Master thesis

Case mix in the Dutch health care system: Is case mix reflected in the negotiated price of a DTC?

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Date: 24 January 2012

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Introduction

In 2006, the Dutch health care system has shifted towards a more market-oriented health care system for specialist medical care. With the introduction of the Diagnosis Treatment Combination (DTC) system, specialist medical care has become a predefined interchangeable product. Negotiations on price, volume and quality are expected between hospitals and health care insurers. Each DTC can be priced differently per hospital and health care insurer. Price differences can be caused by differences in patient population, based on clinical severity and patient characteristics, which influences care consumption and resource use. According to the literature, there is a need to adjust for case mix to avoid selection and to create an appropriate reimbursement. Therefore, this study investigated whether case mix is discussed in the negotiations and whether case mix is reflected in the negotiated price of a DTC. This study used age, gender, continuation of indication, referral, chronic illness, multiple DTCs, diabetes and socioeconomic status (SES) as parameters of case mix. The following diagnoses were involved in this study: knee osteoarthritis, cataract, meniscus lesion and hernia of the nucleus pulposus (HNP).

Methods

This study used a mixed method approach. Quantitative data were obtained from the database of a Dutch health care insurer. This database contained information of the case mix parameters and negotiated prices over the years 2007 to 2009 for the six DTCs that were involved in this study. Although the original dataset consisted of observations per insured, the data were aggregated on hospital level. The relationship between the case mix parameters and the negotiated price of a DTC was tested with Pearson correlation tests, multiple hierarchical regressions, which adjusted for the effect of type of institution, and fixed-or random-effects regressions. In the correlation tests and hierarchical regressions, a weight for hospital size was included. For the qualitative analyses, data were obtained from semi-structured interviews which were conducted with seven respondents from hospitals and from a health care insurer who were involved in the negotiations between hospitals and health care insurers. Important subjects of the interview were the respondents' thoughts about case mix and the role of case mix, the necessity to adjust for case mix and the practical implications of the results of the quantitative analyses. The interviews were analyzed by coding and categorizing the transcribed text.

Results

The results of the hierarchical multiple regressions, which were performed for each year separately and adjusted for type of institution, did not show a clear relationship between the case mix parameters and the negotiated price of the DTC except for the diagnosis cataract. Over the years, the adjusted R squares range from 9.8% to 16.1%. Significant parameters were gender, multiple diagnoses, referral and chronic illness. The variable for SES2 showed a significant negative contribution which was in line with the results of the correlation test. The results of the panel data regressions, which combined the

data of all years, showed that the case mix parameters explained a significant part of the variance in the price for the diagnoses cataract (Adj. R2=0.478) and meniscus lesion (Adj. R2=0.131). However, for meniscus lesion the hierarchical multiple regressions only showed a significant relationship between the case mix parameters and the price in 2009 (Adj R2=0.07) and not in 2008. Therefore, it can be concluded that case mix differences are only reflected in the price of cataract.

Based on the qualitative analyses, it can be concluded that case mix played a limited role during the negotiations. In addition, case mix was not directly translated in the price of a DTC, but only indirectly by differentiating between types of institutions or by encouraging hospitals to use their cost prices. Some respondents mentioned that a direct translation would be desirable if a relationship between case mix and costs could be proved. However, practical problems as the lack of clear criteria and a uniform definition of case mix impede this.

Discussion

In this study, case mix is defined very broadly based on the literature. However, not all case mix parameters from literature were used in the qualitative and quantitative analyses since this study focused on case mix differences *within* a DTC. Although during the interviews respondents mentioned that comorbidity and age were important parameters of case mix, the currently performed quantitative analyses gave no clear evidence for a relationship between case mix parameters and the price. This lack of significant results can be caused by the use of negotiated prices instead of cost prices or can be due to other causes for price differences, like quality of care. Another possible explanation, which is indicated by the literature, descriptive statistics and results of the interviews, is that case mix and price differences only exist between types of institutions, while this study adjusted for the influence of type of institution. Besides, insignificant results may be due to the fact that currently, case mix does not play a role during price negotiations. For cataract, case mix seems to be reflected in the DTC price which can be explained by the clear structure of the DTC, the non-complex nature of the treatment and the higher competition level of ITCs on the market. An additional conclusion that can be drawn, based on the insignificant quantitative results, is that the aim of the Risk Equalization Fund, which is reducing the incentive for selection, does not seem to be achieved.

Recommendations for further research are the development of general and disease specific parameters of case mix, the development of a uniform general definition of case mix, the use of case mix parameters from hospitals, the use of cost prices and the investigation of the way case mix is expressed in the DOT system.

1. Introduction

Patient populations can differ considerably between hospitals. In the Netherlands, a recent study about treatments of the liberalized segment showed that complex patients were mostly treated in academic hospitals, while general hospitals treated patients with minor risks. Patients in academic hospitals had significantly more additional diagnoses and a significantly higher ASA-score[1]. The author stated that regulated competition leads to an unfairly shift of relatively unhealthy patients from general hospitals to academic hospitals which is undesirable since it indicates patient selection (Medisch Contact 2011).

In 2006, the Dutch health care system has shifted towards a more market-oriented health care system for specialist medical care. This includes a liberalized segment of care for which local negotiations on price, volume and quality are encouraged between hospitals and health care insurers. Therefore, a new reimbursement system was introduced: the Diagnosis Treatment Combination (DTC) system. With this system, specialist medical care has become a predefined interchangeable product. Hospitals receive a predefined amount of money for each DTC they provide regardless of the exact input of care for an individual patient. This implies that a hospital can both make a profit and incur a loss per DTC depending on how much resources the patient exactly uses. Since insurers are able to make profit, they bear risk and have an interest to negotiate a price that reflects the costs (Enthoven&Van de Ven 2007:2422). Additionally, the role of the health care insurer as purchaser of care will become increasingly important since the Dutch government wants to remove the ex-post cost compensation between 2012 and 2015 which increases the financial risk of health care insurers (Rijksoverheid 2011b).

Price liberalization means that every DTC from the liberalized segment can be priced differently at every hospital and for every health care insurer. Sometimes, price differences are related to the quality or organization of care. In addition, they can be caused by differences in patient population or case mix which is the focus of this study. Case mix is translated into clinical severity and patient characteristics which influence care consumption and resource use (Marazzi et al. 2007:203). For instance, an older patient will have more care requirements and therefore a higher case mix (Street et al. 2010:152). During the negotiations between health care providers and health care insurers about the price, case mix can play a role. For instance, hospitals would like to receive a price that reflects their costs. However, for health care insurers it is difficult to evaluate both the case mix of the hospital and how case mix is related to the price, due to information asymmetry between insurers and providers. This means that health care insurers have less information about the patient population of hospitals and thus about their case mix (De Boo et al. 2008:6).

From the literature, there is some evidence to conclude that there is a need to adjust the price for case mix. An adjusted price would probably give a better insight of the real costs and will therefore lead to a better reimbursement (Street et al. 2010; Weissert&Musliner 1992; Söderland et al. 1995; Löbbes 2011). By adjusting for case mix, insurers distribute their funds more fairly to hospitals that

[1] The ASA-score is a global score that divide patients into five categories regarding their physical health status before surgery.

treat complex patients. When hospitals receive money in accordance with the case mix of their patients, this can serve as a disincentive for selecting patients. Therefore, it is desirable that case mix is translated in the price of a DTC since otherwise adverse effects will arise like 'cherrypicking'. Currently, adjustment takes place between health care insurers based on insured characteristics. The Risk Equalization Fund (REF) compensates health care insurers financially for high-risk insured, while health care insurers have to pay an equalization payment to the REF for low-risk insured (Van de Ven&Schut 2008:774). So while compensation between insurers is arranged, it would be desirable that the adjustments are also expressed in the price agreements between health care insurers and hospitals. However, information about the relation between case mix and price agreements is currently unavailable.

Parameters that are known to influence case mix are age, gender, number of diagnoses, multiple DTCs, comorbidity, number of procedures, continued DTCs, referral, chronic illness, diabetes, transferring of patients, length of stay and functional dependency (Street et al. 2010:152; Marazzi et al. 2007:203; Greenfield et al. 1995:AS48; De Boo et al. 2008:7; Björkgren 2004:465).

In this study, the relationship between some of these case mix parameters and the negotiated prices is analysed for the following diagnoses: knee osteoarthritis, hernia of the nucleus pulposus (HNP), meniscus lesion and cataract. Some of the case mix parameters are similar to the parameters of the risk equalization between health care insurers. Interviews were conducted to investigate the role of case mix in the negotiations and the desirability to adjust for case mix.

The **problem statement** central to this research is:
Is case mix, based on information of a Dutch health care insurer, reflected in the negotiated price of a DTC and is case mix discussed in the negotiations between the hospital and the health care insurer?

To answer this problem statement, five research **questions** are composed:

1. How is the Dutch health care system designed, especially with respect to reimbursement of specialist medical care?
2. What is case mix, what parameters affect case mix and in what way?
3. Is there a need to adjust the negotiated price of a DTC for case mix differences? If yes, what information is required to adjust for case mix?
4. Are differences in case mix reflected in the price of a DTC?
5. What is the current role of case mix in the price and in the negotiations between a health care insurer en the health care provider?

In the following chapters, the research questions are discussed. Chapter two discusses the Dutch health care system. The literature review about case mix is provided in chapter three. The methods used for this research are described in chapter four and the results of the quantitative and qualitative analyses are shown in chapter five. Finally, a conclusion and discussion of this study is provided in chapter six.

2. Background: the Dutch health care system

This chapter discusses the context of this study. The first paragraph provides a short overview of the development of the Dutch health care system. The Diagnosis Treatment Combination-system (DTC-system) and the risk-adjustment system are discussed more extensively in the second paragraph.

2.1 Development of the Dutch health care system

As in most developed countries, many health care reforms have occurred in the Netherlands (Schut&Van de Ven 2005:S59). From the beginning of the twentieth century to the 1960s, the goal of the Dutch health care system was promoting public health, guaranteeing quality and ensuring universal access to basic health services (Schut&Van de Ven 2005:S60). As a consequence, health care expenditures were growing at an extreme pace. Therefore, cost containment through increasing demand and supply regulation was introduced by budget agreements (Van de Ven&Schut 2008:772). Unfortunately, universal access was no longer guaranteed (Schut&Van de Ven 2005:S62). Therefore, the Dekker Committee, appointed by the Dutch government, advised a market-oriented health care reform and a national health insurance system. There are five preconditions underlying this proposed system including (Van de Ven&Schut 2008:773):

1. An adequate system of risk equalization
2. An adequate system of product classification and medical pricing
3. An adequate system of outcome and quality measurement
4. An adequate system of consumer information about price and quality of insurers and care providers
5. An adequate governance structure

Especially the first and second preconditions concern the role of the health care insurer and are therefore relevant in the context of this study. They are discussed in paragraph 2.2.

Time passed before the preconditions were fulfilled. The system of regulated competition was introduced in 2006 by the instalment of the Health Insurance Act (HIA). The HIA obliged each person who legally lives or works in the Netherlands to buy a legally prescribed benefit package from a private insurance company (Van de Ven&Schut 2008:773). To avoid risk selection, every insurer has to accept every individual for the basic insurance package at any time and for the same premium. Premiums are allowed to differ between health care insurers, therefore insurers use a premium that is community-rated (Enthoven&Van de Ven 2007:2422). The contract period is one year and insured are allowed to switch between insurers once a year. The possibility of switching gives an incentive for the insurer to offer good quality for a good price in order to keep its clients. While the basic insurance package is identical, the execution is allowed to differ between health care insurers. As mentioned before, the premium of the basic insurance package can differ. Another example is that insurers are not obligated to contract every provider to grant care, but they can specify the contracted providers in their entitlements (Van de Ven&Schut 2008:775). To conclude, a market-oriented healthcare system requires a more active role for all stakeholders including the patient, hospital and health care insurer.

2.2 Features of the Dutch health care system

This paragraph describes two features of the Dutch health care system; the DTC reimbursement system and the risk adjustment system.

2.2.1 DTC reimbursement system

In the Netherlands, health care insurers should be prudent buyers of care for its insured and compete on the basis of premiums, service and the quality of care (Enthoven&Van de Ven 2007:2422). Instrumental to this, specialist medical care is reimbursed based on the Diagnosis Treatment Combination case mix system (DTC-system). This system is based on the Diagnosis Related Group (DRG) system which is used in several countries. The DRG-system is not used in the Netherlands because the level of detail was regarded as insufficient (Oostenbrink&Rutten 2006:288). To illustrate, the DTC-system has 30,000 DTCs compared to approximately 900 DRGs. In addition, the medical profession was strongly involved in the design of the DTC-system (van Poucke 2007:1). A DTC is a predefined average package of care activities and interventions for a specific diagnosis. So, the DTC-system is a case based system and thus covers the whole episode of care. The maximum duration of a DTC is one year. The main objectives of the DTC-system are (Oostenbrink&Rutten 2006:288):

- to increase transparency of hospital and specialist care
- to realize the transformation from a supply-led to a demand-led system
- to increase efficiency and to facilitate regulated competition between health care providers

Originally, the health care market is known as an imperfect market, for instance because of the heterogeneity of the product (Lapré et al. 2006:15). However, the DTC-system makes it possible to compare health care products and negotiate on their price, volume and quality. Two types of DTCs can be distinguished, namely A-DTCs and B-DTCs. A-DTCs have fixed prices which are set by the Dutch Healthcare Authority (NZa). These DTCs are currently considered unsuitable for price negotiations and mainly used as an administrative tool. Therefore, actual reimbursement agreements are still made based on budget agreements as were in place before 2005. The B-DTCs cover about 34% of the total revenue of specialist medical care in 2011 (Enthoven&Van de Ven 2007:2422). For these DTCs, insurers and providers should negotiate about price, volume and quality of care. As a consequence, the negotiated prices and quality can differ per hospital (Oostenbrink&Rutten 2006:288,289). In practice, there are large variations in the negotiated price of a certain DTC between hospitals (Zorgbalans 2010; CTG/ZAio 2005:52). For example, the price of an inguinal or thigh fracture in 2008 varied between institutions from €1,000 to €2,500 (Zorgbalans 2010).

The DTC-system does not function as good as expected since there is a lack of transparency. For example, the number of DTCs is very large which impede the medical recognisability (Werken met DOT 2010). Besides, the mixture of care activities of a certain DTC is able to differ between hospitals. This is due to different registrations of hospitals. Another shortcoming of the DTC-system is the fact that a DTC is not able to transcend specialties (Belleghem&Redel 2011:327,328). This means that the specialties have their own DTCs, even when they provide the same care (Werken met DOT 2010). The DTC on the way to Transparency (DOT) system, which is implemented in 2012, aims to overcome

these shortcomings. Instead of 30,000 DTCs, this system has 4,400 care products (Werken met DOT 2010). Furthermore, the care product is automatically obtained of the hospital registration and reflects the actual provided care (Belleghem&Redel 2011:329). Additionally, specialties that provide the same care are able to declare the same care products which increase uniformity. Since the DOT-system seems to fix a number of important shortcomings of the DTC-system, the gradual implementation of pay for performance (B-DTCs) can be extended (Werken met DOT 2010). Therefore, in 2012 the number of B-DTCs is increased to 70% (Rijksoverheid 2011a). This policy decision increases the role of health care insurers since negotiations will be about an increased number of DTCs and the health care insurers will bear more financial risk.

2.2.2 Risk adjustment system

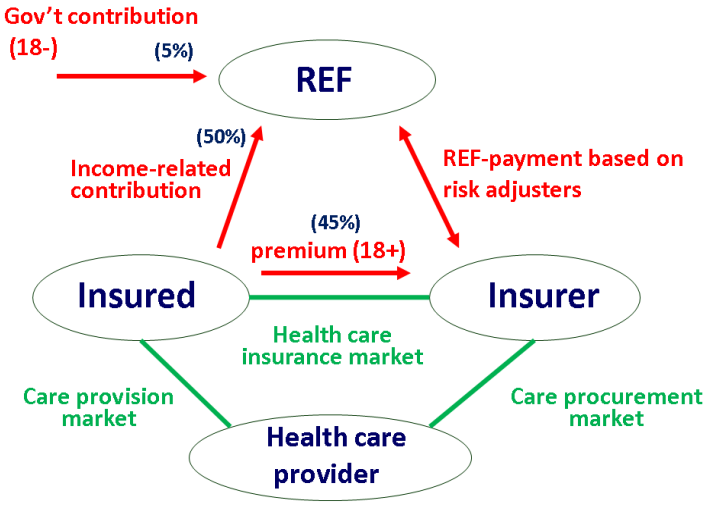
In the Dutch health care system, private health care insurance companies are allowed to make profit. However, this might conflict with the interest of their clients. Additionally, health care insurers have more incentives to make profit and more tools for risk selection. For instance, by using their tools for managing care or by defining precise entitlements. They can also select risk through information obtained from other insurances, for instance supplementary health insurance, or through the nature of the group insurance of the insured (Van de Ven et al. 2007:175). As mentioned before, in the Dutch system, insurers are obliged to accept everyone for the basic insurance. However, for some high-risk consumers, for instance chronically ill people, insurers know that they are not profitable (Van de Ven et al. 2004:46). Their expected health care costs are higher than the money a health care insurer receives. To sustain solidarity and avoid selection within the insurance system, a Risk Equalization Fund (REF) is introduced. The REF is introduced to reduce incentives for risk selection. Risk selection may threaten solidarity, quality of care and efficiency (Van de Ven et al. 2007:168), so a good risk adjustment system is required.

The REF is filled by money from different sources. **Figure 1** gives an overview of the financing flows. Because children (younger than 18 years) do not have to pay a premium for their coverage, the government compensates the REF for their health care costs. Furthermore, all individuals pay an income-related contribution to the REF. Additionally, health care insurers have to pay an equalization payment for low-risk insured to the REF, while they receive a financial compensation for high-risk insured from the REF (Van de Ven&Schut 2008:774). The current system in the Netherlands adjusts for age, sex, the main source of income, region, Pharmaceutical Cost Groups (PCGs) and Diagnosis Cost Groups (DCGs) (Stam&Van de Ven 2008:104). PCGs are based on outpatient pharmacy information which can be used to indicate whether someone has a chronic disease. Therefore, using PCGs results in a better prediction of outpatient expenses (Prinsze&Van Vliet 2007:472). The DCG-model for predicting inpatient expenses is based on the diseases diagnosed during previous hospitalizations (Prinsze&Van Vliet 2007:469). Ideally, risk insurance does not have predictable gains or losses. However, the risk adjustment system is still imperfect and therefore risk selection is possible (Van de Ven et al. 2005:223; Stam&Van de Ven 2008:105).

In addition to the risk adjustment system which adjusts ex-ante, a part of the difference between health care costs and revenues (through premium) is compensated ex-post to insurers with

large losses. Also, for variable costs of hospital care and for specialist medical care, an ex-post compensation between health care insurers and a post-calculation with the REF occurs. However, these arrangements are a disincentive for efficiency (Stam&Van de Ven 2008:105). Therefore, to increase efficiency, the government will remove the ex-post compensation of costs between 2012 and 2015 (Rijksoverheid 2011b). However, this requires a better risk equalization formula.

