delivery of resources was mentioned as an important factor, as a delay in resources required for a treatment will cause deferrals as well. Potential influences of these variables that could explain results from the analysis, should be analysed with the given hospital after the analysis is performed, to assure the perceived effects can be attributed to turnover limits.

The potential influence of variables such as policyholder mutation, staff shortages, and, depending on the time-period, the effects of the pandemic should be evaluated with the hospitals as well. The interview with a health insurance company revealed that the introduction of public healthcare screenings influenced healthcare demand, and therefore healthcare production. In addition, the interviewee mentioned that treatments resulting from public healthcare screenings could be included in a partial ceiling. The Netherlands carries out three public healthcare screenings, namely, for breast cancer, cervical cancer, and colon cancer. Whilst the breast cancer screenings are done by professionals, the screenings for cervical and colon cancer are carried out independently continuously throughout the year. (57–59) Hence, there is no specific time-period these screenings will affect healthcare production. Therefore, a contract analysis should identify whether these treatments are included in a partial ceiling or other additional agreement. If not, public healthcare screenings do not need to be controlled for in the analysis.

The final variable is the number of general practitioners, which was identified as a potential influence on admission rates, and thus the daily number of DBCs opened, from the interview with hospital three. In the interview the interviewee mentioned that there are fewer general practitioners, resulting in more referrals to medical specialist care. Whilst there are no recent reports on the number of general practitioners available, NIVEL reported that in 2021, 76.6 percent of patients had contact with a general practitioner on one or more occasions, which is lower than in 2019. However, the same report states that for every thousand patients, 327.1 referrals are made, which is an increase of 7 percent compared to 2019. (60) Hence, the extent to which general practitioners influence healthcare production is unknown. Yet, if a credible source on the number of practitioners can be acquired, it should be controlled for in the analysis.

Table 5 Other (confounding) variables

Variables	Source(s)	Derived from
Patient characteristics		
1 Age category	Health insurance company	Systematic literature review
2 Gender	Health insurance company	
3 Presence of chronic diseases or comorbidities (DKG 1 t/m 15, 98 & 99)	Health insurance company	Systematic literature review
4 Number of annual hospital appointments	Health insurance company	Systematic literature review
5 In-kind or restitution policy	Health insurance company	Grey literature & interviews
Hospital characteristics		
6 Type of hospital (academic, general, etc.)	Health insurance company	Systematic literature review
7 Hospital size (number of beds or yearly revenues)	Annual report hospitals	Systematic literature review & interviews
8 Specialism	Contracts health insurance company/NZa	Systematic literature review & interviews
9 Collaborations with clinics or other hospitals	Hospitals	Grey literature
Contract details		
10 Partial ceilings	Contracts health insurance company/NZa	Interviews
11 Additional agreements (offset agreements)	Contracts health insurance company/NZa	Interviews
12 Continuing obligation	Contracts health insurance company/NZa	Grey literature & interviews
Other variables		

13	Vacations & national holidays (per region)	National calendar	Interviews
14	Delivery of resources	Confirming through interview	Interviews
15	Policyholder mutation	Confirming through interview/Contracts health insurance company/NZa	Interviews
16	Staff shortages	Confirming through interview	Grey literature
17	Number of general practitioners	Unknown	Interviews
18	Effects of the pandemic (depending on time-period)	Confirming through interview	Grey literature & interviews
19	Public healthcare screenings	Website 'Bevolkingsonderzoek Nederland'	Interviews

4.3.4 Method(s)

In preparation for the quantitative analysis that would initially be carried out, a variety of research methods were discussed. After researching a wide variation of methods, either the difference-in-differences (DID) method or a multiple linear regression appear to be the most suitable methods to study the effects of turnover limits.

DID is commonly used to measure the effects of new public health policies. (61) In addition, three studies (47,49,51) included in the systematic literature review used DID to analyse the effects of the DRG-system. DID's main strength is that it can be performed on either group or individual level data, and that it takes change due to other variables into account. However, there are several limitations, and conflicts with two of the four main assumptions required for DID. The main limitation is the need for a control group. (62) Solutions for this limitation could be patients with a restitution policy, as they likely will not experience any of the effects of turnover limits, or the use of time series forecasting, (48) to predict healthcare production without a hospital reaching the turnover limit. Another possible solution would be to use a hospital that did not reach the turnover limit as a control group. However, one of the four, and most critical, assumptions for an internally valid DID analysis is the parallel trend assumption, which means that the intervention and control group need to have parallel trends in outcome. (62) Therefore, the hospital used as the control group generally requires a similar trend in healthcare production. Because there is no statistical test to assess the parallel trend assumption, a visual analysis of the trend is required in preparation. Generally, a smaller time-period increases the chances of the assumption being met. (62) However, because the effects of turnover limits should be measured throughout the year, the smallest time-period possible is one year.

Suppose DID is used to determine the effects of the extent to which the turnover limit has been reached on the number of DBCs opened, and another hospital which has not reached

the turnover limit is used as the control group. This would require the data of two hospitals, of which one has reached the turnover limit, and of which one did not. To find a hospital with a parallel trend of the daily number of DBCs opened to the point that one of the hospitals has reached their turnover limit, the daily number of DBCs opened for all hospitals included in the analysis, should be plotted. Following, for each hospital that has reached their turnover limit, a hospital which has not should be identified. However, there is one presumption why for this specific outcome measure, the parallel trend assumption cannot be met when using another hospital as the control group. As the size of a hospital is taken into account when determining the height of a turnover limit, hospital size does not influence whether a hospital reaches its turnover limit. Meaning, regardless of hospital size, if two hospitals have a parallel trend of the daily number of DBCs opened, they will likely either both reach their turnover limit or not. Therefore, it can be assumed that you likely cannot find two hospitals with a parallel trend in the daily number of DBCs opened, up to the point of which one hospital has reached their turnover limit and the other has not. Hence, for this specific outcome measure the use of time series forecasting, to predict the daily number of DBCs opened if the turnover limit had not been reached, is recommended as the control group.

Further, the initially perceived lack of an independent variable conflicts with the second assumption required for a DID analysis. This assumption states that the intervention, in this case reaching the turnover limit, is not allocated by the outcome measure, of which one is the daily number of DBCs opened. (62) However, as explained in Section 4.3.2, this assumption can be met by measuring the outcome measures per day. In summary, if the parallel trend assumption can be met, it is recommended that the DID method be used. Otherwise, a multiple linear regression would be a suitable method as well.

5. Discussion & Conclusion

This research consisted of a grey literature review, interviews, a systematic literature review, and recommendations for a quantitative analysis. This Chapter will provide a critical overview of the results, the strengths and limitations of the study, recommendations for further research, and the conclusion.

5.1 Review of results, and strengths and limitations

In Chapter 2, “The utilization of turnover limits”, a grey literature review was followed by interviews with various actors in the Dutch healthcare system. This study is the first study in potentially a series of studies that assess the effectiveness of turnover limits. Therefore, this chapter was used to gather a full understanding of turnover limits, the place they hold within the Dutch healthcare system, and to detect potential discrepancies between theory and practice. The main takeaway from the initial grey literature review was that little information can be found on turnover limits, their introduction, and the reasoning behind their introduction. This became not only clear from grey literature but was later also supported by the interviews and the lack of articles identified in the systematic literature review.

Three main conclusions from the interviews will be discussed. First, the patient federation stated that patients often do not take turnover limits into account when choosing a health insurance company. Given the lack of accessible information on turnover limits, this is not unexpected. However, in 2019 the NZa implemented a regulation stating that health insurance companies are obligated to notify customers on which healthcare providers are contracted, the utilization of turnover limits, and the potential effects, through the companies’ website. (63) Nevertheless, according to the Dutch patient federation patients still do not take turnover limits into account. There are two possible explanations for this. Either the regulation to extend information has not yet been effective in informing the affected patients on turnover limits, or patients’ priorities when choosing a health insurance company and policy lie elsewhere.