Figure 1: Overview financing flows



3. Review of literature about case mix

This chapter discusses the concept of case mix. Firstly, case mix is defined based on the literature which offers multiple definitions. Also the relevance of case mix adjustment is discussed. After that, based on the literature, parameters that influence case mix are mentioned. It is also investigated how case mix is expressed in health care systems of a few other countries. Major keywords used to search in Google Scholar and Pubmed are 'case mix', 'case mix adjustment', 'reimbursement', 'DRG', 'AR-DRG' and 'G-DRG'. Finally, hypotheses are formulated and a conceptual framework is created.

3.1 Definition of case mix

Case mix is the main subject of this study and can be defined in different ways. This paragraph discusses multiple definitions.

Higher case mix can be defined as more intensive care for a patient which results in a more extensive care profile and requires more time of medical specialists. Higher case mix results in higher costs which are not due to inefficiency (Casemix 2007 in: De Boo et al. 2008:6). A distinction between patient case mix and product case mix is made. This thesis focuses on patient case mix which means that every hospital has her own patient population with its own characteristics that may influence the extensiveness of the care profile (De Boo et al. 2008:6). Averrill et al. (1998) expand the concept of case mix by referring to a distinct set of patient attributes which include severity of illness, risk of dying, prognosis, treatment difficulty, need for intervention and resource intensity. They made a distinction between clinical complexity and resource intensity demands of patients (Averill et al. 1998:2). The clinical part of the definition of Averrill et al. (1998) can be expanded with disease burden, disease severity assessment and comorbidity assessment (Greenfield et al. 1995:AS48). In addition, Björkgren et al. (2004) focuses more on the resource part of the definition of Averrill et al. (1998) by defining case mix as a system that classifies patients into groups that are homogeneous in their consumption of resources and costs (Björkgren et al. 2004:464). The clinical and resource part come together by regarding case mix as patients who can be ascribed to homogeneous groups based on clinical criteria and resource consumption (Marazzi et al. 2007:203).

Based on the literature, case mix consists of clinical aspects and resource use. So, a higher case mix means that patients consume more care and use more resources, not caused by inefficiency, but due to higher clinical severity or patient characteristics.

3.2 Relevance of case mix adjustment

Since the goal of this study is to investigate whether case mix is reflected in the DTC price, attention is given to some studies that examined the effect of case mix on reimbursement. After that, the relevance of case mix adjustment for the hospital and the health care insurer is shown.

Firstly, there are studies indicating differences in case mix between different types of institutions. Since case mix is measured by its parameters, a lower case mix means for example a

lower age and no additional diagnoses. Street et al. (2010) performed a study in the United Kingdom to assess whether the complexity of patients treated in hospitals or private treatment centres differ within Healthcare Resource Groups. They mentioned that a categorization system can never account perfectly for differences in patient complexity and its costs. This is not problematic when differences are random and the volume is large, because then they will cancel out. However, imperfect reimbursement is a problem when health care providers can distinguish low-cost and high-cost patients and if patients are unequally distributed between providers. The results of the study show that hospitals treated more complex patients compared to treatment centres. Patients treated in hospitals were more likely to have more diagnoses, to undergo significantly more procedures and to come from deprived areas[2] than patients treated in treatment centres (Street et al. 2010:150-151). In a Dutch study, the author concluded that there are differences in case mix between Independent Treatment Centres (ITCs) and academic, general and categorical hospitals. Characteristics associated with a lower case mix were more present in ITCs, but the extent to which they were present depended on the type of hospital, diagnosis and indicator of case mix (Löbbes 2011:70). If differences in case mix between hospitals and treatment centres (or perhaps also other types of hospitals) are not random and drive costs, both authors recommend to refine payments to be case-based which will lead to a fair distribution and realistic reimbursement (Street et al.2010:150 & Löbbes 2011:77).

Other studies only indicate the relevance of adjusting for case mix. Weissert & Musliner (1992) performed a study in the context of nursing-home reimbursement. Although this is not fully comparable with hospital care, they made some generalizable statements. Case mix adjusted reimbursement is intended to make facilities indifferent to patients' care needs when they seek admission, or in this case treatment. Adjusting for case mix would reduce the incentive for selection. For example, the facility should be willing to spend adequately to provide appropriate care for their patients if costs of optimal care are included in the payment rate (Weissert&Musliner 1992:456). The study of Olthof supported these results since it showed that failing to adjust for case mix could result in patient selection. For instance, selection occurs by referring complex patients to academic hospitals (Medisch Contact 2011). Söderland et al. (2005) performed a study in which they wanted to examine the relationship between hospital costs and case mix. Additionally, they also examined the relationship between costs and institutional size, number of specialties, occupancy and teaching status after case mix adjustment. According to their results, case mix differences need to be taken into account when comparing providers for the purpose of contracting, because unadjusted unit costs may be misleading (Söderland et al. 1995:25).

Finally, case mix adjustment is relevant for both hospitals and insurers. For a health care insurer, the relevance of adjusting for case mix is that they can distribute the money fairly between hospitals and its high-risk insured to whom it belongs. In addition, case mix adjustment can serve as a disincentive for risk selection. For a hospital, the relevance of adjusting for case mix is that they receive the money needed according to the case mix of their patients. Therefore, hospitals should not

[2] Patients from areas with higher income deprivation may have more care requirements (Street et al. 2010:150-151).

have an incentive to select patients by referring patients with a higher case mix or by offering low quality to patients with a higher case mix.

So, while it is not exhaustive, based on the literature, there is evidence to conclude that there is a need to adjust for case mix because it gives a better insight in the real costs, will lead to more adequate reimbursement and will possibly serve as a disincentive for selection. The next paragraph discusses which parameters are needed to adjust for case mix.

3.3 Parameters of case mix

Paragraph 3.1 described case mix as clinical aspects and patient characteristics which may impact care consumption and resource use. Case mix can be measured by parameters. Although some examples were already mentioned, the range of parameters is expanded in this paragraph. Also, if possible, it is mentioned whether the parameters influence case mix positively or negatively. Since this study focuses on general aspects of case mix, disease specific parameters of case mix are not included.

Parameters of case mix are age, gender, number of diagnoses, multiple DTCs, comorbidity, number of procedures, income deprivation, continued DTCs, referral, chronic illness, diabetes, transferring of patients, length of stay and functional dependency (Street et al. 2010:152; Marazzi et al. 2007:203; Greenfield et al. 1995:AS48; De Boo et al. 2008:7; Björkgren 2004:465). **Table 1** gives an overview of the parameters and how they were defined in several studies. Number of diagnoses, multiple DTCs and comorbidity are combined since they refer to a similar concept.

Sometimes, the impact of the parameters on case mix was mentioned in the literature. This is shown in **Table 1** where '+' means that an increase in the case mix parameter would have a positive influence on case mix. Based on Street et al. (2010) older patients, patients with a longer length of stay, patients with more diagnoses, patients who undergo more procedures, patients who have to be transferred and patients who come from areas with a higher income deprivation will have more care requirements and therefore have a higher case mix (Street et al. 2010:152). Adjustments for the parameter length of stay are also proposed in a study of Marazzi et al. (2007:203), because outliers in hospital data, which cannot be included in classification systems, are often associated with an extraordinary long length of stay and high costs (Marazzi et al. 2007:204). Regarding the other case mix parameters, they were only indicated as parameters of case mix while the way they could impact case mix was not mentioned.

This paragraph indicated parameters of case mix based on the literature, while the following paragraph provides examples of case mix adjustments in DRG-systems.

Table 1: Overview parameters for complexity and case mix (Street et al. 2010:152; De Boo et al. 2008:15; Greenfield et al. 1995:AS48; Björkgren et al. 2004:465)

Indicator	Influence	Source	Description
Age	+	Street et al. (2010)	Older patients are likely to have more care requirements
		De Boo et al. (2008)	Mean age of all patients of a certain disease

Diagnoses / Multiple DTCs / Comorbidity	+	Street et al. (2010)	Patients with a higher number of diagnoses are likely to have more care requirements
		De Boo et al. (2008)	Percentage of patients with multiple DTC (also A-DTCs)
		Greenfield et al. (1995)	-
Length of stay (LOS)	+	Street et al. (2010)	More complex patients are likely to have to stay longer
		Marazzi et al. (2007)	Outliers in hospital data (which cannot be included in classification system) are often associated with an extraordinary long length of stay and high costs
Procedures	+	Street et al. (2010)	Patients undergoing more procedures are likely to have more complicated conditions and greater post-surgical care requirements
Income deprivation	+	Street et al. (2010)	Patients from areas with higher income deprivation may have more care requirements and it may be more difficult to arrange timely discharge
Transfers	+	Street et al. (2010)	Patients who are subsequently transferred may have required more complex care.
Gender		De Boo et al. (2008)	Percentage men within a patient population of a certain disease
Continuation of indication		De Boo et al. (2008)	Number of continued DTCs compared to the total amount of DTCs of a certain disease
Referral same disease (receiver)		De Boo et al. (2008)	Percentage of patients that previously have been in another hospital for the same disease
Referral same disease (sender)		De Boo et al. (2008)	Percentage of patients that later on have been in another hospital for the same disease
Chronically ill		De Boo et al. (2008)	Percentage of patients within one or more Pharmaceutical Cost Groups (PCG)
Diabetes patient		De Boo et al. (2008)	Percentage of patients within PCG diabetes
Number of DTCs for same disease		De Boo et al. (2008)	Average number of DTCs of a patient for a certain disease
Number of DTCs, same specialism, other hospital		De Boo et al. (2008)	Average number of DTCs of a patient within the same port specialism, but at another hospital
Functional dependency		Björkgren et al. (2004)	It can be measured by a functional dependency scale based on a patient information system

3.4 Case mix adjustment in DRG-systems

Firstly, this paragraph introduces the DRG-system. Thereafter, it is investigated in what way other health care systems adjusted for case mix.

For hospital reimbursement, most countries are using a (variant of the) Diagnosis Related Groups (DRG) system. DRGs were developed in the seventies and were used in the United States for a prospective payment system of all Medicare patients. Subsequently, the DRG-system was also implemented for non-Medicare patients. DRGs are used to group patients into clinical meaningful categories with homogeneous resources consumption (Roger France 2003:215). A lot of other countries which adopted the American DRG-system applied some adjustments to the system. For example, each country has made an individual choice for the classification system for procedures. Also, the diagnostic classification system to group DRGs is not universal between countries (Roger France 2003:216). Besides, case mix adjustments are implemented differently. The American DRG-

system adjusts for case mix by ascribing patients to DRGs based on their age, discharge status and occurrences of complications and/or comorbidities (CCs). For some DRGs, a CC exclusion list is defined because these complications do not result in a higher DRG weight and thus a higher fee (Steinbusch et al. 2007:291). In addition, gender, current and additional diagnoses and current and additional procedures were taken into account for ascribing a patient to a DRG (CMS 2011). Furthermore, this paragraph will discuss the design of case mix adjustment in the Australian and German DRG-systems more extensively. These countries were chosen since Germany is a surrounding country of the Netherlands and since their system is based on the Australian system. Both countries implemented an adjusted form of the original DRGs.

In 1992, Australia introduced the DRG-system as a modification of the DRG-system of the United States (HCFA-DRG). Since there were differences between the clinical practice of the US and Australia, the system was modified to a national system that relies on its own classification system (Duckett 2000:116). In the Australian system, case mix is expressed in two ways. Firstly, patients are ascribed to an adjacent DRG group which means that one or more DRGs are defined by the same diagnosis or procedures. From an adjacent DRG, patients are assigned to a DRG based on age, the Complexity and Comorbidity Level (CCL) and/or the Patient Clinical Complexity Level (PCCL) (Steinbusch et al. 2007:291; Duckett 2000:118). The CCL estimates the utilization of resources for the treatment of complications. The level depends on the severity of the complications and is also related to the discharge status and the adjacent DRG. The PCCL is a measure of the cumulative effect of a patients' CCs (Steinbusch et al. 2007:291). So, the Australian system adjusts for case mix by ascribing patients to a DRG based on these patient characteristics. Secondly, there are three additional adjustments for case mix in the Australian system (Department of Health 2011). First, case mix funding is based on a separation (a patient episode) which is cost weighted according to its DRG group and the Length of Stay (LOS). This cost weighted separation is called a Weighted Inlier Equivalent Separation (WIES) and is calculated by using different cost weights for different types of stay within each DRG. A cost weight is a relative measure of resource use for each episode of care in a DRG. They are calculated every year, based on the costs reported by public hospitals, as the ratio of the average cost of all episodes in a DRG to the average cost of all episodes across all DRGs. Based on this adjustment, health services receive an annual budget of WIES funding for a target level of activity and a range of specified grants. Secondly, an adjustment is applied for the LOS that deviates from the defined inlier LOS. If the patient's LOS falls within the inlier range, the episode will get the standard inlier WIES payment for that DRG. If the patient stays longer than the inlier, the hospital will receive an additional payment for every day over the inlier range. So, the total value of the WIES is based on the sum of cost weights for the inlier and the possible outlier components of stay. Finally, there are also co-payments since it can occur that patients have higher costs which are not applicable to all patients within the DRG or group of DRGs. For example, the higher costs of patients in an intensive care unit or costs of types of patients that have more complex needs regardless of the DRG. Therefore, a co-payment is provided for the higher costs of these patients. For instance, there is a co-payment for thalassemia patients and a bonus 30 per cent co-payment for Aboriginal and Torres Strait

Islander patients. Also for new technologies, if they are associated with higher costs, a co-payment may be provided (Department of Health 2011).

To conclude, case mix is expressed in the Australian health care system by both using patient characteristics to assign patients to a DRG and by using cost weights, adjustments for LOS and co-payments. However, it seems that this system does not adjust for all case mix differences since Antioch et al. (2007:196) suggested an additional adjustment for teaching hospitals since the existing payment system resulted in a systemic underpayment for some hospitals.

In Germany, a DRG-system was introduced in 2000 by the Statutory Health Insurance Reform Act which proposed an activity-oriented payment system instead of the historically-based hospital budgets (Qentin et al. 2010:4). The AR-DRGs were used as a starting point in the development of the German-DRG (G-DRG). Local adjustments were applied by using the German classification system for procedures and diagnoses. It seems that case mix is expressed in the G-DRG in two ways. Firstly, the procedure to assign cases to a certain DRG is based on a grouping algorithm which uses an inpatient hospital discharged dataset for the following criteria: major diagnosis, other diagnoses, medical procedures, patient characteristics including gender, age and weight of new born children, reason for hospital discharge (e.g. death), type of admission (e.g. emergency, referral from GP or transfer from other hospital), length of stay and duration of ventilation (Schreyögg 2006:270, Busse et al. 2011:248). Secondly, a cost weight approach is used for hospital payment. Cost data, which confirmed to a standardized cost accounting system, were collected from a sample of about 250 hospitals. Therefore, the hospitals must be able to calculate costs on patient level by collecting information about individual services delivered to each patient. These cost data are used to calculate cost weights. The hospital payment for a treated patient is calculated by multiplying the cost weight of the patients' DRG with a base rate. However, only 'in-lier-cases' are used by calculating the cost weight per DRG. This means that cases with extremely long (>2 deviations from the mean length of stay) or very short (< one third of the mean) hospital stay are excluded. For the outliers regarding the length of stay, hospitals receive DRG specific surcharges for every day that the patient stays above the upper threshold and the DRG payment is reduced by a length of stay that is below the lower threshold (Qentin et al. 2010:5).

To conclude, it seems that case mix is reflected in a G-DRG by the way cases are assigned to a DRG and by financially adjusting hospitals for treating patient with an extraordinary short or long length of stay.

In the Netherlands, the diagnosis and type of treatment are taken into account for ascribing a patient to a certain DTC. Accordingly, patient characteristics are not involved in selecting a DTC and there are also no additional adjustments for case mix. Although the Risk Equalization Fund (REF) compensates between insurers for high- and low risk patients based on patient characteristics, it is unknown whether this compensation is translated to hospitals that treated these patients. So, it can be concluded that there are major differences in adjusting for case mix between the Dutch health care system and the systems of the US, Australia and Germany. Since the other countries all use patient characteristics by assigning a patient to a certain DRG and additional case mix adjustments are applied by some of them, it seems case mix is adjusted more accurate.

3.5 Conceptual framework

Previous paragraphs described the concept of case mix, the necessity of adjustment and determined parameters of case mix. Also, the design of case mix adjustment in other countries was described and compared with the Netherlands. This indicated that other countries also adjusted for case mix based on specific patient characteristics and applied additional adjustments.

Since DTC prices are negotiable, health care insurers and hospitals have the possibility to translate case mix into the price. The quantitative part of this thesis investigates whether case mix is reflected negotiated price of a DTC. The diseases which are chosen for analyses are knee osteoarthritis, meniscus lesion, hernia of the nucleus pulposus (HNP) and cataract. These diseases were chosen because they have a high incidence and therefore adjustment can possibly have a large impact for both the hospital and the health care insurer. Since the quantitative analyses will be performed with data of a health care insurer, it is not possible to take into account all parameters of case mix as described in paragraph 3.3. For instance, the insurer does not have specific information about the length of stay of each insured, the number of procedures and about the functional dependency of the insured. Therefore, **Figure 2** shows the parameters of case mix that are used in the quantitative analyses.

Based on the literature, the following hypotheses can be set for the quantitative analyses:

1. Older patients will have more care requirements and therefore a higher case mix.
2. Gender will influence case mix.
3. The presence of continued DTCs will influence case mix.
4. Whether a patient is referred or not will influence case mix.
5. Whether a patient has a disease that is included in a pharmaceutical cost group (without diabetes) will affect case mix.
6. Having the diagnosis diabetes will influence case mix.
7. Patients who have multiple DTCs are more likely to have more care requirements.
8. Patients who have a lower socioeconomic status[3] will have more care requirements.

Although it was not always mentioned in the literature, in this study higher case mix means that the parameters for case mix (**Figure 2**) have a positive effect on costs per DTC (except for gender and SES). So, being older, having more continued DTCs, being referred, having a chronic illness, having multiple DTCs, having diabetes and having a lower SES means a higher case mix. For gender, it is unknown how it is related to case mix.

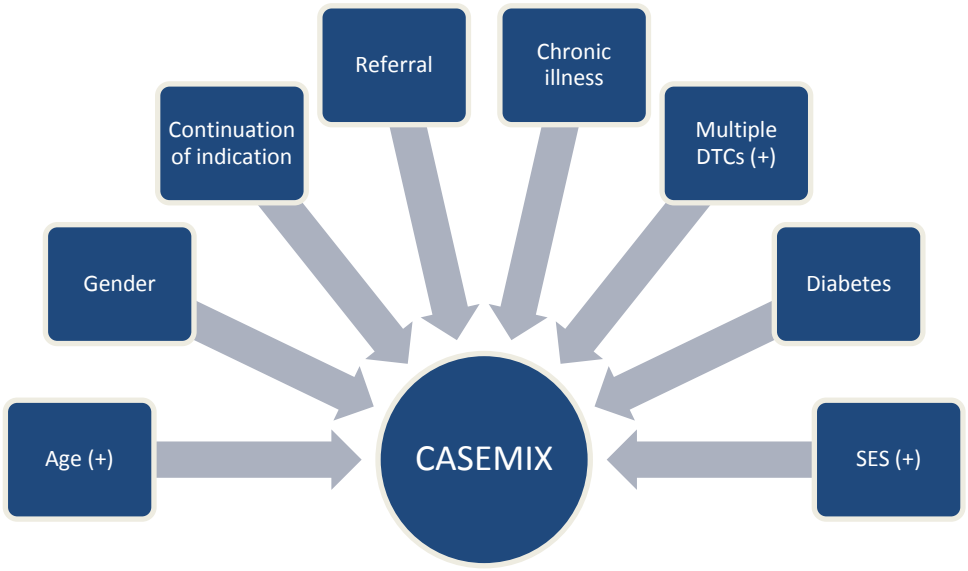
The case mix parameters age, gender, chronic illness and diabetes are also included in the Dutch risk-adjustment formula. However, this risk-adjustment takes place between health care insurers by the Risk Equalization Fund (REF). So, it does not imply that the money an insurer received from the REF for high-risk insured is also fairly distributed to the hospitals that treated that high-risk insured. Therefore, since partly the same parameters are involved, this study can also evaluate whether the compensation from the REF is translated to hospitals. **Figure 1** (page 10) illustrates that

[3] This hypothesis is based on the parameter income deprevation of Street et al. (2010).

the risk-adjustment takes place between health care insurers by the REF, while case mix adjustment takes place between the health care insurer and the hospitals.

The qualitative part of this thesis investigates whether case mix is discussed in the negotiations between the hospital and the health care insurer. Due to the explorative nature of the interviews that will be conducted, no hypotheses are set. The next chapter explains which subjects are discussed during the interviews.

Figure 2: Conceptual framework for the quantitative analyses



4. Methods

In this study mixed methods were used. Therefore, the sequential explanatory strategy was chosen to design this research. This is one of the six major mixed methods approaches of Creswell (2003:215). In accordance with this strategy, firstly quantitative data were collected and analysed followed by the collection and analysis of qualitative data. The quantitative analyses answered the first part of the problem statement by investigating whether case mix was reflected in the negotiated DTC price. The second part of the problem statement which investigated whether case mix is discussed during the negotiations, was answered based on the interviews. Therefore, the interviews add to this study since they obtained information about case mix from daily practice.

This chapter describes the two methods that were used. For the quantitative analyses, data of a health care insurer were used. Besides, qualitative analyses were performed with the interviews that were conducted. Finally, the validity and reliability of this study is described.

4.1 Quantitative methods

Firstly, this paragraph describes the data that was used for the quantitative analyses. Also, the methods for performing these analyses are described.

4.1.1 Data

Data were obtained from the database of a Dutch health care insurer. This database provided information about the hospital, hospital category, performance code, diagnosis, DTC price and characteristics of insured including gender, age, socioeconomic status, PCG (Pharmaceutical Cost Group), number of DTCs, number of continued DTCs and referral DTCs. Since prices were negotiable, prices differed between hospitals (Zorgbalans 2010). In **Appendix 1** is explained which DTCs were used as an indicator for continued DTCs and referral DTCs.

In consultation with care purchasers and medical advisors of the health care insurer some diagnoses were selected which had a high incidence or where case mix adjustment was expected to have a large impact. Per diagnosis, there had been investigated which DTCs[4] were suitable for analysis. The DTCs included in the dataset are shown in **Table 2**. The treatment of HNP could be performed within the specialism of orthopaedics or neurosurgery. Therefore, three DTCs of HNP were included in the dataset.

This study used data from 2007 to 2009. While the DTC-system was introduced in 2005, data was reliable since 2007. The last year that could be chosen was 2009, because DTCs were closed approximately a year after start date. For meniscus lesion an exception was made. Data of 2007 was not used because prices were negotiable since 2008 (VWS 2007).

[4] Only DTCs of surgery in hospitalization or in day care treatment were involved.

Table 2: Overview DTCs in dataset

Diagnosis	DTC-code	Description
Knee osteoarthritis	110018010223	Surgery with hospitalization and joint prosthesis
HNP (orthopaedic DTC)	110013600213	Surgery with hospitalization
HNP (neurosurgery DTC)	110025500023	Surgery with hospitalization: removal of the lumbar intervertebral (single)
	110025550023	Surgery with hospitalization: removal of the lumbar intervertebral (multiple)
Meniscus lesion	110018050212	Surgery with day care treatment
Cataract	110005540032	Surgery with day care treatment

4.1.2 Data analyses

This paragraph describes the execution of the quantitative analyses and the choices that were made for these analyses.

Since the database of the health care insurer did not provide detailed information about clinical complexity, this study used the eight parameters that were expected to influence case mix as shown in the conceptual framework (**Table 3**). The quantitative part of this study investigated whether case mix is reflected in the negotiated price of a DTC. The correlation between the eight parameters and the negotiated price of the DTC was tested quantitatively by performing Pearson correlation tests, multiple hierarchical regressions and fixed-or random-effects regressions. Before this, for descriptive purposes it was tested whether the average price of a DTC differed significantly between types of institutions by performing one-way ANOVA or Kruskal-Wallis tests. The statistical programs that were used to perform these tests were SPSS 18.0, SAS Enterprise Guide 4.22 and Stata 11.2.

Table 3: Overview parameters used for analyses

Parameters to use:	Description
Age	Mean age of the insured
Gender	Percentage of women
Continuation of indication	Percentage of insured with a continued DTC of the same diagnosis in 365 days after the current DTC
Referral same disease (receiver)	Percentage of insured with a referral in 365 days before the current DTC
Chronic illness	Percentage of insured with a PCG (excl. diabetes)
Multiple DTCs	Percentage of insured with one or more alternative diagnoses in 365 days before the current DTC
Diabetes	Percentage of insured with a PCG diabetes
Socioeconomic status (SES)	Four categories based on postal code where 1 is the highest socioeconomic status and 4 the lowest (SCP 2009)

The original database consisted of observations per insured. From this database, a dataset on hospital level was derived where every institution was included once a year. As a consequence of

using data on hospital level, the price of the DTC[5] and the parameters of the insured were averaged per institution. These aggregated data were used for analyses. So, each parameter had an interval measurement level.

Firstly, it was tested whether the average DTC prices differed significantly between types of hospitals for each DTC per year. Before deciding which tests could be performed, it was tested whether the price was normal distributed by using the Shapiro Wilk test. A significance level lower than 0.05 indicated that the price was not normally distributed, while a significance level higher than 0.05 indicated a normal distribution. The DTC price had an interval measurement level and in most cases there were four different types of institutions. Therefore, a one-way ANOVA was used to test whether the DTC prices differed significantly. However, when the price was not normally distributed, the Kruskal-Wallis test was performed. For some DTCs, the treatment was only performed in two types of institutions. Instead of using the one-way ANOVA, the T-test for independent samples was used. The non-parametric variant of this test was the Mann-Whitney test.

Some hospitals treated more insured than others since they were located in an area where the health care insurer had a high market share. Therefore, these hospitals should get more weight in the analyses. A weight per year was calculated for each diagnosis and per hospital by dividing the number of insured of a certain hospital in a certain year by the total number of insured in that year. The formula is as follows:

For both correlations and regressions, the weight was used. However, also an overall correlation test (including 2007, 2008 and 2009) was performed per DTC. For this test, the weight was calculated by dividing the number of insured of all years of a certain hospital by the total number of insured in the dataset of the concerning diagnosis. The formula is as follows:

Since variables are not normally distributed, Spearman correlation tests should be performed. However, including a weight in correlations is only possible with parametric tests. Therefore, Pearson correlations were performed instead of Spearman correlations. Per DTC, all these tests were executed for each year and for all years together.

Also hierarchical multiple regressions were performed per DTC and for each year separately. This type of regression was chosen since it allows correcting for the influence of certain variables in explaining the variance in the dependent variable. In this study, it was desirable to correct for the influence of category of institution, because certain types of institutions are more likely to have patients with a higher or lower case mix compared to others (Street et al. 2010:150). Therefore, for category of institution three dummy variables were composed with the largest category, general hospital, as the reference. These dummies were included as a covariate in the regressions. In the first model, the

[5] For some hospitals, per year more than one price is negotiated for the same DTC (for instance: the price changed in July). In that case, the price was averaged.

dummies of category of institution were added and in the second model all the explanatory variables[6] were added. The difference in adjusted R square between model 2 and model 1 was the adjusted R square of the explanatory variables added in model 2. Therefore, the influence of the independent variables, age, gender, continuation of indication, referral, chronic illness, diabetes, multiple DTCs and SES, was tested on the DTC price corrected for the effect of type of institution.

Finally, the data of all years were combined per DTC, because this would probably improve the explanatory power of the model. Since the data contained repeated measures of the same hospitals, the data was treated as panel data. The Hausman test compared the estimations of the fixed-effects model and the random-effects model. It tested for endogeneity or consistency of the coefficients. When the test showed insignificance, estimations of both models are not very different and the random-effects model was preferred. This estimator will be consistent and efficient. When the Hausman test was significant, the fixed-effects model was preferred.

4.2 Qualitative methods

Interviews were conducted to obtain information of case mix in daily practice. This paragraph describes the data and methods that were used for the qualitative analyses.

4.2.1 Data

For the qualitative analyses, data was collected by conducting interviews. The main selection criterion for respondents was their involvement in negotiations between hospitals and health care insurers.

Respondents of hospitals were selected based on region of the hospital, category of hospital and the extent to which the health care insurer negotiated with the hospital. Also information of health care purchasers of the health care insurer about possible experience with case mix during negotiations was taken into account.

4.2.2 Qualitative analyses

The interviews were conducted after the first results of the quantitative analyses were known. As mentioned before, the interviews were mainly intended to obtain information of case mix in daily practice. Important subjects of the interview were the respondents' thoughts about case mix and the role of case mix, the necessity to adjust for case mix and the practical implications of the results of the quantitative analyses. The interviews had a semi-structured design (**Appendix 4**). Most of the questions were open-ended or had a multiple choice component with the opportunity to explain the choice. All interviews were recorded and also notes were made during the interviews. For analysis, the interviews were transcribed. The six steps of Creswell (2003:191-195) were leading for analysing the interviews. Therefore, the transcribed text was coded and categorized extensively (**Appendix 5**).

[6] If necessary, extra variables were created. This was the case for the parameter 'socioeconomic status'. This variable consisted of four categories, from 1 (=high) to 4 (=low). For each category, a variable was created which represented the mean percentage of insured in a certain category.

4.3 Validity and reliability

This paragraph describes the validity and reliability of the study. Validity is distinguished in internal validity and external validity. Internal validity is the extent to which proper inferences could be drawn correctly based on the research (Swanborn 2002:24). In this study, several things were done to increase the internal validity. Firstly, the database was checked extensively for double declarations of the DTCs of HNP and osteoarthritis. For instance, when more than two DTCs of osteoarthritis were declared for one insured within a year, the others were deleted. For the other DTCs, it was not clear which maximum number of DTCs could realistically be declared within a year per insured. Another correction of the database refers to a hospital that was included twice in the database. Finally, the internal validity was increased by using both quantitative and qualitative methods. The interviews contributed in explaining the quantitative results which increased the validity.

External validity is about the generalizability of the research for other comparable groups (Swanborn 2002:25). Since this study used basic data which is available for each health care insurer, the quantitative part of this research can be repeated by other health care insurers. However, a part of the interviews were conducted with respondents of one health care insurer. Therefore, these results are possibly not fully generalizable for other health care insurers.

Finally, the reliability of a research means that the results are reliable by using good research – and measurement methods (Swanborn 2002:23). The reliability of a study increased by using more than one method. As mentioned above, two different methods were used. Although some double declarations were detected, the data which was used for quantitative analyses was already checked twice on incorrect data. Firstly, hospitals used a validation module for checking whether a DTC code was correct by matching all the registered activities of a patient (Hasaart 2011:85). However, over declaration can still occur by multiple DTCs which were open at the same time (parallel DTCs) or which were open and closed shortly after each other (serial DTCs). To detect this over declaration, the health care insurer used a system that investigated whether the declaration of additional DTCs was justified (Hasaart 2011:86, 90). Also the choice of time horizon (2007-2009) increased the reliability. DTCs were more reliable from 2007 and DTCs of 2009 were definitely closed at the moment this study was performed. Finally, the reliability of the qualitative methods increased by using a semi-structured design which included some multiple choice questions.

5. Results

This chapter describes the data population and the results. Firstly, the data population and results of the quantitative analyses are described. The results are listed for each individual DTC. The second paragraph shows the data population and results of the interviews.

5.1 Quantitative analyses

This paragraph describes the data population and results of the quantitative analyses.

5.1.1 Data population

The quantitative analyses were based on a database of a health care insurer. The whole dataset contained of 93,896 observations. As described in the previous chapter, the data analyses were not performed on insured level but on hospital level by using aggregated insured characterizations. Therefore, the total number of observations used for analyses was 1,075. **Table 4** shows more information of the total data set which contained of data of 2007, 2008 and 2009. The total number of insured, the total number of aggregated observations and the number of unique institutions are shown for each diagnosis. These aggregated observations were used for analyses. Furthermore, this paragraph describes the data population per DTC.

Table 4: Overview observations in total dataset (2007-2009)

	Total number of insured (2007, 2008, 2009)						**Total number of aggregated observations (2007,2008,2009)**	**Number of unique institutions**
Diagnosis	Academic hospital	General hospital	Categorical hospital	ITC	*Total*			
Osteoarthritis	189	7724	312	335	*8560*		276	99
HNP (ortho)	0	479	16	421	*916*		71	36
Meniscus lesion	131	15284	108	2549	*18072*		206	109
Cataract	1581	58710	2156	1688	*64135*		312	111
HNP (neuro, simple)	99	1484	0	0	*1583*		112	47
HNP (neuro, multiple)	11	608	0	11	*630*		98	45

Osteoarthritis

Over three years (2007, 2008, 2009) 8,560 treatments were performed for knee osteoarthritis by surgery with hospitalization and joint prosthesis. The insured were treated in 99 different institutions. General hospitals treated most of the insured followed by ITCs, categorical hospitals and academic hospitals. The number of aggregated observations, which were used for analyses, was 276 (see **Table 4**). These observations were almost equally distributed over the years.

As shown in **Table 5**, there large differences between the average price of different types of institutions. The price ranged from €7,489.00 to 12,030.61. Academic hospitals had the highest

average price followed by general hospitals, ITCs and the categorical hospital (n=1). Only in 2007, the median price significantly differed between types of institutions.

In **Appendix 3** (**Table 20**), the aggregated characteristics of insured treated for knee osteoarthritis are shown. ITCs had a relatively healthy population based on the parameters of case mix (with ignorance of the categorical hospital). Insured treated in ITCs had on average a lower mean age and there were more insured with SES1 and SES2 and less insured with SES4, continued DTCs, chronic illnesses and diabetes compared to the other types of institutions. Academic hospitals had a relatively worse population regarding the case mix parameters. They had on average less insured with SES1 and SES2 and more insured with SES4, continued DTCs and chronic illnesses.

Table 5: Descriptive information and tests of DTC price osteoarthritis

		N	Price of the DTC osteoarthritis				Normality[7]	Test	P-value
			Min	Max	Mean	Median			
2007	Academic hospital	8	9747.95	11026.26	10344.40	10405.14	No (p=0.004)	Kruskal-Wallis	0.018
	General hospital	81	8795.10	11285.23	10117.10	10173.50			
	Categorical hospital	1	9197.53	9197.53	9197.53	9197.53			
	ITC	3	7489.00	9439.00	8708.51	9197.53			
2008	Academic hospital	6	9247.35	10927.82	10458.83	10852.58	Yes (p=0.161)	One-way ANOVA	0.385
	General hospital	81	8018.00	11646.44	10150.32	10159.93			
	Categorical hospital	1	9245.79	9245.79	9245.79	9245.79			
	ITC	4	9031.63	10657.00	9900.93	9957.54			
2009	Academic hospital	7	9360.25	11824.13	10646.33	10903.42	Yes (p=0.497)	One-way ANOVA	0.326
	General hospital	77	8010.01	12030.61	10017.96	10037.41			
	Categorical hospital	1	10054.94	10054.94	10054.94	10054.94			
	ITC	6	9031.63	10639.00	9895.17	9911.20			

HNP (orthopaedics)

In 2007, 2008 and 2009, insured received 916 treatments of HNP by an orthopaedist. The treatment was given in 36 different institutions. Insured were not treated in academic hospitals. Most insured received their treatment in general hospitals followed by ITCs and categorical hospitals. The number of aggregated observations used for analyses was 71 (see **Table 4**).

The average prices of a DTC showed major differences. They ranged from €1,754.53 in 2007 to €5,455.99 in 2009. In contrast to the previous DTC where ITCs had the lowest average price, they now have the highest one followed by general hospitals. However, **Table 6** also shows that the differences in the median price between types of institutions were not significant.

The average characteristics of insured treated in ITCs were more favourable than insured treated in general hospitals (**Appendix 2**, **Table 20**). Insured treated in ITCs had on average a lower

[7] Normality was tested by the Shapiro-Wilk test.

mean age and there were less insured with SES4, continued DTCs, referral, chronic illnesses and diabetes. In these comparisons the category 'categorical hospital' was ignored since there was only one categorical hospital included.

Table 6: Descriptive information and tests of DTC price HNP (orthopaedics)

		N	Price of the DTC HNP (orthopaedics)				Normality	Test	P-value
			Min	Max	Mean	Median			
2007	General hospital	20	1754.53	3734.53	3268.89	3286.32	No (p=0.000)	Kruskal-Wallis	0.311
	Categorical hospital	1	3021.74	3021.74	3021.74	3021.74			
	ITC	3	3009.96	3784.43	3272.05	3021.74			
2008	General hospital	23	1781.41	4412.00	3453.72	3455.25	No (p=0.013)	Kruskal-Wallis	0.374
	Categorical hospital	1	3009.65	3009.65	3009.65	3009.65			
	ITC	2	3040.98	4007.50	3524.24	3524.24			
2009	General hospital	17	1834.85	5499.55	3458.17	3354.80	No (p=0.006)	Kruskal-Wallis	0.969
	Categorical hospital	1	3381.05	3381.05	3381.05	3381.05			
	ITC	3	3040.98	4020.00	3437.70	3252.11			

Meniscus lesion

In 2008 and 2009, 18,072 treatments of meniscus lesion were performed. The treatment was given in 109 different institutions. Most of the insured received their treatment in general hospitals. The number of aggregated observations is 206 (see **Table 4**). These observations were used for analyses.