Second, there appears to be a difference in opinions on whether hospitals adjust healthcare production in anticipation of reaching a turnover limit. First, in terms of adjusting healthcare production, whilst all hospitals stated they do not adjust healthcare production to avoid reaching a turnover limit, the interviewee from the health insurance company believes the opposite is true. On the other hand, whilst initially the interviewee from hospital one stated that patients do not experience effects from turnover limits, later the interviewee stated that there is a difference in effects for patients with a restitution policy and an in-kind policy, contradicting the earlier statement that no patient experiences effects. Moreover, even though hospitals state they do not apply these methods, the interviewees from hospital two and three acknowledge this would be possible. With the interviewees from hospital two even stating it would be valuable to know which treatments are most profitable. Because there has been no previous research on the effects of turnover limits, it is difficult to verify these results. Whilst there have been reports on hospitals enforcing admission stops due to turnover limits, (1) I was unable to find reports on other methods hospitals have used to adjust healthcare

production, such as adjusting the distribution of provided care. This further supports the importance of a quantitative analysis of the effects of turnover limits.

Third, there also appears to be a difference in opinions on the effectiveness and the justification of the utilization of turnover limits. Whilst health insurance companies appear to find the application of turnover limits an effective solution to the rising healthcare costs, hospitals appear to disagree. Even though the interviewee from hospital three agrees it is effective in terms of decreasing national healthcare costs, the interviewee states that it mainly benefits the health insurance companies by reducing their financial risk. In addition, the interviewee from hospital three states that the hospital views adjusting healthcare production as unethical and therefore restrains from applying such methods.

For both conclusions it is important to note that aside from the Dutch patient federation, merely three hospital representatives and one health insurance company representative were interviewed. Therefore, these results are not generalisable to all hospitals and health insurance companies. More interviews should be conducted to increase reliability. For example, as explained in Section 4.3.2, additional interviews on the potential shift in the distribution of DBCs should be conducted. Further, Section 4.3.4 addressed the complications of a quantitative analysis. If it is not possible to quantify the effects of turnover limits on hospitals' healthcare production, more interviews should be conducted to determine the effects in The Netherlands. In addition, it could be of value to conduct a survey amongst Dutch patients to determine the knowledge and potential experiences with turnover limits in medical specialist care. Finally, as the grey literature review uncovered that the NZa and ZIN have recently become more critical towards the effectiveness of turnover limits (8,17), the opinions of parties such as the NZa and the ministry of VWS would be a valuable addition.

Chapter three, 'The global effects of turnover limits', researched the potential effects of turnover limits. This was done by conducting a systematic literature review on the effects of the DRG-system, after which the results were translated to effects of turnover limits in Section 3.5 'Translating global results'. After translation it was concluded that towards the end of the year, turnover limits could lead to a shift in the distribution of provided DBCs, decrease admission rates, and in return, increase in deferrals, waitlists, and the number of referrals to other hospitals. As mentioned in Section 3.5, in what way these measures were affected by the DRG-system, expectedly differs from how they would be affected by turnover limits. However, whilst the extent to which these variables were affected might differentiate, as turnover limits were introduced to combat the production incentives from the DRG-system, the type of variables that are affected remain the same. Therefore, the affected variables resulting from the systematic literature review are considered a valid representation of the potential effects of turnover limits.

Having said that, based on the systematic literature review, interviews, and grey literature review, the hypothesis for the outcome measures in Chapter 4 include estimates of in what way the outcome measure will be affected. If a statistical analysis shows that the direction in which the outcome measure was affected differentiates from the hypothesis, this could possibly be explained by the fact that the articles included in the systematic literature review were conducted on healthcare systems other than The Netherlands. Whilst all countries included in the results have a DRG-system like The Netherlands, other parts of the funding system might differentiate from the Dutch healthcare system. For example, an American

study (40) on the effects of the DRG-system on costs and quality of care was included in the results. However, as the Dutch and American healthcare system differ fundamentally, it is plausible the effects would differ or be of different significance in The Netherlands.

Finally, it is important to note that all these six outcomes from the systematic literature review are not only affected by the financial limitations generated from systems like the DRG-system or turnover limits. Measures such as admission stops, and waitlists are greatly affected by healthcare demand and hospital capacity. (20) To specify, in the interview with the capacity management of hospital two, the interviewees stated that due to the under-capacity during Covid-19, healthcare demand has decreased. As a result, in contrast to previous years, the hospital is actively trying to move towards reaching the turnover limit. In addition, a recent article on the structural effects of turnover limits, insinuates that as a result of turnover limits, available hospital capacity remains unutilized, further elongating waitlists. (64) Hence, further research and discussions on payment systems should put more emphasis on hospital capacity.