The price of the DTC meniscus lesion ranged from €1,109.03 to €2,500.08. **Table 7** shows that ITCs had the lowest average price, while academic hospitals had the highest average price. Hereby, the price of the categorical hospital was ignored since this treatment was performed in only one categorical hospital. In 2008 and 2009, the differences in median prices between types of institutions were significant by performing Kruskal-Wallis tests.

ITCs still had the most favourable average insured characteristics, but it is less convincing since they had fewer characteristics with much lower or higher averages compared to the other types of institutions (**Appendix 2, Table 21**). ITCs had on average more insured with SES1 and SES2 and less insured with SES4 and continued DTCs compared to the other types of institutions.

Table 7: Descriptive information and tests of DTC price meniscus lesion

		N	Price of the DTC meniscus lesion				Normality	Test	P-value
			Min	Max	Mean	Median			
2008	Academic hospital	6	1679.23	2449.77	1843.90	1730.43	No (p=0.000)	Kruskal-Wallis	0.004
	General hospital	85	1149.33	2020.95	1635.47	1667.35			
	Categorical hospital	1	1589.24	1589.24	1589.24	1589.24			
	ITC	10	1109.03	2058.00	1507.63	1487.23			

2009	Academic hospital	7	1706.60	2500.08	1865.04	1760.30	No (p=0.000)	Kruskal-Wallis	0.002
	General hospital	82	1159.60	2182.00	1633.73	1650.39			
	Categorical hospital	1	2199.23	2199.23	2199.23	2199.23			
	ITC	14	1202.25	2228.24	1630.66	1527.75			

Cataract

Over three years, insured received 64,135 treatments of cataract in 111 different institutions. The majority of the insured was treated in a general hospital. Academic hospitals, the categorical hospital and ITCs treated a comparable number of insured. The number of aggregated observations was 312 (see **Table 4**).

As shown in **Table 8**, the price of a cataract treatment varied from €871.00 to €1,354.67. Over the years, ITCs had the lowest average price and the categorical hospital had the highest average price followed by academic hospitals. The differences in median price between types of institutions showed significance for all years.

Based on the average characteristics, it could be concluded that ITCs had the most favourable insured regarding the case mix parameters. ITCs had on average more insured with SES1 and less insured with SES4, multiple DTCs, chronic illnesses and diabetes (**Appendix 2, Table 22**).

Table 8: Descriptive information and tests of DTC price cataract

		N	**Price of the DTC cataract**				**Normality**	**Test**	**P-value**
			Min	Max	Mean	Median			
2007	Academic hospital	8	1088.69	1212.58	1130.81	1113.06	No (p=0.000)	Kruskal-Wallis	0.000
	General hospital	85	871.00	1224.42	1086.15	1101.00			
	Categorical hospital	1	1127.93	1127.93	1127.93	1127.93			
	ITC	8	762.60	837.60	789.48	787.60			
2008	Academic hospital	8	1110.79	1179.69	1140.79	1126.98	No (p=0.001)	Kruskal-Wallis	0.000
	General hospital	85	884.00	1354.67	1096.21	1100.00			
	Categorical hospital	1	1199.96	1199.96	1199.96	1199.96			
	ITC	10	806.03	983.50	860.48	832.91			
2009	Academic hospital	8	1055.00	1224.28	1157.62	1153.83	No (p=0.022)	Kruskal-Wallis	0.000
	General hospital	82	827.64	1309.56	1076.32	1090.51			
	Categorical hospital	1	1230.00	1230.00	1230.00	1230.00			
	ITC	15	787.08	1021.00	890.75	898.00			

HNP (neurosurgery simple)

In 2007, 2008 and 2009, insured received 1,583 treatments for HNP (simple) by a neurosurgeon. Insured were treated in 47 different hospitals, only academic and general hospitals. Most treatments were received in general hospitals. The number of insured per year increased and the number of

different hospitals per year decreased. The number of aggregated observations was 112 (see **Table 4**). These observations were used for analyses.

The average DTC price of a treatment for HNP (simple) ranged from €1,189.61 and €4,085.12 (**Table 9**). The average price was higher for academic hospitals than for general hospitals. However, there were no significant differences in price between the types of hospitals.

Also the average case mix parameters were more favourable for general hospitals since they had on average more insured with SES2 and less insured with SES4, continued DTCs, referral, multiple DTCs and diabetes (**Appendix 2, Table 23**).

Table 9: Descriptive information and tests of DTC price HNP (neurosurgery, simple)

		N	Price of the DTC HNP (neurosurgery, simple)				Normality	Test	P-value
			Min	Max	Mean	Median			
2007	Academic hospital	7	2947.53	3428.86	3098.43	2997.12	No (p=0.000)	Mann-Whitney	0.722
	General hospital	34	1189.61	3901.47	3064.21	3064.13			
2008	Academic hospital	7	3025.94	3514.58	3148.53	3107.75	Yes (p=0.070)	Independent samples T-test	0.863
	General hospital	29	2152.00	3918.28	3123.48	3073.56			
2009	Academic hospital	7	2876.36	3584.87	3268.03	3224.46	Yes (p=0.315)	Independent samples T-test	0.605
	General hospital	28	2207.00	4085.12	3182.00	3160.08			

HNP (neurosurgery, multiple)

Over the years, 630 treatments of HNP (multiple) were performed by a neurosurgeon. Over time, there was a small increase of insured. Insured received their treatment in 45 different institutions. Most insured were treated in general hospitals and some insured in academic hospitals or ITCs. This treatment was not received in categorical hospitals. In 2007, there were no insured treated in ITCs. In 2008 and 2009, respectively one and two ITCs treated insured for HNP (multiple). The number of aggregated observations was 98 (see **Table 4**).

Table 10 shows that the average price for this DTC ranged from €1,190.63 to €4,569.08. Over the years, ITCs had the lowest average price and academic hospitals had the highest one. However, the differences in price between types of institutions did not differ significantly.

Again, ITCs had the most favourable average case mix parameters compared to academic and general hospitals. ITCs had on average insured with a lower age and had less insured with SES4, continued DTCs, referral, chronic illnesses and diabetes (**Appendix 2, Table 24**).

Table 10: Descriptive information and tests of DTC price HNP (neurosurgery, multiple)

		N	Price of the DTC HNP (neurosurgery, multiple)				Normality	Test	P-value
			Min	Max	Mean	Median			
2007	Academic hospital	1	3706.62	3706.62	3706.62	3706.62	No (p=0.000)	Mann-Whitney	0.813
	General hospital	31	1190.63	4569.08	3592.47	3645.39			

2008	Academic hospital	4	3756.07	4347.71	3948.78	3845.67	No (p=0.000)	Kruskal-Wallis	0.080
	General hospital	27	1226.35	4071.54	3515.87	3687.95			
	ITC	1	3056.48	3056.48	3056.48	3056.48			
2009	Academic hospital	5	3560.12	3989.28	3861.05	3940.95	No (p=0.000)	Kruskal-Wallis	0.085
	General hospital	27	2080.32	4248.00	3584.19	3725.21			
	ITC	2	2527.00	2889.01	2708.01	2708.01			

Conclusion

The DTC prices varied between types of institutions. Overall, it can be concluded that ITCs had the lowest average price, except for HNP treated by an orthopaedist. For osteoarthritis (only 2007), meniscus lesion and cataract, the prices showed significant differences between the types of institutions.

The patient population also differed between the types of institutions. Based on the average case mix parameters, ITCs treated insured with the most favourable characteristics compared to the other types of institutions.

5.1.2 Results of quantitative analyses

This paragraph describes the results of correlations and regressions for each DTC. The analyses were performed for each year. Only significant correlations are shown. The degree of significance is shown by stars, where one star (*) refers to a significance level of 0.05 and two stars (**) to a significance level of 0.10. The hierarchical multiple regressions consist of two blocks or models. In model 1, variables of category of institution are included and model 2 includes all parameters of case mix. The results of these regressions are shown more extensively in **Appendix 3**. Finally, regressions were performed that combined the information of all years by using a fixed-effects or random-effects model.

Osteoarthritis

Table 11 shows the significant correlations between the case mix parameters and the price of the DTC. The overall correlation test (all years) and the one of 2007 indicated that the parameter ‘SES1’ correlated significantly with the price of the DTC. Based on the correlation coefficients, an increase in the mean percentage of insured with SES1 will result in a higher price of the DTC. The parameter ‘continued DTC’ showed a significant positive correlation in the overall correlation test and in 2008. The parameter of diabetes showed a significant negative correlation in the overall correlation test and in 2009. Other parameters that were significantly correlated with the price were ‘SES3’ in 2007 and age and chronic illness in 2009. So, an increase in the mean percentage of insured with multiple DTCs will result in a higher price, while an increase in the mean age, mean percentage of insured with SES3 or a chronic illness will result in a lower price.

Table 11: Outcomes of significant correlations (osteoarthritis)

Year	Mean age	Mean % SES1	Mean % SES3	Mean % with continued DTC	Mean % with multiple DTCs	Mean % with chronic illness	Mean % with diabetes
All years		0.131*		0.190*			-0.184**
2007		0.367*	-0.221*		0.294*		
2008				0.253*			
2009	-0.238*					-0.200**	-0.238*

Based on the hierarchical multiple regressions, only in 2007 the parameters of case mix (see **Table 3**) explained a significant part of the variance in the price (p=0.002). They explained 17.2% of the variance (**Appendix 4, Table 25**). This is the difference in adjusted R square between model 2 (Adj. R2=0.210) and model 1 (Adj. R2=0.038), which indicates that the influence of the types of institutions in explaining the variation in the price was excluded. Only in 2007, the types of institutions explained a significant part of the variance in the price of the DTC, namely 3.8 % (p=0.092). This increases the interpretability of the difference in adjusted R square between the two models. Within the model with case mix parameters, none of the variables contributed significantly. Therefore the reliability of the significant model can be questioned. In 2008 and 2009, the parameters of case mix did not have a significant contribution in explaining the variance in the price (**Appendix 4, Table 26-27**).

Finally, the data of all years was combined and analysis for panel data was applied. Since the Hausman test was not significant (p=0.2922), a random-effects model was chosen. The results of this test showed that the case mix parameters did not explain a significant part of the variation in the price of the DTC (p=0.6258).

To conclude, for osteoarthritis the parameters of case mix only explained a significant part of the variance in the price in 2007 which was adjusted for type of institution. As mentioned before, the reliability of this significance can be questioned since none of the variables contributed significantly. Also the significant correlations showed sometimes unexpected patterns. For instance, the signs of the correlation coefficients of age, SES1, chronic illness and diabetes were not in line with the expectations. Since the results of the random-effects model also showed no significant influence of all the parameters on the price, it can be concluded that case mix (based on the parameters) is not reflected in the price of the DTC of osteoarthritis.

HNP (orthopaedics)

The significant correlations between the case mix parameters and the DTC price are shown in **Table 12**. Overall and for 2009, the parameter ‘SES1’ showed a significant positive correlation with the price. So, an increase in the mean percentage of insured with SES1 would increase the price. In 2007 and in the overall correlation test, there is a negative significant correlation between ‘referral’ and price which indicates that an increase in the mean percentage of referred insured will result in a lower price. Finally, the parameter ‘multiple DTCs’ was negatively correlated with the price. This means that an increase in the mean percentage of insured with multiple DTCs will result in a lower price of the DTC.

Table 12: Outcomes of significant correlations (HNP orthopaedics)

Year	**Mean % SES1**	**Mean % with referral**	**Mean % with multiple DTCs**
All years	0.274*	-0.296**	
2007		-0.635*	-0.347**
2009	0.386**		

Hierarchical multiple regressions per year showed that the variables of case mix, by adjustment of categories of institutions, did not explain a significant part of the variance in the DTC price (**Appendix 4, Table 28-30**).

Also, the data of all years was combined. Based on the Hausman test (p=0.0007), the fixed-effects model was chosen. The results of this test showed no significance (p=0.5610), so the differences in DTC price cannot be explained by the case mix parameters.

To conclude, both the regressions per year, adjusted for type of institution, and the fixed-effects regression showed that the parameters of case mix did not explain a significant part of the variance in the price of the DTC. Again, the significant correlations are perhaps not very reliable, since none of the parameters remained significant in the regression analyses. So, for HNP which was treated by an orthopaedist, case mix was not reflected in the price of the DTC.

Meniscus lesion

Table 13 shows the significant correlations between case mix parameters and the price of the DTC. As well in all years (2008 and 2009) as in 2008 and 2009 separately, the parameter 'SES2' was significantly correlated with the price. Based on the correlation coefficients, an increase in the mean percentage of insured with SES2 will result in a lower price. Other parameters that showed a significant correlation with the price were 'SES4' and gender in 2009. So, an increase in the mean percentage of insured with SES4 and the mean percentage of men will result in a higher price.

Table 13: Outcomes of significant correlations (meniscus lesion)

Year	**Mean % SES2**	**Mean % SES4**	**Mean % of men**
All years	-0.297*		
2008	-0.253*		
2009	-0.289*	0.172**	0.197*

Based on the hierarchical multiple regressions, the parameters of case mix, adjusted for the influence of types of institutions, did not explain a significant part of the variance in the DTC price in 2008 (**Appendix 4, Table 31**). In 2009, the variables of case mix explained a significant part of the variance in the price, namely 7.0% (p=0.049) as shown in **Appendix 4, Table 32**. However, since the adjusted R square is the difference between the ones of model 2 and model 1 and since model 1 was not

significant, the percentage of 7% should be used carefully. The variable for SES2 contributed significantly (p=0.099) and indicated a negative influence on the price (stand.beta= - 5.384).

Finally, a random-effects regression was performed, since the Hausman test indicated this (p=0.9224). The random-effects regression showed that case mix, based on its parameters, explained significant differences in the price of the DTC (p=0.0309). The overall R-squared was 13.1%.

For meniscus lesion, the regression of 2009 and the overall regression showed significance. This gave evidence to conclude that case mix, based on the defined parameters, is to some extent reflected in the price of the DTC. However, the results of the regression in 2009 should be interpreted carefully since they were mainly caused by the constant term and since model 1 was not significant. It should also be mentioned that the results of the random-effects regression were not corrected for the influence of type of institution.

Cataract

Significant correlations between case mix parameters and the price of the DTC are shown in **Table 14**. Important parameters were age, gender and continued DTC since they showed a significant correlation with the price in all years together and separately. Also the variable of SES2 was important since it was significantly correlated with the price in all years together and in 2008 and 2009. An increase in the mean age of insured or in the mean percentage of insured with SES2 will result in a lower price. An increase in the mean percentage of men or in the mean percentage of insured with continued DTCs will increase the price. Other parameters with significant correlations with the price were 'SES4' in 2009, 'referral' in 2007, 'multiple DTCs' in 2008 and 'chronic illness' in 2009 and in the overall correlation test. So, an increase in mean percentage of insured with SES4 will increase the price. An increase in the mean percentage of insured with a referral, multiple DTCs or chronic illnesses will result in a lower price.

Table 14: Outcomes of significant correlations (cataract)

Year	Mean age	Mean % SES2	Mean % SES4	Mean % of men	Mean % with continued DTC	Mean % with referral	Mean % with multiple DTCs	Mean % with chronic illness
All years	-0.248*	-0.284*		0.340*	0.217*			-0.207*
2007	-0.221*			0.304*	0.215*	-0.172**		
2008	-0.212*	-0.186**		0.163**	0.169**		-0.233*	
2009	-0.202*	-0.348*	0.175**	0.230*	0.176**			-0.219*

In 2007, 2008 and 2009, the variables of case mix explained a significant part of the variance in the DTC price by adjustment for the influence of types of institutions (**Appendix 4, Table 33-35)**. The hierarchical multiple regressions indicated that the case mix parameters explained 11.8% of the variance in the price in 2007, 9.8% in 2008 and 16.1% in 2009. Significant variables were gender and referral which showed positive influence on the price and multiple DTCs and chronic illness which showed a negative influence, adjusted for type of institution. The standardized betas are shown in **Appendix 3, Table 33, 34 and 35**. In all years, the model that includes the variables of category of

institution also explained a significant part of the variance on the price, ranging from 25.9% to 40.2% (see **Appendix 3**).

Finally, the Hausman test was performed. The outcome (p=0.2646) indicated that the random-effects model could be used. Since the results of the random-effects regression were significant (p=0.000), the case mix parameters seem to explain a significant part of the differences in price of the DTC, namely 47.8%. However, the results of the random-effects regression were not corrected for the influence of type of institution.

Based on the results of the regressions per year and on the random-effects regression, it can be concluded that case mix was reflected in the price of the DTC of cataract.

HNP (neurosurgery, simple)

Table 15 shows the significant correlations between the case mix parameters and the price of the DTC. The parameter 'SES2' was significantly correlated with the price in 2007 and 2009. However, SES2 showed a negative correlation with the price in 2007 and a positive correlation in 2009. So, an increase in the mean percentage of insured with SES2 in 2007 will result in a lower price, while an increase in 2009 will result in a higher price. The parameter of chronic illness showed a significant positive correlation with the price in the overall correlation test and in 2008. An increase in the mean percentage of insured with chronic illnesses will increase the price. Other parameters which showed significant correlations with the price were 'SES3' in 2007 and 'SES4' in 2009. Based on the correlation coefficients, an increase in the mean percentage of insured with a SES3 will increase the price of the DTC and an increase in the mean percentage of insured with SES4 would result in a lower price.

Table 15: Outcomes of significant correlations (HNP neurosurgery, simple)

Year	**Mean % SES2**	**Mean % SES3**	**Mean % SES4**	**Mean % with chronic illness**
All years				0.288*
2007	-0.268**	0.274**		
2008				0.465*
2009	0.324**		-0.356*	

The results of the hierarchical multiple regressions per year showed that the variables of case mix (model 2) and the types of institutions (model 1) did not explain a significant part of the variance in the DTC price (**Appendix 4, Table 36-38**).

Finally, a random-effects regression was performed, since the Hausman test indicated this (p=0.9930). The result of the random-effects regression (p=0.8923) also showed that the variables of case mix did not explain a significant part of the variance in the price of the DTC.

So, it can be concluded that the parameters of case mix were not reflected in the price of the HNP, treated by the neurosurgeon.

HNP (neurosurgery, multiple)

The significant correlations between the case mix parameters and the price of the DTC are shown in **Table 16**. The parameters that showed a significant correlation with the price were 'SES2', 'SES4', 'referral' in 2007 and 'age' and 'chronic illness' in 2009. An increase in the mean age, the mean percentage of insured with SES2, with a referral or with a chronic illness will increase the price. An increase in the mean percentage of insured with SES4 will result in a lower price.

Table 16: Outcomes of significant correlations (HNP neurosurgery, multiple)

Year	**Mean age**	**Mean % SES2**	**Mean % SES4**	**Mean % with referral**	**Mean % with chronic illness**
All years					
2007		0.349**	-0.448*	0.329**	
2009	0.353*				0.329**

Based on the hierarchical multiple regressions per year, the parameters of case mix did not explain a significant part of the variance in the DTC price with adjustment of the influence of types of institutions (**Appendix 4, Table 39-41**). Only for 2009, the model with variables for categories of institutions explained a significant part of the variance in the DTC, namely 27.1%.