5.2 Recommendations for further research and discussions

Aside from turnover limits potentially affecting medical specialist care, several news outlets have reported on turnover limits posing an issue in the mental health care sector. One article reported that in 2018 two third of independent and one third of contracted institutions were obligated to enforce an admission stop. (65) In addition, a recent article from the NRC on the new healthcare outline agreement, emphasized that the waitlists for mental health care have been a result of years of deficient turnover limits. (66) Hence, it would be of value to assess the potential for quantifying the exact effects of turnover limits on mental healthcare as well.

Finally, both the article by Frakt and Mayes, (16) and the interviews with the hospitals, state that the DRG-system and turnover limits shift the financial risk from the health insurance company to the healthcare provider. It is known that in the past this has led to hospitals feeling obligated to enforce an admission stop. (1) In response, in 2019, congress send a letter to then minister Bruins asking for accountability from him. (31) However, even though turnover limits have been discussed several times, no lasting discussion or systematic change has occurred. This brings up two questions. First, is it justified to shift this financial pressure to healthcare providers, when, at least according to the interviewees, hospitals do not want to adjust health care production to limit financial burden, and when they do, they get critiqued? Second, if this truly is believed to be the best way to combat increasing healthcare costs, what do we as a society consider to be the ethical boundaries of adjusting healthcare production to avoid reaching a turnover limit?

This research provided insight into several parties' opinions and experiences with turnover limits. However, on top of a lack of general information on turnover limits, most of these opinions had not yet been reported on, and there seems to be a lack of communication between the involved parties. However, three parties have reported on potential alternatives for turnover limits. For example, the Dutch Consumers Association has vocalised their wishes for a ban on the use of turnover limits and continuing obligations. (39) However, as long as turnover limits are still utilized, the association proposes two solutions. First, patients that are affected by turnover limits, should be able to change health insurance companies during the

year. Second, the association advocates to ban admission stops throughout the year. (67) Further, together with the ZIN, the NZa has started to view the effectiveness of turnover limits more critically, and both the ZIN and NZa have recommended that parties involved start researching other possible financial agreements to include in contracts. (8,17) The NZa believes the future of the Dutch healthcare system consists of patient centred care, through for example the JZOJP initiative. However, production agreements such as turnover limits prevent a reorganisation of healthcare. Instead of turnover limits, the NZa proposes the utilization of an outline agreement for multiple years, which would provide hospitals with the financial freedom required for the reorganisation of healthcare. This reorganisation could for example entail a partial shift to primary care or an increase in telemonitoring. However, the NZa emphasizes on the importance that to achieve a reorganisation of healthcare, all parties involved need to participate equally. (8) Hence, as turnover limits currently are such a fundamental part of the Dutch healthcare system, I believe its effectiveness and potential alternatives, such as suggested by the NZa and the Dutch Consumer Association, should be further assessed by all involved parties.

Closing, as Section 5.1 briefly stated, there is a correlation between hospital capacity and turnover limits. (64) Specifically, during the Covid-19 pandemic when capacity decreased, 305.000 operations got delayed (68) and the intensive care unit overflowed, which eventually led to the discussion on which patients should receive priority. (69) Whilst the Covid-19 pandemic was a unique situation, healthcare demand continues to rise in a time when cost-reduction is prioritised. Therefore, I believe a societal discussion should be held to determine the best way to maximise capacity, whilst maintaining the ethical boundaries of adjusting healthcare production.

5.3 Conclusion

This research set out to answer the following research question: “How do turnover limits affect healthcare production of hospitals, and therefore patients, in The Netherlands?” In general, it can be concluded that there currently is a lack of information on turnover limits and their effects. However, from grey literature, interviews with involved actors, and a systematic literature review it can be concluded that there are five potential effects of turnover limits: a shift in the distribution of provided DBCs, a decrease in admission rates, and in return, an increase in deferrals, waitlists, and in the number of referrals to other hospitals.