Finally, the data of all years was combined. Based on the Hausman test (p=0.9879), the random-effects model was chosen. The results of the test showed no significance (p=0.1127) which indicates that the differences in price cannot be explained by the case mix parameters.

For HNP, treated by a neurosurgeon, it can be concluded that case mix is not reflected in the price since both the regressions per year and the random-effects regression gave no evidence for this.

5.2 Qualitative analyses

This paragraph describes the data population and results of the interviews.

5.2.1 Data population

Interviews were conducted among employees of a health care insurer and among employees of several hospitals. In total, seven interviews were conducted. Four of these were performed at a health care insurer and three at different hospitals. Most of the respondents of the health care insurer (n=3) were health care purchaser. The other respondent was a medical advisor and is involved in the negotiations for the part regarding quality of care. The respondents of hospitals had all financial positions in sales or management. Due to practical reasons, all hospital respondents came from hospitals in the west of the country. One respondent was from an academic hospital and the other two respondents were from general hospitals. Both general hospitals were relatively small since they have about 300 to 400 beds. They were 'normal' general hospitals and did not belong to the top clinical hospitals. However, these hospitals were located in areas were case mix could be relevant. One hospital was located in a neighbourhood with a lot of expects, while the other hospital's neighbourhood included a lot of immigrants. The table below (**Table 17**) gives an overview of all respondents.

Table 17: Overview of respondents

Respondent	Function	Institution
1	Medical advisor	Health care insurer
2	Health care purchaser MSC[8]	Health care insurer
3	Health care purchaser MSC	Health care insurer
4	Manager health care purchasing MSC	Health care insurer
5	Account manager sales	Academic hospital
6	Controller	General hospital
7	Head of the financial department	General hospital

5.2.2 Results interviews

This paragraph shows the results of the interviews. The interviews were recorded and transcribed. The transcriptions were coded and categorized (**Appendix 5**). The coding continued until all pieces of the text were grouped by subject. The results are discussed per subject.

Case mix

The first question of the interview was 'how would you describe or define case mix?' Based on this basic question, the general thoughts about case mix were investigated before asking more specific questions about the subject.

[8] Medical Specialist Care

The respondents describe case mix in terms of differences in patient characteristics and differences in treatment intensity. Also, one respondent mentioned that ITCs select on a different, healthier patient population. The quotes below illustrate this.

> *"I think of complexity of the patient, but also other circumstances […] like medical problems that affect each other, psychological conditions and social circumstances […] that can impede the self-care ability".* (Respondent 1)
>
> *"Actually, case mix has to do with patient characteristics which are specially focused on the disease and result in differences in complexity of treatment […]."* (Respondent 3)
>
> *"Case mix is the intensity of treatment needed for a certain patient and the type of treatment [..] based on specific patient characteristics."* (Respondent 4)
>
> *"Of course it is true that one hospital sometimes has a heavier type of patients. An ITC that selects less severe patients or relatively healthy people, has an easier job […] ".* (Respondent 6)

Differences in patient characteristics and treatment intensity influence resource use which leads to higher costs of the DTC. This is shown in the following citations.

> *"Case mix, that are the additional costs for treating complex patients, for instance patients with comorbidities or patients which need additional care due to their age. So, treatments are not more complicated but due to of the condition of the patient, more care should be given".* (Respondent 5)
>
> *[…] It is possible that the care profile consists more than average in terms of time spend during inpatient visit or surgery […] Another possibility is the comorbidity of the patient that can result in another, more expensive care program […].* (Respondent 6)
>
> *"The amount of effort and its related costs to run a certain patient through a care project, that the costs are higher than averaged. So, in the current world: for a similar DTC, more hospital activities, patient days or time that are needed"* (Respondent 7)

There are similarities in the answers of the respondents concerning the definition of case mix. Most of them mentioned that case mix is about patient characteristics or another type of patients. Also the complexity or intensity of the treatment and comorbidity is mentioned by several respondents. However, there are also differences between respondents. Some respondents (1, 3, 4) emphasize the patient characteristics, while others (respondent 5, 6, 7) gave more attention to the costs and resource use. Additional concepts from the patient perspective were complexity of the patient, self-care ability and medical, psychological and social well-being. The perspective of costs and resource use was mostly present among respondents of hospitals (respondent 5, 6, 7). They related case mix to higher costs and differences in care profile. A care profile shows the content of a DTC in terms of resources that were used. A description is shown in the following quote.

> "[…] *the way you make the product (DTC). To be more specific, just what is included; a daycare treatment, outpatient visit, laboratory, people, et cetera.*" (respondent 6).

Finally, one respondent described case mix from another point of view. She was more talking about how adjustment for case mix could be performed (by creating similar groups) than about the definition of case mix itself.

> *"I would define case mix as the factors that you should take into account in the purchasing or in the bills to create an identical or similar group between institutions. Case mix are the factors that you should take into account […]. It is not about the factors but about the heaviness of the factors".* (Respondent 2)

To conclude, respondents explained that patient characteristics and type of patients can influence case mix. Also, comorbidity can influence case mix. Finally, the more resources are used, the higher the costs. This was explained by respondents as a result of case mix.

Role of case mix in negotiations

This paragraph investigates the role of case mix during the negotiations and raises the topic by whom the argument of case mix was mostly offered. Almost all respondents mentioned that case mix played a limited role during the negotiations between health care insurers and hospitals. One respondent (respondent 6) stated that case mix played no role. All respondents confirmed that the argument of case mix was raised by care institutions.

The respondent's choice to attribute a limited role to case mix was based on several ideas. Most of the respondents mentioned that case mix was addressed during discussions about the price. Sometimes it was offered by the institutions because they assumed to have more complex patients which used more resources and therefore cost more money. The citations illustrate this.

> *"It (LvH: case mix) is about prices. […] Case mix indicates that it influences the deployment of the hospital and deployment should be translated in prices and rates"* (Respondent 1)
>
> *"[…] it (LvH: case mix) is sometimes offered by hospitals in case of 'we are entitled to additional money, additional resources, we have set up something special or we have a special project because we have a target group with a higher case mix compared to… […]"* (Respondent 2)

Some respondents related the relevance of the concept of case mix to the type of institution. As is shown in the quotes, they expect ITCs to have a lower case mix and academic hospitals to have a higher case mix. The respondents also relate the heaviness of case mix to the DTC price.

> *"Perhaps in ITCs you can say; you often have a target group with a lower case mix and that is one of the reasons that you could provide a lower fee […]"* (Respondent 2)
>
> *"[…] But for academic hospitals, it (LvH: case mix) is often on the agenda. And I think that therefore they should ask a higher price for the care. By general hospitals, it does not often occur."* (Respondent 3)
>
> *"[…] We would like that it (LvH: case mix) played a major role, because we are convinced that case mix is very important for an academic hospital. Because we get more complex patients and, since the introduction of the B-segment, the ITCs and also a few other general hospitals are more likely to say; you should actually go to an academic hospital for a specific case".* (Respondent 5)
>
> *"We simply know that an ITC works with a selected patient group"* (Respondent 6)

However, not all respondents were convinced that case mix should play a role. As shown in the quote below, one respondent mentioned that the argument of case mix played no or at least a limited role and was only offered as a reaction on a question of the health care insurer. This is the same respondent as the one who indicated that case mix did not play a role in the negotiations.

> *"[…] You are focused to sell your own products, to show your own care profile […] and the concept of case mix comes at most into play when insurers say; this is all beautiful, but you are too expensive because somewhere else I contract for so and so (LvH: a certain price). Then you get the discussion: why is it (LvH: a certain DTC) more expensive in this hospital? Is your profile heavier? Only then, case mix comes into play."* (Respondent 6)

Other reasons, suggested by respondents, that case mix did not play a major role was because they supposed that case mix was not relevant within a DTC. For example, a respondent mentioned that it was more likely that case mix was expressed between clinical DTCs and day care treatment DTCs. Another respondent argued that case mix played minor role since the B-segment includes elective care. It was also mentioned that during the negotiations more attention was given to a few DTCs or that agreements of price occurred over the total number of DTCs. The following quotes explain this.

> *"[…] It is more likely that it (LvH: case mix) exists for example in the relationship between clinical DTCs and day care treatment DTCs. […] For instance, you have a lot of day care treatment DTCs and less inpatient visits for the treatment of inguinal hernia. Sometimes it is said: that is caused by a patient category that is heavier. […] The B-segment consists of elective care and case mix can play a role there, but it is less present than in the A-segment."* (Respondent 3)
>
> *"[…] you will agree on prices and often you focus on the total and not on individual DTCs […]".* (Respondent 6)
>
> *"[…] Usually, the insurer choses a few DTCs to which they give more attention and spend more time in the negotiations. […] Case mix plays a limited role because it is only present for a select number of DTCs".* (Respondent 7)

The previous arguments for the limited role that case mix played were related to its content. However, respondents also mentioned arguments about the feasibility of the role of case mix. Most respondents indicated difficulties about measuring case mix. This is supported by the following quotes which all come from employees of the health care insurer.

> *"[…] it is the question to what extent you can prove it (LvH: case mix) because you do not have strong criteria on which you can test it. […] Often, it is a feeling of the hospital and they cannot prove it. If you want to prove it, you should clearly define the parameters and you should register them."* (Respondent 1)
>
> *"[…] We suggest it (LvH: case mix) very limited since the health care insurer has a very limited insight if case mix plays a role. It is very difficult to compare."* (Respondent 2)
>
> *"[…] On this moment, it is (LvH: case mix) very difficult to measure were differences exist. So, on a high level of abstraction it is taken into account, but is not possible to specify it."* (Respondent 4)

To conclude, case mix played a limited role during negotiations. The argument of case mix was mostly addressed by hospitals in case they assumed to have a heavier patient population and therefore needed a higher price. However, most respondents mentioned practical problems. Parameters of case mix were not well defined and clear criteria were lacking. Therefore respondents indicated that it was difficult to prove whether case mix played a role and to what extent.

Case mix in the DTC price

This paragraph investigates the translation of case mix in the DTC price. A question in the interview was as follows 'Is case mix directly reflected in the price of a DTC?' Most respondents did not answer straight forward, but mentioned that on this moment case mix could be translated in the DTC price, but not directly. They explained that case mix was reflected in the price between types of institutions. The quotes below explain this.

> *"[…] Yes, I think so, that it is expressed there (LvH: between different categories of institutions)."* (Respondent 2)
>
> *"[…] Implicitly, from top clinical hospitals, you may expect that they have a heavier patient category. So, implicitly, for some diseases the costs of a top clinical hospital may be higher due to a heavier patient category."* (Respondent 3)
>
> *"[…] And for academic hospitals you suppose that they have a heavier patient category and then you take it into account in the price […]."* (Respondent 4)

Respondents also mentioned the use of the cost price as an indirect method to translate case mix in the price. This is described in the following citations.

> *"We stimulate hospitals to use their cost prices. A lot of hospitals are already using them. If you have a heavier patient population, you get higher costs, possibly caused by case mix, and that should be translated in the rate."* (Respondent 2)
>
> *"Yes, the hospital will translate it (LvH: case mix) in the required DTC price, but it is not a one-to-one relationship […]".* (Respondent 4)

There were also some respondents who indicated that case mix was directly translated into the price of the DTC. One respondent argued that the price of a DTC was based on its own care profile and cost price. However, other respondents restricted the direct translation to certain DTCs or explained that it was expressed in an overall raise. Both opinions are shown in the quotes below.

> *"Yes, for us, the price of a DTC is determined from our own care profile and our cost price. So, when it contains more time or resources…"* (Respondent 6)
>
> *"For some DTCs we succeeded it (LvH: to directly translate case mix in the DTC-price). But only as an overall raise […]".* (Respondent 5)

One respondent mentioned that it would be desirable to directly translate case mix into the price. He suggested a percentage raise on the DTC price since an overall raise had a negative influence on the competitive position of the hospital.

> *"You would prefer that case mix was expressed in a percentage raise on a DTC were it plays a role and not spread over all (LvH: DTCs) because that influences our competitive position. Health care insurers are looking to raw prices and for next year they are saying: you are very expensive, we will buy the basic care from a hospital around the corner […] "* (Respondent 5)

In some interviews, the methods for translating case mix in the price came into play. Previously in this paragraph, there was mentioned that the health care insurer stimulated hospitals to use cost prices. Over time, the use of cost price systems by hospitals has increased. It also has advantages for

hospitals since it provides more insight in profitable and non-profitable products. This is shown in the following quote.

> *"They (LvH: hospitals) make more use of cost price systems and will of course try to increase their margin. However, they try to move towards cost prices because then they can manage it. If they do not have any information about cost prices, then they would not know which products are loss-making and which products are profitable. It is something of recent years, more hospitals are moving towards it."* (Respondent 2)

However, another respondent had a more critical view against cost prices since cost price information depends on a lot of choices of the hospital and is therefore not uniform between hospitals. The following citation shows this.

> *"The cost price information in a hospital strongly depends on some allocation formulas and choices hospitals make regarding this allocation formulas. If you want to do it very correctly, employees should also write time. […]. So, cost price systems in hospitals, it is in its infancy."* (Respondent 3)

Respondents also mentioned difficulties by translating case mix into the price of a DTC. Their arguments were quite consistent with the ones that were cited previously in this paragraph by the subject of the role of case mix during the negotiations. Respondents indicated that it is difficult to prove that case mix plays a role. This is mainly caused by the lack of a uniform definition of case mix and its parameters.

> *"I do not think so (LvH: that case mix is expressed in the price), because you can not prove it. […] It is not said: just prove it, let's see what it turns out. So far, it is not played that hardly. […] You also do not have any control on it, you have not made clear arrangements about; what is case mix? […] We still have no good definition of case mix. "* (Respondent 1)
>
> *"If it (LvH: case mix) is directly translated in the price of a DTC, that would mean that it is exactly observable. […] On this moment, it is difficult to measure."* (Respondent 2)

To conclude, most respondents indicated that case mix was not directly reflected in the price of a DTC, but indirectly by differentiating between types of institutions or by encouraging hospitals to use their cost prices. However, there are also shortcomings in both the use of cost prices and in proving the argument of case mix.

Parameters of case mix

This paragraph investigates the respondents' thoughts about which parameters (as defined in the conceptual framework) have the largest impact on case mix and costs with the assumption that case mix is reflected in the price of a DTC.

Before describing the results regarding the parameters, it should be mentioned that some respondents indicated that it was difficult to choose the parameters in general. This is shown in the following quotes.

"It (LvH: the factors you choose for case mix) is very dependent on the DTC […]" (Respondent 2)

" […] it is a combination of all that things (LvH: parameters of case mix) […] it is very difficult to say something general about it." (Respondent 4)

The table below (**Table 18**) gives a general summary of the respondents' answers before the results will be discussed more extensively. The symbol '+' means that the respondent indicated that this was a parameter of case mix, while the symbol '-'means that this was not the case. Also some respondents mentioned that the parameter could influence case mix or was partly related to case mix. Then the symbol '+/-' was given. Finally, some respondents indicated that the parameter was only relevant for case mix since it was related to comorbidity. The empty cells in the table means that respondents did not mention the parameter and did not relate that parameter to case mix.

Table 18: Summary of respondents' answers about case mix parameters

Respondent	Age	Gender	SES	Continued DTC	Referral	Chronic illness	Diabetes	Multiple diagnoses
1	Related to comorbidity	-	+		+/-	+/-		
2	+			+/-	+/-	+/-	+/-	+
3	Related to comorbidity		Related to comorbidity		+/-			+
4				+	+			
5	+		+			+		+/-
6	+/-	-	-			+	+	+
7	+	-	Related to comorbidity	-	+	+	+	+ or +/-

As shown in the table, most respondents indicated **multiple diagnoses** as a parameter of case mix. Multiple diagnoses was often (n=6) regarded as a major parameter since respondents related it to comorbidity. The citations below describe this.

"Multiple diagnoses is an important one […]" (Respondent 2)

"I think the last one (LvH: multiple diagnoses), comorbidity. Yes, I believe comorbidity is often a major cause for a heavier case mix." (Respondent 3)

"Definitely the multiple diagnoses (LvH: as answer on the question which parameter has the highest impact)." (Respondent 6)

"[…] Also multiple diagnoses. So, you are looking for symptoms of comorbidity […]." (Respondent 7)

Although 'multiple diagnoses' was indicated as a major parameter, respondents also mentioned some shortcomings of its measurement. Diagnoses that were treated in the 'first line', the non-hospital care, do not emerge due to the definition of this parameter. Also, not all other diagnoses are relevant regarding case mix. Finally, it was mentioned that the time horizon was defined too broadly. The quotes explain this.

"Yes, when they (LvH: insured) are in the first line, you will not see it (LvH: in the parameter of multiple diagnoses)." (Respondent 2)

"[…] Yes, but I think it (LvH: parameter of multiple diagnoses) is perhaps defined too broadly. Another DTC with an alternative diagnosis, that can also be someone with a broken leg. In a lot of cases this (LvH: this parameter) plays a role, but I think you should narrow it […]." (Respondent 5)

"The 365 days, I find it a little difficult, because when people have things (LvH: diseases) sequentially they are not becoming more complicated. So, the longer you take the period, the more your data is contaminated […]. So, multiple diagnoses is only relevant when paths are parallel or nearly parallel." (Respondent 7)

Most respondents (n=6) also indicated that **age** is a relevant parameter for case mix, but sometimes they mentioned that age only affected the comorbidity. So, age was directly and indirectly related to case mix.

"[…] because for certain diseases a higher age results in more comorbidity, but also results in more time required to explain something to the patient […]." (Respondent 2)

"Age, not necessarily, because there are also a lot of healthy elderly […] but there are also people of 65 or 70 with a lot of comorbidity or medical problems. So, age in itself is not a strong argument […]." (Respondent 1)

"[…] age definitely plays a role. […] I expect older patient or very young children to be heavier." (Respondent 5)

"Age, certainly (LvH: as answer on the question which parameter has the highest impact)." (Respondent 7)

Five respondents suggested that the parameter of **referral** could play a role regarding to case mix. They explained that a referral could indicate a higher case mix if patients were referred to more specialized clinics. However, another respondent mentioned that referral only plays a role for a specific part of the second opinions.

"[…] Referral is also 'half' important. […] A referral also means that the treatment is not completed." (Respondent 2)

"[…] It is possible of course. When the situation is that firstly the conservative route was tried and, when it does not succeed, it was decided to perform a surgery. Yes, could, I deliberately say: could, indicate a higher case mix. […] Referral to a more specialized clinic could indicate a higher case mix. If that is the case, then I agree with you" (Respondent 3)

"Referral, could be possible. […] It is only the case for a specific category of referrals, the second opinions. […] You can explain this in two ways. One can be that the physician in the first hospital will not perform a surgery because he thinks there is no indication for it. The other one can be that he will perform a surgery, but the waiting lists are too long and therefore you are referred to another hospital. In the latter case, the second hospital of course has much less case mix than the first hospital. The first hospital put effort to clarify that you do not have to undergo a surgery and the second hospital got all the information of the first hospital […] and only performs the surgery". (Respondent 1)

Also five respondents suggested that the parameter of **chronic illness** has an impact on case mix. Sometimes, because it is related to comorbidity. Another respondent mentioned that the impact of chronic illness on case mix depended on the current disease. It is shown in the following quotes.