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Appendix A

Dutch Patient Federation

- 1** What is the patient federation's opinion on the use of turnover limits?
 - 2** Does the patient federation consider turnover limits to be a positive development?
 - 3** Does the patient federation notice any negative effects for patients?
 - 4** Does the patient federation receive any complaints on turnover limits from patients?
 - 5** Would the patient federation like to see changes to the system, and if so, what changes should be made?
 - 6** What methods do hospitals utilize to avoid reaching a turnover limit?
 - 7** Does the patient federation notice an increase in referrals due to turnover limits being reached?
 - 8** Does the patient federation notice an increase in the length of waitlists due to turnover limits being reached?
 - 9** Do patients take turnover limits into consideration when choosing a health insurance company?
 - 10** Are there any noticeable differences in effects between different health insurance companies?
 - 11** Considering your vision for the future, what role could turnover limits play in that future?
 - 12** What is the patient federation's opinion on competition between healthcare providers?
-

Hospital 1

- 1** When were turnover limits introduced?
 - 2** Is there one turnover limit for the entire hospital?
 - 3** What does a turnover limit entail?
 - 4** What is the usual timeline of negotiations?
 - 5** Are there often differences between turnover limits with different health insurance companies?
 - 6** How is the height of a turnover limit determined?
 - 7** To what extent is the height of turnover limits negotiable?
 - 8** What is the usual procedure for negotiations between hospitals and health insurance companies?
 - 9** How frequently is a continuing obligation included in contracts?
-

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- 10** Is it possible to increase the height of a turnover limits during the year?
-
- 11** Are there departments that generally contribute the most to reaching the turnover limit?
-
- 12** Are there departments that generally contribute the least to reaching the turnover limit?
-
- 13** What methods do hospitals utilize to avoid reaching a turnover limit?
-
- 14** Is there a difference in effects between patients?
-

Hospital 2

- 1** What methods do hospitals utilize to avoid reaching a turnover limit?
-
- 2** Is there an increase in referrals due to turnover limits being reached noticeable towards the end of the year?
-
- 3** Are there certain periods of the year that the hospitals generally have less capacity?
-
- 4** How frequently are turnover limits being reached?
-
- 5** Are there certain periods of the year when waitlists are generally longest?
-
- 6** How is the hospital's turnover limit divided across all departments?
-

Hospital 3

- 1** How frequently are turnover limits agreed upon compared to other agreements, such as contract prices?
-
- 2** To what extend is the height of turnover limits negotiable?
-
- 3** What is the usual procedure for negotiations between hospitals and health insurance companies?
-
- 4** How is the height of a turnover limit determined?
-
- 5** How can hospitals improve their positions during negotiations?
-
- 6** Which factors cause the differences in contracts with different health insurance companies?
-
- 7** How frequently is a continuing obligation included in contracts?
-
- 8** How frequently are offset agreements included in contracts?
-
- 9** Is it possible to increase the height of a turnover limits during the year?
-
- 10** How frequently are partial turnover limits included in contracts?
-
- 11** How frequently are turnover limits being reached?
-
- 12** Are the involved parties (hospitals and health insurance companies) aware of their position regarding reaching a turnover limit?
-

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- 13** What are the positive and negative effects of turnover limits?
-
- 14** Is there a difference in effects between patients with different types of health insurance policies (Restitution, in-kind, and combination policy)?
-
- 15** What methods do hospitals utilize to avoid reaching a turnover limit?
-
- 16** What is your organisations' opinion on the use of turnover limits? (Effective method for cost reduction?)
-

Health insurance company

- 1** When were turnover limits introduced?
-
- 2** What is the usual procedure for negotiations between hospitals and health insurance companies?
-
- 3** How is the height of a turnover limit determined?
-
- 4** Which factors cause the differences in contracts with different hospitals?
-
- 5** How frequently are partial turnover limits included in contracts?
-
- 6** How frequently is a continuing obligation included in contracts?
-
- 7** Is it possible to increase the height of a turnover limits during the year?
-
- 8** How frequently are turnover limits being reached?
-
- 9** Are the involved parties (hospitals and health insurance companies) aware of their position regarding reaching a turnover limit?
-
- 10** What is your organisations' opinion on the use of turnover limits? (Effective method for cost reduction?)
-