"Chronic illness, yes, that means that he has also another disease that should be taken into account or can have impact on the DTC. Then he consumes more and uses more resources." (Respondent 2)

"Chronic illness, it depends […] but if you are treated for a broken leg and additionally you have a chronic disease like diabetes or COPD, then its impact can be questioned. […] It can have impact, especially when it is about surgeries. There I can imagine" (Respondent 1)

"Chronic illness, yes, because that is comorbidity." (Respondent 7)

The parameter of **socioeconomic status (SES)** was indicated by four respondents. Some of them related SES directly to case mix since it is about self-care ability or because it has an impact on the general health status. Others mentioned that SES was only related indirectly to case mix by comorbidity. This is shown in the citations below.

"If you are looking to patient characteristics, then socioeconomic status will play a role but it is dependent on the disease. Look, people live unhealthier, smoke more and that will result in a bit more comorbidity. So, I would say that they are aligned and not two different characteristics." (Respondent 3)

"Socioeconomic status, yes I think so, because it has to do with the self-care ability of people." (Respondent 1)

"The expectation is that the general health status is lower by a lower socioeconomic status. So, we suspect that the risk of complications is higher and therefore we should offer more expensive care". (Respondent 5)

"Socioeconomic status, I do not think so. I only think that it causes more complaints, but I do not know whether the complaints of people are becoming more heavily." (Respondent 7)

Three respondents indicated **diabetes** as a parameter of case mix. One respondent mentioned diabetes because it is a measure of comorbidity. Another respondent restricted the impact of diabetes on case mix to certain diseases that are related to diabetes. Finally, it could be possible that some respondents did not mention the parameter of diabetes since they indicated it as a chronic disease which was another parameter.

"And diabetes, yes but only if it is about diseases that are related to diabetes." (Respondent 2)

"Diabetes, because that is also comorbidity". (Respondent 7)

The parameter of **continued DTC** was indicated by only two respondents. They were not very sure about its impact on case mix, but they mentioned that it could be possible that the treatment was not finished within the expected period. The quotes below illustrate this.

"Continued DTC, to a lesser extent but it means that the treatment is not finished yet. So, the case mix must be higher compared to a treatment that is finished in two weeks." (Respondent 2)

"Perhaps continued DTC, because the treatment is not completed within the expected period. But it can be questioned if that really says something about case mix." (Respondent 4)

Finally, none of the respondents indicated gender as a parameter of case mix.

To conclude, most respondents supposed comorbidity as having the largest impact on case mix. However, some shortcomings of the parameter multiple diagnoses were mentioned. Also the parameter age was important for case mix. The impact of the other parameters on case mix was less convincing since respondents had different views. Finally, it was mentioned several times that parameters, especially age, chronic illness and SES, are not directly related to case mix but that they are related to comorbidity and therefore impact case mix.

Desirability of price correction

This paragraph discusses the desirability to adjust the price for case mix based on the parameters respondents mentioned in the previous paragraph.

Most respondents (n=5) indicated that the price should be adjusted for case mix since that would result in a real price that reflects costs. However, most respondents mentioned a proved relationship between case mix and costs as an important precondition.

"Yes […] because the policy of the health care insurer […] is that we want to reimburse higher costs if they are caused by a higher case mix. Or if higher quality results in higher costs, we also want to respond on that […] You also have a social responsibility to care for heavier target groups". (Respondent 2)

"In theory, yes […] So, ideally if you want to determine the price as specific as possible, the patient characteristics should perhaps play a role. […] However, it is very difficult to prove." (Respondent 3)

"Yes, it is desirable if case mix results in a more expensive treatment or if treating a less complex patient category results in a lower price. Then it should be connected […] Yes, if that relationship can be made." (Respondent 4)

"Yes […] it should be translated in the effort and price. Yes, that seems quite logical to me. However, the difficulty is that you should define a clear relationship." (Respondent 1)

"Yes, I think so because then you get a real price that reflects the costs you made" (Respondent 5)

There was also a respondent who explained that adjusting the price for case mix was only desirable between types of institutions. However, another respondent mentioned that differences in case mix between types of institutions are already reflected in the price since they performed different DTCs which have different prices (e.g. clinical and day care treatment).

> *"Except when you are working in an ITC setting and only perform easy planning care, then it is another story. Then it seems quite logical to me that the price is a bit lower. Not between hospitals."* (Respondent 5)
>
> *"In general, ITCs are treating less complex patients [...] so that should be expressed in the prices they charge. In practice that will occur [...] In ITCs, it (LvH: staying in the hospital after surgery) almost never happens, they mostly perform day care treatments. So actually, it is already expressed there, because if you arrange prices you only agree about day care treatments and not about clinical DTCs. So, indirectly you allow the lower case mix by arranging a lower priced DTC."* (Respondent 1)

There were also two respondents who found it not desirable or necessary to adjust the price for case mix. One respondent mentioned that is was not desirable, because in his opinion case mix was not a major cause for price differences. The other respondent indicated that it was not necessary to explicitly adjust the price for case mix since the negotiations offer enough space for this subject.

> *"I say no. The reason is that of course it (LvH: case mix) could have impact, that is clear, but the most determining is how the care is organized. […] That it can have a little impact, that will be averaged."* (Respondent 5)
>
> *"[..] You have inefficiency, teaching function and case mix and it is difficult to distinguish. […] I think that on this moment the negotiable prices offer enough space to express case mix in it (LvH: the price), because as a hospital you can explain why your profile is different. […] So, when you take enough time to negotiate, with respect to the content of care and not only about 'what is below the line', then I think the free negotiation situation is the best."*

Finally, two respondents also mentioned negative consequences of adjusting the price for case mix. Adjusting for case mix could serve as an incentive for hospitals to select their patient population or could be used as a disincentive for efficiency. Both the incentive and disincentive were regarded as undesirable.

> *"If you do not measure it (LvH: case mix) very well, the risk is that it can serve as an extra incentive for hospitals. […] If it could be offered in the negotiations by hospitals to agree a higher price, then in the next year they are going to select their patient population and still get a higher price."* (Respondent 1)
>
> *"If you want to fencing off by using a system from the government, I am afraid that you create too less incentive for providers of complex care to treat complex patients as efficient as possible."* (Respondent 7)

To conclude, most respondents indicated that case mix should be expressed in the price if the relationship between case mix and costs could be proved. One respondent mentioned that adjusting the price for case mix was only desirable between types of institutions. Two respondents suggested not to adjust for case mix since case mix is not a major cause of price differences and the current system creates enough space to negotiate about it. Finally, the incentive to select patient population and the disincentive for efficiency were mentioned as negative implications of adjusting for case mix.

Other causes of higher price or different care profile

Sometimes, as has been addressed in previous paragraphs, respondents indicated that a higher DTC price or differences in care profile could be explained by other arguments than case mix. Since it contributes to the understanding of the role of case mix, these arguments are mentioned shortly.

Respondents indicated that the differences in price could be explained by the organization of an institution. For instance, because ITCs do not have a certain intensive care level, they only treat young, quick patients. In contrast, academic and categorical hospitals have higher prices since they often have more referrals. However, for larger organizations, economics of scale can play a role.

> *"Maybe it has to do with case mix differences, but perhaps it has to do more with the organization of an ITC compared with the organization of an academic hospital. And when we are talking about costs, it (LvH: a larger organization) can have efficiency benefits. […] So, I think that (LvH: organization of institution) has a lot more impact on the price compared to the effect of case mix."* (Respondent 3)
>
> *"Yes, for example in academic or categorical hospitals prices are higher since they have more referrals. And ITCs solely because the way their institution is organized results in a lack of a certain IC-level and therefore in another type of patient. […] So, you expect that hospitals focus on the complex patient and ITCs on the quick, young patient."* (Respondent 4)
>
> *"[…] On the other hand, I think that a top clinical hospital that treats indeed more complex patients, do also have the economies of scale of a large institution. So, it is mostly a political debate whether you should adjust for case mix or not."* (Respondent 6)

It was also mentioned that other topics like experience of the physician, medical policy of the hospital or service level can influence the care profile and its costs. It is explained in the following quotes.

> *"For instance, it is possible that the time you spend on inpatient visit or surgery is more than average. Then, you get a discussion like; is it inefficiency or is it experience of an eye specialist […] or do you have another category of patients?"* (Respondent 5)
>
> *"It can be caused by inefficiency. It can also be caused by the care side of the hospital since they have a policy to see people that often or you can be confronted with patients who demand a certain service level. […] Sometimes it is case mix, sometimes it is more customer focused."* (Respondent 7)

To conclude, some respondents mentioned other reasons than case mix for differences in price or care profile. They indicated the organization of care, experience of the physician, medical policy or service level as subjects that can also cause these differences.

Conclusion

The important results of the interviews are shortly summarized.

Respondents defined case mix as patient characteristics and comorbidity that influence resource use and costs. Case mix played a limited role during the negotiations between the health care insurer and the hospital. This was mainly caused by practical problems since a universal definition and clear criteria of case mix were lacking. Therefore, it was difficult to prove whether case

mix played a role or not. These practical problems were also the main reason that respondents mentioned that case mix was not directly reflected in the DTC price. Case mix was only reflected indirectly in the price by differentiating between types of institutions or by encouraging hospitals to use their cost prices. Respondents indicated that comorbidity is the most important parameter of case mix. Also other parameters like age, chronic illness and socioeconomic status influence case mix, but it was mostly mentioned that they were indirectly related to case mix since they influenced comorbidity. Respondents indicated that case mix, based on the defined parameters, should be expressed in the DTC price when the relationship between case mix and costs can be proved. It was also mentioned that adjusting for case mix was only desirable between types of institutions. However, other respondents suggested that case mix adjustment is not desirable since it is not a major cause of price differences. Other adverse effects of adjustment were the incentive of patient selection and the disincentive for efficiency. Finally, it was mentioned that the organization of care, experience of the physician, medical policy or service level were other causes than case mix for explaining price differences or differences in care profile.

6. Conclusion and discussion

In this final chapter, the conclusion and discussion of this study are given. Firstly, in the conclusion the problem statement is answered. Secondly, the data, methods and results of this study are discussed. Also, the results of this study are compared with the literature and recommendations for further research are given. Finally, the implications of this study are discussed.

6.1 Conclusion

This study answers the following problem statement: "*Is case mix, based on information of a Dutch health care insurer, reflected in the negotiated price of a DTC and is case mix discussed in the negotiations between the hospital and the health care insurer?"*

Firstly, the Dutch health care was described followed by an explanation of case mix. Differences in case mix between types of institutions were observed (Street et al. 2010:150 & Löbbes 2011:70). Adjustment for case mix is necessary to redistribute money fairly between hospitals and to avoid patient selection including referral of complex patients or offering low quality care to high-risk patients (Weissert&Musliner 1992:456 & Medisch Contact 2011).

To investigate whether case mix was reflected in the price of a DTC, quantitative analyses were performed. Based on the data available to the health care insurer, some general parameters of case mix were chosen: age, gender, continuation of indication, referral, chronic illness, multiple DTCs, diabetes and socioeconomic status. The relationship between these parameters and the negotiated price of a DTC was tested quantitatively by correlations and regressions. These tests were performed for six DTCs: knee osteoarthritis, meniscus lesion, cataract, HNP (orthopedics) and two DTCs for HNP performed by a neurosurgeon. The data contained information of the years 2007, 2008 and 2009. The results of the hierarchical multiple regressions, which were performed for each year separately, did not show a clear relationship between the case mix parameters and the negotiated price of the DTC. Only for the diagnosis cataract, the case mix parameters explained a significant part of the variation in the price for all years. Over the years, the adjusted R square ranges from 9.8% to 16.1%. Significant variables were gender, multiple diagnoses, referral and chronic illness. Also, panel data regressions were performed that combined the data of all years. These results showed that the case mix parameters explained a significant part of the variance in the price for the diagnoses cataract (Adj. R2=0.478) and meniscus lesion (Adj. R2=0.131). However, the hierarchical multiple regressions per year only showed significance for meniscus lesion in 2009, mainly caused by the constant term. Therefore, it can be concluded that case mix differences are only reflected in the price of cataract. However, the case mix parameters did not explain a major part of the variance in the price based on the adjusted R square.

Based on the qualitative analyses, it was investigated whether case mix was discussed during the negotiations between the hospital and health care insurer. It can be concluded that case mix played a limited role during the negotiations. Comorbidity seems to be a major parameter of case mix

and also some other parameters could influence comorbidity. In addition, respondents mentioned that case mix was only indirectly reflected in the price of a DTC by differentiating between types of institutions or by encouraging hospitals to use their cost prices. Although, case mix was not directly expressed in the DTC price, some respondents mentioned that a direct translation would be desirable if a relationship between case mix and costs could be proved. However, practical problems as the lack of clear criteria and a uniform definition of case mix impede this.

According to the results of the quantitative analyses and the interviews, it can be concluded that case mix, based on the defined parameters, was not reflected in the negotiated price of the DTCs analyzed in the study, except for cataract.

6.2 Discussion

This paragraph discusses the data, methods and results of this study. Firstly, the limitations of this study are mentioned. Then the quantitative analyses are discussed followed by the qualitative analyses. Finally, the results of this study are compared with the existing literature.

6.2.1 Study limitations

Since this study investigated the reflection of case mix in the DTC price, both case mix and price are important topics. In this study, higher case mix was defined as a higher resource use due to patient characteristics and clinical aspects (Marazzi et al. 2007:203). However, the parameters of case mix that were used in the quantitative analyses were mainly the ones with respect to patient characteristics. Disease specific and clinical parameters were not included since these were unavailable in the database of the health care insurer. However, the inclusion of these parameters would have resulted in a more comprehensive measure of case mix.

The prices that were used in this study are negotiated prices between institutions and the health care insurer. Ideally, prices should be based on real costs which also reflect case mix. However, cost prices were unavailable in the database of the health care insurer. The extent to which negotiated prices reflect real costs could be questioned. During the interviews, some respondents mentioned that the price is a result of the negotiation process and that negotiations did not always take place at DTC level, but on diagnosis or hospital level. However, some respondents of hospitals indicated that their negotiated prices were based on cost prices or that negotiated prices start to better reflect costs given the experience both hospitals and health care insurers. Therefore, the use of negotiated prices might be more reliable.

However, the causality of the relationship between the case mix parameters and costs remains questionable. During the interviews, respondents mentioned that there could also be other reasons for a higher price, like inefficiency or quality differences. This study did not correct for quality differences while these could to some extend influence costs and the relation between case mix and price. Although the role of quality indicators increases, the use of quality indicators in hospital care is still in its infancy (Schut&Van de Ven 2011:116) and impossible to include in this study. Besides quality measurement, also two other remaining preconditions of Van de Ven&Schut (2008:773) about

the market-oriented health care system were not fulfilled at the moment of this study including an adequate system of consumer information about price and quality and an adequate governance structure.

6.2.2 Quantitative analyses

In this study, correlations and hierarchical multiple regressions were performed for each year. In these tests, a weight was included to give more weight to hospitals that treated more insured and less weight to the hospitals that treated less insured. Also, fixed- or random-effects regressions were performed which combined the data of all years. Overall, results were not significant. This could be due to for instance the use of negotiated prices as mentioned before, but it could also be the result of the methods that were used.

The correlations investigated the univariate relationship with the price while the multivariate regressions also allowed the influence of other parameters in investigating the relationship. The results of the correlations were not consistent with the parameters that showed significance in the hierarchical multiple regression analyses. It should be noted that the results of the regressions were adjusted for type of institution, while this was not the case in the correlations. So, differences in results could be caused by the lack of consistence between correlations and regressions with respect to adjustment for type of institution and the nature of the test. Also the type of correlation can be discussed. Since not all parameters were normally distributed[9], the non-parametric Spearman test should be performed. However, non-parametrical tests cannot include a weight for hospital size. Hence, a trade-off was made between including a weight and the (none) parametric characteristics of the test. It was chosen to perform Pearson correlations since the weight was also included in the regressions which made the results of hierarchical multiple regressions and correlations more comparable. Besides, although the results of the Spearman correlation tests differed, they also did not show a clear relationship between the parameters and the prices. Also, panel data regressions were performed because this would probably improve the explanatory power of the model. However, it was beyond the scope to include a weight for hospital size and a covariate for type of institution in these regressions. So, the results of the panel data regressions were not fully comparable. Therefore, the results of the hierarchical multiple regressions, which were performed for each year, were more reliable since a weight and covariate were included. Hence, these regressions results are the main results.

Sometimes, the hierarchical multiple regressions gave remarkable results. For instance, the regression for osteoarthritis in 2007 showed significance but none of the variables contributed significantly. Another example is the results of meniscus lesion in 2009. The model explained a significant part of the variation in the price caused by the constant term and the parameter of SES2. However, when socioeconomic status would really have an influence on the DTC price, then all parameters of SES should have shown significance. Finally, the beta coefficients of parameters which had shown significance in the regressions sometimes showed contrary signs. For instance, an

[9] In paragraph 5.1.1 is shown that the price is mostly not normally distributed for all DTCs over the years.

increase in the percentage of insured with multiple diagnoses would reduce the price of the DTC. This was not conform expectations. These remarkable results might be explained by the lack of correlation between (certain) case mix parameters and the negotiated DTC price.

6.2.3 Qualitative analyses

The interviews were conducted with employees of a health care insurer and employees of several hospitals. It should be mentioned that the employees of an insurer were all working at the same health care insurer. So, perhaps selection bias has influenced the results since they could have similar experiences or matched opinions about the subject of the interview. The results did indeed show large correspondence in their opinions. It is difficult to determine if the correspondence is due to fact that they all worked at a health care insurer or that they all worked at *the same* health care insurer. By generalizing the results for other health care insurers, this should be taken into account.

The employees of hospitals all came from different hospitals. Interviews were conducted with one respondent of an academic hospital and two respondents of general hospitals. This will have resulted in different opinions which enhanced the data.

Related to the content of the interview, question five[10] could be regarded as a suggestive question since the multiple choice component restricted respondents in choosing parameters of case mix. This shortcoming was partly solved since question seven[11] gave respondents the possibility to mention other aspects of case mix. However, not much respondents indicated other aspects that played a role. Therefore, the suggestiveness of the question did not restrict the respondents too much in choosing parameters of case mix.

6.2.4 Results versus literature

This paragraph compares the results of this study with the existing literature. The four topics that will be discussed are the definition of case mix, the relationship between case mix parameters and the DTC price, the Risk Equalization Fund (REF) and the need for case mix adjustment.

Case mix can be defined as patient characteristics and clinical severity which influences care consumption and resource use (Marazzi et al. 2007:203). The definition of case mix as mentioned during the interviews was fully comparable with the definition from the literature. Since this study only focused on case mix *within* DTCs, some aspects of case mix as mentioned in the literature, were not used because they refer to case mix *between* DTCs. For example, aspects as severity of illness and treatment difficulty (Averill et al. 1998:2) or, as mentioned during the interviews, the complexity or intensity of treatment and other types of patients are not used in the analyses. Respondents mentioned that, based on their complexity, patients could be treated in day care treatment or in clinical

[10] Question 5: Suppose: case mix is reflected in the price. Which of the following parameters have (in your opinion) the largest impact on case mix and thus on the cost of care of an individual patient? *(the parameters as mentioned in **Table 3** were called)*

[11] Question 7: Are there other parameters (not mentioned in question 5) that influence case mix?

setting – which are two different DTCs. However, there were also sufficient motives to investigate case mix differences *within* a DTC since for each DTC the negotiated prices differed between hospitals and the patient population, based on some case mix parameters, differed between types of institutions.

The literature indicated age, gender, number of diagnoses, multiple DTCs, comorbidity, number of procedures, income deprivation, continued DTCs, referral, chronic illness, diabetes, transferring of patients, length of stay and functional dependency as parameters of case mix (Street et al. 2010:152; Marazzi et al. 2007:203; Greenfield et al. 1995:AS48; De Boo et al. 2008:7; Björkgren 2004:465). Some of these parameters[12] were used in the quantitative and qualitative analyses. During the interviews, most respondents mentioned comorbidity as a major parameter of case mix. Also age was mentioned as a parameter of case mix, directly or indirectly due to its impact on comorbidity. So, the results of the interviews that comorbidity and age would increase case mix are in line with the study of Street et al. (2010:152). The relationship between the case mix parameters and the price was tested quantitatively. Although the literature indicated that for instance older patients will have more care requirements (Street et al. 2010:152), the quantitative results gave no clear evidence for such a relationship between the parameters and case mix. This lack of significant results can be explained in different ways. Firstly, the analyses were performed on an aggregated level which may have resulted in smaller differences since the patient population was averaged on hospital level. However, differences between hospitals also exist on an aggregated level and also price agreements were made on a hospital level. A second possible explanation is that case mix and price differences exist especially between types of institutions, while this study adjusted for the influence of type of institution. The literature, the descriptive statistics and the results of the interviews indicated this. In the literature was shown that hospitals treated more complex patients compared to private treatment centers (Street et al. 2010:150-151). Also, Löbbes (2011) mentioned that characteristics associated with a lower case mix were more present in ITCs (Löbbes 2011:77). Since this study uses almost the same data as Löbbes (2011), it can imply that the same conclusion regarding case mix is valid. Also, for most DTCs, as shown in paragraph 5.1.1, the average case mix parameters indicated that ITCs treated the healthiest patients compared to other types of institutions. The results of the interviews support that case mix differences could exist between types of institutions. The respondents expect ITCs to have a lower case mix and academic hospitals to have a higher case mix. They mentioned that ITCs select directly on a healthier patient population, but also indirectly because they do not always have an intensive care unit and therefore are not allowed to treat very complex patients. Respondents also explained that case mix was reflected in the price between types of institutions. This is in line with the current policy of the health care insurer, which provided the data, since they only agreed prices with ITCs that were a certain percentage lower than the mean price of the other types of institutions. Thirdly, the lack of significant results may be due to the fact that currently, during the negotiations, case mix does not play a role in creating the price.

Although most results were insignificant and possible explanations were discussed, attention should be given to the results of cataract. For this diagnosis, case mix parameters explained a significant part

[12] The parameters age, gender, continuation of indication, referral, chronic illness, multiple DTCs, diabetes and socioeconomic status were used for quantitative analyses.

of differences in the price. This can be explained by the clear structure of the DTC since it is not a complex treatment. Besides, there is more competition of ITCs on the market which possibly resulted in a negotiated price that is a better representative of the costs. Additionally, the fact that the DTC of cataract is a major part of the ophthalmic specialism could also imply that ophthalmologists do not want to drop this DTC.

As mentioned before, this study used partly the same parameters as the Risk Equalization Fund (REF) which compensates between health care insurers for high- or low-risk insured. However, the lack of a significant relationship between the parameters age, gender, chronic illness and diabetes and the negotiated price implies that the adjustment, which insurers received from the REF for high-risk insured based on these parameters, is probably not transferred to hospitals. Therefore, the aim of the REF, which is reducing the incentive for selection (Van de Ven et al. 2007:168), does not seem to be achieved.

Based on the interviews, it can be concluded that at this moment case mix was not directly translated into the DTC price, but only indirectly by differentiating between types of institutions or by encouraging hospitals to use their cost prices. However, respondents mentioned that it would be desirable to directly adjust for case mix or only adjust between types of institutions. Also the literature indicated that it is desirable to adjust for case mix since it reduces the incentive for selection, by for instance referring complex patients to academic hospitals, and because unadjusted unit costs may be misleading (Weissert&Musliner 1992:456; Medisch Contact 2011; Söderland et al. 1995:25). In contrast to the literature, a respondent suggested that adjusting for case mix could actually serve as an incentive for selection. To explain, if adjustment for case mix will be applied, hospitals with complex patients receive a higher reimbursement and then, for the following year, they could cherry pick their patient population while still receiving the higher reimbursement. However, the incentive for selection only occurs when the adjustment is applied once. Since the price negotiations take place every year, it implies that the adjustment is a continuous process and therefore would not serve as an incentive for selection.

6.3 Recommendations

Based on this study, a few recommendations are given for further research.

The first major recommendation is the development of both general parameters and disease specific parameters of case mix. Also the development of a uniform general definition of case mix would be recommended since it can prevent misinterpretation.

Secondly, for further research it is recommended to combine disease specific information of hospitals with the declaration data of the health care insurer for defining case mix. An example of disease specific information is the ASA-score[13] and Body Mass Index. Another example is to take into account a certain PCG specific for a disease. In this study was only mentioned whether a patient did

[13] This is a global score that divide patients into five categories regarding their physical health status before surgery.

have a PCG, but the content of the present PCGs was ignored. It is also recommended to use cost prices of DTCs instead of negotiated prices.

Other causes of price differences can be related to treatment or quality aspects which are translated in the care profiles of hospitals. Therefore, it is recommended to compare care profiles of different hospitals, so that it is possible to indicate which costs are a result of quality interventions.

The final recommendation refers to a short term action. In the Netherlands, the DTC-system has been replaced in 2012 by the DTC system On the way to Transparency (DOT). It is expected that case mix is better included in this system since a DOT would have different subcategories that refer to the number of patient days. It is recommended to investigate extensively the way case mix is included in DOT and to investigate the possibilities to improve the way case mix is expressed in this system.

6.4 Implications

In this final paragraph, the implications of the results of this study are discussed. The major question that needs to be answered based on this thesis is 'Should case mix adjustment, based on several characteristics, be implemented in the reimbursement of specialist medical care in the Netherlands?'

Based on the literature, it can be concluded that applying case mix adjustment is desirable since it will result in a more fair distribution of money between hospitals based on their patient population. Therefore, case mix adjustment can serve as a disincentive for selection for both hospital and health care insurer. However, applying case mix adjustment is very complex since clear criteria of case mix are lacking and the relationship between case mix and costs still has to be proved. Besides that, the desirability is also questionable since it is perhaps in conflict with the market-oriented system which encourages price negotiations between hospitals and health care insurers. However, a first step can be set by adjusting prices for length of stay. Although this parameter was not available in this study, both the literature and the respondents indicated this as a parameter with a considerable impact on the costs of a DTC. Also, the German and Australian health care systems adjust for this parameter. When clear criteria of case mix are available and further research about the relation between case mix and costs is performed, the parameters for case mix adjustment can possibly be expanded.

7. References

Antioch KM, Ellis RP, Gillett S. et al. 2007. 'Risk adjustment policy options for casemix funding, international lessons in financing reform'. Eur J Health Econ 8:195-212.

Averill RF, Muldoon JH, Vertrees JC et al. 1998. 'The evolution of casemix measurement using diagnosis related groups (DRGs)'. *3M HIS Reasearch Report 5-98*: 1-40.

van Belleghem H & M Redel. 2011. 'De voordelen van DOT'. *Medisch Contact* 66(6):327-329.

Björkgren MA, Fries, BE, Häkkinen U. et al. 2004. 'Case-mix adjustment and efficiency measurement'. *Scand J Public Health* 32:464-471.

de Boo A, de Boer WIJ & JA van Erkelens. 2008. 'Zorgzwaarte-indicatoren op aandoeningenniveau'. *Vektis*

Busse R, Geissler A, Quentin W. et al. 2011. *Diagnosis Related Groups in Europe. Moving toward transparency, efficiency and quality in hospitals.* (In press). New York: Mc Graw Hill.

CMS (2010). *CMS Manual System.* [Internet] Centre for Medicare & Medicaid Services, 13-08-2010. [Cited on 29-12-2011]. Accessible at https://www.cms.gov/transmittals/downloads/R2028CP.pdf

Creswell JW. 2003. *Research design. Qualitative, Quantitative and Mixed Methods Approaches.* Second Edition. Thousand Oaks: Sage Publications, Inc.

(CTG/ZAio) 2005. *Oriënterende monitor ziekenhuiszorg.* [Internet] College Tarieven Gezondheidszorg/ Zorg Autoriteit in oprichting, 12-09-2005. [Cited on 04-08-2011]. Accessible at http://www.nza.nl/104107/105773/354586/10089

(DBC Onderhoud) 2011. *Information in English* [Internet] DBC Onderhoud. [Cited on 12-04-2011]. Accessible at http://www.dbconderhoud.nl/Over-de-DBC-systematiek/Information-in-english

(Department of Health) 2011. *Part three: Technical guidelines.* [Internet] Department of health, Melbourne, Victoria. [Cited on 17-01-2012]. Accessible at http://docs.health.vic.gov.au/docs/doc/07730A56386CE006CA25794F001C9473/$FILE/pfg-part3.pdf

Duckett SJ. 2000. 'The development of Australian Refined Diagnosis Related Groups: the Australian inpatient casemix classification'. *CASEMIX* 2(4):115-120.

Enthoven AC & WPMM van de Ven. 2007. 'Going Dutch – Managed-competition health insurance in the Netherlands'. *New England Journal of Medicine* 357(24): 2421-2423.

Greenfield S, Sullivan L, Dukes KA et al. 1995. 'Development and testing of a new measure of case mix for use in office practice'. *Medical Care* 33(4):AS47-AS55.

Hasaart F. 2011. *Incentives in the Diagnosis Treatment Combination payment system for medical specialist care.* [Dissertation] University of Maastricht.

Lapre RM, Rutten FFH & FT Schut. 2006. *Algemene economie van de gezondheidszorg.* Tweede herziene druk. Maarssen: Elsevier Gezondheidszorg. [1999]

Löbbes A. 2011. *Does the diagnosis treatment combination reimbursement system lead to patient selection by Duch Independent Treatment Centres and hospitals due to casemix differences?* [Master Thesis]. University of Maastricht.

Marazzi A, Gardiol L & HD Duong. 2007. 'New approaches to reimbursement schemes based on patient classification systems and their comparison'. *Health Services Management Research* 20:203-210.

(Medisch Contact) 2011. *UMC's krijgen zware patienten uit het B-segment.* [Internet] Medisch Contact, 29 april 2011. [Cited on 29-12-2011]. Accessible at http://medischcontact.artsennet.nl/Nieuws-26/Tijdschriftartikel/94978/UMCs-krijgen-zware-patienten-uit-Bsegment.htm

Oostenbrink JB & FFH Rutten. 2006. 'Cost assessment and price setting of inpatient care in the Netherlands. The DBC case-mix system'. *Health Care Management Science* 9:287-294.

van Poucke, A. 2007. 'The Dutch experience: reciprocal influences between (socio-)political processes and casemix systems'. *BMC Health Services Research* 7 (Suppl 1):A1.

Prinsze FJ & RCJA van Vliet. 2007/2008. 'Health-based risk adjustment: Improving the pharmacy-based cost group model by adding diagnostic cost groups'. *Inquiry* 44:469-480.

Quentin W, Geissler A, Scheller-Kreinsen D et al. 2010. 'DRG-type hospital payment in Germany: The G-DRG system'. *Euro Observer* 12(3):4-7.

Schreyögg J, Tiemann O & R Busse. 2006. 'Cost accounting to determine prices: How well do prices reflect costs in the German DRG-system?' *Health Care Manage Sci* 9:269-279.

Schut FT & WPMM van de Ven. 2005. 'Rationing and competition in the Dutch health care system'. *Health economics* 14:S59-S74.

Schut FT & WPMM van de Ven. 2011. 'Effects of purchaser competition in the Dutch health system: is the glass half full or half empty?' [Debate]. *Health Economics, Policy and Law* 6:109-123.

(SCP) 2009. *Statusscores* [Internet] Sociaal en Cultureel Planbureau, 04-03-2009. [Cited on 09-08-2011]. Accessible at http://www.scp.nl/Organisatie/Onderzoeksgroepen/Wonen_Leefbaarheid_Veiligheid/Lopend_onderzoek_van_WLV/Statusscores

Söderland N, Milne R, Gray A. et al. 1995. 'Differences in hospital casemix, and the relationship between casemix and hospital costs'. *Journal of Public Health Medicine* 17(01):25-32.

Stam PJA & WPMM van de Ven. 2008. 'De harde kern in de risicoverevening'. *Economisch Statistische Berichten* 4529(93):104-107.

Steinbusch PJM, Oostenbrink JB, Zuurbier JJ et al. 2007. 'The risk of upcoding in casemix systems: A comparative study'. *Health policy* 81:289-299.

Street A, Sivey P, Mason A et al. 2010. 'Are English treatment centres treating less complex patients?'. *Health Policy* 94:150-157.

Swanborn PG. (2002). *Basisboek Sociaal Wetenschappelijk Onderzoek*. Amsterdam: Boom.

(Rijksoverheid) 2011a. *Belonen naar prestatie voor ziekenhuizen* [Internet] Rijksoverheid, 14-03-2011. [Cited on 12-04-2011]. Accessible at http://www.rijksoverheid.nl/onderwerpen/prestaties-belonen-in-ziekenhuizen/nieuws/2011/03/14/belonen-naar-prestatie-voor-ziekenhuizen.html

(Rijksoverheid) 2011b. *Besluit van P.M. houdende wijziging van het Besluit zorgverzekering in verband met beperking van de ex post compensatiemechanismen voor de vaststelling van de vereveningsbijdrage* [Besluit] Rijksoverheid.

Roger France FH. 2003. 'Case mix use in 25 countries: a migration success but international comparisons failure'. *International Journal of Medical Informatics* 70:215-219.

van de Ven WPMM, van Vliet RJCA & LM Lamers. 2004. 'Health-adjusted premium subsidies in the Netherlands'. *Health Affairs* 23(3):45-55.

van de Ven WPMM, Prinsze FJ, de Bruijn D & FT Schut. 2005. 'Nieuw zorgstelsel vereist betere risicoverevening'. *Economisch Statistische Berichten* 4460(90):223-225.

van de Ven WPMM, Beck K, van de Voorde C. et al. 2007. 'Risk adjustment and risk selection in Europe: 6 years later' *Health Policy* 83:162-179.

van de Ven WPMM & FT Schut. 2008. 'Universal mandatory health insurance in the Netherlands: a model for the United States?'. *Health Affairs* 27(3):771-781.

(VWS) 2007. *Aanwijzing inzake uitbreiding DBC-segment met vrije tarieven* [Internet] Staatscourant, 19-09-2007 [Cited on 01-09-2011]. Accessible at https://zoek.officielebekendmakingen.nl/stcrt-2007-181-p18-SC82269.pdf

Weissert WG & MC Musliner. 1992. 'Case mix adjusted nursing-home reimbursement: a critical review of evidence'. *The Milbank Quarterly* 70(3):455-490.

(Werken met DOT) 2010. *DOT: de tweede generatie DBC's* [Internet] Werken met DOT, 01-04-2010. [Cited on 07-06-2011]. Accessible at http://www.belonennaarprestaties.nl/GetDocument.aspx?Source=documentoverview&DocumentID=9752

(Zorgbalans) 2010. *Zonder correctie voor case-mix en kwaliteit, bestond er behoorlijke variatie tussen ziekenhuizen in de prijzen van vrij onderhandelbare zorg* [Internet] Rijksinstituut voor Volksgezondheid en Milieu, 31-05-2011. [Cited on 03-08-2011]. Accessible at http://www.gezondheidszorgbalans.nl/kosten/doelmatigheid/prijzen_bsegment/

Appendices

Appendix 1 DTC-codes used for referral and continued DTC

The following table shows which DTCs were used as an indicator for a referral or a continued DTC. Since HNP can be treated within different specialties, the same DTCs were used to identify a referral or continued DTC. Patient could also be referred from the specialism of neurology. Therefore, also DTCs from neurology were used as an indicator.

Finally, it should be mentioned that for the continued DTC only attention was given to whether it was a continued DTC or not. This is expressed in the first two digits of the code. The last four digits were not specified since they refer to the treatment code.

Diagnosis	**Indicator of referral**	**Indicator of continued DTC**
Cataract	110005540011 110005540014	21000554….
Meniscus lesion	110018050111 110018050114	21001805….
Osteoarthritis	110018010111 110018010114	21001801….
HNP • orthopaedics • neurosurgery, simple • neurosurgery, multiple	<u>Orthopaedics</u> 110013600111 110013600114 <u>Neurology:</u> 110012030111 110012030112 110012030121 <u>Neurosurgery</u> 110025500011 110025500014 110025550011 110025550014	<u>Orthopaedics</u> 21001360…. <u>Neurology:</u> 21001203…. <u>Neurosurgery</u> 21002550…. 21002555….

Appendix 2 More extensive information of data population

Table 19: Aggregated insured characteristics of knee osteoarthritis

Category institution	N	Mean price of a DTC (in Euros)	Mean age	Mean % of men	Mean % of SES1 (=high)	Mean % of SES2	Mean % of SES3	Mean % of SES4 (=low)	Mean % with continued DTC	Mean % with referral	Mean % with multiple DTCs	Mean % with chronic illness	Mean % with diabetes
Academic hospital	21	10477.74	60.19	50%	13%	23%	30%	33%	33%	9%	63%	42%	7%
General hospital	239	10096.42	67.69	36%	18%	26%	32%	23%	11%	10%	69%	42%	8%
Categorical hospital	3	9499.42	63.87	36%	16%	27%	37%	20%	1%	15%	67%	39%	6%
ITC	13	9623.10	59.42	44%	26%	30%	33%	11%	9%	14%	66%	28%	3%
Total	*276*	*10096.65*	*66.68*	*37%*	*18%*	*26%*	*32%*	*23%*	*12%*	*10%*	*68%*	*41%*	*8%*

Table 20: Aggregated insured characteristics of HNP (orthopaedics)

Category institution	N	Mean price of a DTC (in Euros)	Mean age	Mean % of men	Mean % of SES1 (=high)	Mean % of SES2	Mean % of SES3	Mean % of SES4 (=low)	Mean % with continued DTC	Mean % with referral	Mean % with multiple DTCs	Mean % with chronic illness	Mean % with diabetes
General hospital	60	3393.37	47.75	52%	21%	29%	33%	17%	10%	5%	56%	24%	6%
Categorical hospital	3	3137.48	42.38	70%	19%	7%	49%	26%	0%	0%	54%	13%	0%
ITC	8	3397.21	43.18	53%	19%	35%	36%	10%	6%	4%	56%	10%	1%
Total	*71*	*3382.99*	*47.01*	*53%*	*21%*	*28%*	*34%*	*17%*	*9%*	*5%*	*56%*	*22%*	*5%*

Table 21: Aggregated insured characteristics of meniscus lesion

Category institution	N	Mean price of a DTC (in Euros)	Mean age	Mean % of men	Mean % of SES1 (=high)	Mean % of SES2	Mean % of SES3	Mean % of SES4 (=low)	Mean % with continued DTC	Mean % with referral	Mean % with multiple DTCs	Mean % with chronic illness	Mean % with diabetes
Academic hospital	13	1855.28	38.4	58%	11%	34%	23%	31%	10%	1%	54%	13%	2%
General hospital	167	1634.62	46.05	63%	21%	27%	28%	23%	4%	1%	52%	16%	2%
Categorical hospital	2	1894.24	41.76	76%	14%	20%	45%	19%	0%	1%	52%	11%	0%
ITC	24	1579.4	42.74	73%	25%	36%	27%	13%	1%	1%	53%	13%	2%
Total	*206*	*1644.63*	*45.14*	*64%*	*21%*	*29%*	*28%*	*22%*	*4%*	*1%*	*52%*	*15%*	*2%*

Table 22: Aggregated insured characteristics of cataract

Category institution	N	Mean price of a DTC (in Euros)	Mean age	Mean % of men	Mean % of SES1 (=high)	Mean % of SES2	Mean % of SES3	Mean % of SES4 (=low)	Mean % with continued DTC	Mean % with referral	Mean % with multiple DTCs	Mean % with chronic illness	Mean % with diabetes
Academic hospital	24	1143.07	65.21	49%	21%	25%	28%	26%	16%	7%	72%	47%	13%
General hospital	252	1086.35	73	44%	19%	26%	29%	26%	1%	9%	67%	47%	12%
Categorical hospital	3	1185.96	67.42	43%	25%	22%	31%	22%	2%	5%	52%	42%	8%
ITC	33	857.02	70.44	45%	31%	24%	31%	14%	1%	8%	66%	35%	4%
Total	*312*	*1067.41*	*72.08*	*45%*	*20%*	*26%*	*29%*	*24%*	*2%*	*9%*	*67%*	*46%*	*12%*

Table 23: Aggregated insured characteristics of HNP (neurosurgery, simple)

Category institution	N	Mean price of a DTC (in Euros)	Mean age	Mean % of men	Mean % of SES1 (=high)	Mean % of SES2	Mean % of SES3	Mean % of SES4 (=low)	Mean % with continued DTC	Mean % with referral	Mean % with multiple DTCs	Mean % with chronic illness	Mean % with diabetes
Academic hospital	21	3171.66	45.49	41%	35%	23%	14%	29%	7%	3%	66%	19%	3%
General hospital	91	3119.34	45.81	51%	23%	27%	27%	22%	3%	1%	43%	21%	2%
Total	*112*	*3129.15*	*45.75*	*49%*	*25%*	*26%*	*25%*	*24%*	*4%*	*2%*	*47%*	*21%*	*2%*

Table 24: Aggregated insured characteristics of HNP (neurosurgery, multiple)

Category institution	N	Mean price of a DTC (in Euros)	Mean age	Mean % of men	Mean % of SES1 (=high)	Mean % of SES2	Mean % of SES3	Mean % of SES4 (=low)	Mean % with continued DTC	Mean % with referral	Mean % with multiple DTCs	Mean % with chronic illness	Mean % with diabetes
Academic hospital	10	3880.7	45.7	50%	15%	20%	40%	25%	0%	0%	60%	35%	10%
General hospital	85	3565.51	45.09	65%	24%	26%	25%	25%	1%	2%	41%	18%	5%
ITC	3	2824.16	42.67	42%	21%	25%	46%	8%	0%	0%	50%	4%	0%
Total	*98*	*3574.98*	*45.08*	*63%*	*23%*	*25%*	*27%*	*24%*	*1%*	*1%*	*43%*	*19%*	*6%*

Appendix 3 Outcomes of hierarchical multiple regression analyses

Osteoarthritis

Table 25: Results of regression osteoarthritis, 2007

2007	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.069	0.038			0.092
Model 2	0.33	0.210	0.261	0.172	0.002

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000

Table 26: Results of regression osteoarthritis, 2008

2008	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.050	0.018			0.207
Model 2	0.160	0.019	0.110	0.001	0.340

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000
Model 2	(Constant)		0.000
	Categorical hospital	-0.197	0.087
	Continued DTC	0.247	0.029

Table 27: Results of regression osteoarthritis, 2009

2009	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.070	0.038			0.095
Model 2	0.200	0.053	0.130	0.015	0.195

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000
Model 2	(Constant)		0.097
	SES1	11.612	0.049
	SES2	11.190	0.051
	SES3	15.945	0.051
	SES4	14.774	0.052

HNP (orthopaedics)

Table 28: Results of regression HNP (orthopaedics), 2007

2007	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.039	-0.053			0.660
Model 2	0.719	0.355	0.680	0.408	0.143

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000
Model 2	ITC	-0.600	0.057
	Referral	-0.650	0.018

Table 29: Results of regression HNP (orthopaedics), 2008

2008	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.038	-0.045			0.638
Model 2	0.278	-0.389	0.240	-0.344	0.930

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000

Table 30: Results of regression HNP (orthopaedics), 2009

2009	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.110	0.011			0.350
Model 2	0.625	-0.073	0.515	-0.084	0.591

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000

Meniscus lesion

Table 31: Results of regression meniscus lesion, 2008

2008	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.006	-0.025			0.903
Model 2	0.170	0.037	0.164	0.062	0.239

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000
Model 2	Multiple DTCs	-0.284	0.027

Table 32: Results of regression meniscus lesion, 2009

2009	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.057	0.029			0.117
Model 2	0.222	0.099	0.165	0.07	0.049

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000
	Categorical hospital	0.192	0.051
Model 2	(Constant)		0.080
	SES2	-5.384	0.099

Cataract

Table 33: Results of regression cataract, 2007

2007	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.345	0.325			0.000
Model 2	0.520	0.443	0.175	0.118	0.000

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000
	Academic hospital	0.231	0.006
	Categorical hospital	0.236	0.005
	ITC	-0.480	0.000
Model 2	Categorical hospital	0.192	0.061
	ITC	-0.605	0.000
	Gender	0.215	0.013
	Multiple DTCs	-0.216	0.015

Table 34: Results of regression cataract, 2008

2008	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.419	0.402			0.000
Model 2	0.563	0.500	0.144	0.098	0.000

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000
	Academic hospital	0.196	0.011
	Categorical hospital	0.426	0.000
	ITC	-0.434	0.000
Model 2	(Constant)		0.002
	Academic hospital	0.227	0.048
	Categorical hospital	0.329	0.003
	ITC	-0.501	0.000
	Gender	0.155	0.052
	Chronic illness	-0.162	0.080
	Referral	0.361	0.004
	Multiple DTCs	-0.455	0.001

Table 35: Results of regression cataract, 2009

2009	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.28	0.259			0.000
Model 2	0.498	0.420	0.218	0.161	0.000

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000
	Academic hospital	0.234	0.006
	Categorical hospital	0.442	0.000
	ITC	-0.171	0.045
Model 2	Academic hospital	0.300	0.024
	Categorical hospital	0.355	0.000
	ITC	-0.300	0.002
	Gender	0.172	0.038
	Chronic illness	-0.254	0.009
	Referral	0.218	0.054

HNP (neurosurgery, simple)

Table 36: Results of regression HNP (neuro, simple), 2007

2007	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.011	-0.014			0.510
Model 2	0.263	-0.053	0.252	-0.039	0.619

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		

Table 37: Results of regression HNP (neuro, simple), 2008

2008	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.078	0.051			0.100
Model 2	0.345	0.046	0.267	-0.005	0.368

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000
Model 2	(Constant)		0.000
	Chronic illness	0.431	0.045

Table 38: Results of regression HNP (neuro, simple), 2009

2009	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.042	0.013			0.236
Model 2	0.391	0.059	0.349	0.046	0.357

	Sign. variables	Standardized coefficients	Sig		
		Beta			
Model 1	(Constant)		0.000		

HNP (neurosurgery, multiple)

Table 39: Results of regression HNP (neuro, multiple), 2007

2007	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.000	-0.037			0.952
Model 2	0.540	0.195	0.540	0.232	0.199

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000
Model 2	(Constant)		0.061
	Referral	0.663	0.010

Table 40: Results of regression HNP (neuro, multiple), 2008

2008	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.051	-0.014			0.466
Model 2	0.354	-0.113	0.303	-0.099	0.691

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000

Table 41: Results of regression HNP (neuro, multiple), 2009

2009	R squared	Adj R squared	R square change	Adj R square change	Sig
Model 1 (cat. institution)	0.315	0.271			0.003
Model 2	0.447	0.171	0.132	-0.100	0.162

	Sign. variables	Standardized coefficients	Sig
		Beta	
Model 1	(Constant)		0.000
	ITC	-0.556	0.001
Model 2	(Constant)		0.000
	ITC	-0.541	0.004

Appendix 4 Interview

Naam respondent:
…….....
Functie respondent:
…….....

INTERVIEW ZORGZWAARTE

Dit interview maakt deel uit van een onderzoek naar zorgzwaarte. Het doel van het onderzoek is om te onderzoeken of zorgzwaarte tot uitdrukking komt in de prijs van een DBC. Als zorgzwaarte tot uitdrukking komt in de prijs, zal gekeken worden naar de mogelijkheden om een proxy te ontwikkelen voor zorgzwaarte (gebaseerd op de gegevens van een zorgverzekeraar). Door middel van dit interview wordt onderzocht hoe de respondent zorgzwaarte definieert, welke rol zorgzwaarte speelt tijdens de onderhandelingen en hoe de respondent denkt over de plaats die zorgzwaarte inneemt in de prijs van een DBC. Vervolgens worden de voorlopige resultaten van het afstudeeronderzoek voorgelegd en wordt gevraagd naar de relevantie van de resultaten en de praktische gevolgen. Het interview zal worden afgenomen bij respondenten die zich bezighouden met zorginkoop, zowel vanuit de ziekenhuiskant als vanuit de kant van de verzekeraar.

Deel 1: Zorgzwaarte

1. Hoe zou u zorgzwaarte beschrijven/definiëren?
   …….....
   …….....
   …….....
   …….....
   …….....
   …….....
   …….....
   …….....
   …….....
   …….....

Aangezien velen een andere definitie zullen hebben van zorgzwaarte, geef ik u de volgende definitie van zorgzwaarte:

"Hogere zorgzwaarte betekent dat de patiënt meer zorg consumeert en gebruik maakt van meer middelen. Dit wordt niet veroorzaakt door inefficiëntie maar door een hogere klinische ernst of patiënt karakteristieken (patiënt mix)".

Zou u bij het beantwoorden van de volgende vragen deze definitie van zorgzwaarte willen hanteren?

2. Welke rol speelt zorgzwaarte in uw organisatie tijdens inkoop/onderhandelingen?
   - ☐ Zorgzwaarte speelt geen rol
   - ☐ Zorgzwaarte speelt een beperkte rol
   - ☐ Zorgzwaarte speelt een grote rol

   Licht uw antwoord toe:

   ……
   ……
   ……
   ……
   ……
   ……
   ……

3. Door wie worden argumenten over zorgzwaarte aangedragen?
   - ☐ Zorginstelling
   - ☐ Zorgverzekeraar
   - ☐ Beide
   - ☐ n.v.t. (indien bij vraag 2 is aangegeven dat zorgzwaarte geen rol speelt)
   - ☐ Anders, namelijk……

   ……
   ……

4. Komt zorgzwaarte direct tot uitdrukking in de prijs van een DBC?

   Ja / Nee, omdat……..
   ……
   ……
   ……
   ……
   ……
   ……

5. Stel: zorgzwaarte komt tot uitdrukking in de prijs.

   Welke van de onderstaande factoren hebben (denkt u) het grootste effect op zorgzwaarte en dus op de kosten van zorg voor de individuele patiënt? <u>(kies er drie)</u>
   - ☐ Leeftijd
   - ☐ Geslacht
   - ☐ Sociaal Economische Status (SES)
   - ☐ Vervolg-DBC

     (indien er binnen 365 dagen na de einddatum van de DBC een vervolg-DBC is gedeclareerd)

   Z.O.Z.

☐ Doorverwijzing
(indien er 365 dagen voorafgaand aan de DBC een DBC met een zelfde diagnose-as en een andere behandelas is gedeclareerd in een andere instelling)

☐ Chronische aandoening
(de verzekerde heeft minimaal 1 FKG waarbij de FKG's m.b.t. diabetes niet worden meegeteld)

☐ Diabetes
(de verzekerde heeft minimaal 1 FKG die betrekking heeft op diabetes)

☐ Meerdere diagnosen
(indien er 365 dagen voorafgaand aan de DBC, (een) andere DBC('s) met een alternatieve diagnose zijn gedeclareerd)

Licht uw keuze toe:

……
……
……
……
……
……
……
……

6. Zou voor deze factoren (die u gekozen heeft bij vraag 5) gecorrigeerd moeten worden in de prijs van een DBC, zowel positief als negatief?
Ja / Nee, omdat……
……
……
……
……
……
……
……

7. Zijn er nog andere factoren (niet genoemd bij vraag 5) die van invloed zijn op zorgzwaarte?
Ja / Nee, ……
……
……
……
……
……
……
……

Deel 2: Resultaten onderzoek zorgzwaarte

De resultaten van het onderzoek worden getoond door middel van een powerpoint presentatie.

8. Wat vindt u van de resultaten van het onderzoek?

   ……
   ……
   ……
   ……
   ……
   ……
   ……
   ……
   ……
   ……

9. Zijn deze resultaten relevant voor u?

   Ja / Nee, omdat……
   ……
   ……
   ……
   ……
   ……
   ……
   ……

10. Gaat u wat doen met deze resultaten?

    Ja / Nee, omdat……
    ……
    ……
    ……
    ……
    ……
    ……
    ……

11. Wat zou u, vanuit uw functie, nog meer willen weten over dit onderwerp?

    ……
    ……
    ……

……

……

……

……

12. Hoe denkt u dat (de relevantie van) het concept zorgzwaarte zich zal ontwikkelen over de tijd?

……

……

……

……

……

……

……

13. Heeft u nog overige vragen of opmerkingen?

……

……

……

……

……

……

……

……

……

……

……

……

……

Appendix 5 Coding of interviews

1	**Zorgzwaarte**

	Patientkarakteristieken
	- andere categorie patiënten
	- comorbiditeit
	- complexere toestand van patiënt
	- de totale patient
	  o psychisch
	  o medisch
	  o sociaal
	- patiëntkenmerken (op aandoening gericht)
	- samenspel kenmerken
	- vergelijking andere instellingen
	- zelfzorgvermogen
	- zwaarte van de achtergrondkenmerken
	
	Kenmerken van behandeling
	- behandelintensiteit
	- complexiteit van behandeling
	- soort behandeling (binnen aandoening)
	
	Kosten/gebruik
	- creëren vergelijkbare groepen
	- verschillen in zorgprofiel
	  o meer tijd dan gemiddeld
	  o meer verpleegdagen
	  o meer verrichtingen
	- hogere kosten dan gemiddeld
	- meer zorg

2	**Andere oorzaken verschil in zorgprofiel**

	- ervarenheid medisch specialist
	- inefficiency
	- medisch beleid ziekenhuis
	- ondoelmatigheid
	- opleidingsfunctie
	  o langere snijtijd
	  o meer diagnostiek aanvragen
	- schaalvoordelen
	- serviceniveau
	  o ruggenprik bij bevalling
	  o veeleisende klant

3	**Rol zorgzwaarte tijdens inkoop/ onderhandelingen**

	Huidige rol:
	- beperkte rol
	  o wordt genoemd
	  o incidenteel
	  o rol in discussie
	  o select aantal DBC's
	  o tussen DBC's
	- geen rol
	  o reactie op zorgverzekeraar
	  o verkoop product
	
	Argumenten
	- door zorginstelling
	
	Reden:
	- gebruik ziekenhuis
	  o meer geld/middelen
	  o hogere zorgzwaarte
	- belangrijk voor UMC
	  o doorverwijzing zware patient
	  o gewenste rol: groot
	  o ingewikkeldere patient
	- relatie zorgzwaarte & vergoedingen (ZBC's)
	
	Niet belangrijk:
	- electieve zorg
	- onderhandeling op totaal
	- prijzen gebaseerd op schoningsprijzen
	
	Niet haalbaar:
	- definiëren parameters
	- geen harde criteria/lastig aantonen
	- weinig inzicht in zorgzwaarte
	
	Onderbouwing:
	- ligdagen (komt aan bod)
	- mening artsen
	- uitleggen
	- uitwisseling/toelichting zorgprofiel

4	Zorgzwaarte in de DBC-prijs

	Nu
	- ja
	  o sommige DBC's
	  o algemene opslag
	  o bepaald vanuit;
	  ▪ kostprijs
	  ▪ eigen zorgprofiel
	- niet altijd
	  o geen één-op-één relatie
	  ▪ zkh vertaalt in prijs
	  o gebruik kostprijs
	  o impliciet
	  o omrekening
	  o verschillende cat. instellingen
	  o zwaardere pt.categorie
	
	Toekomst
	- wenselijk
	  o procentuele opslag op DBC
	  o concurrentiepositie
	
	Methoden
	- kinderschoenen
	- kostprijsinformatie niet uniform
	- kostprijssystemen
	- ontwikkeling over tijd
	- relatie cat. instelling,
	- stijging gebruik kostprijzen
	  o druk verzekeraar
	  o keuze ziekenhuizen
	- stimulatie gebruik kostprijzen
	- sturen
	- verlies/winstgevende producten
	- verschil in functieprofiel
	
	Problemen
	- deels kostprijzen
	- deels schoningsprijzen
	- geen definitie zorgzwaarte
	- geen harde vertaling zorgzwaarte in prijs
	- lastig meetbaar
	- lastig te bewijzen
	- relatie onderhandelde prijs & kostprijs
	- zorgzwaarte & prijs

5	Factoren van invloed op zorgzwaarte

	Algemene opmerkingen:
	- afhankelijk van DBC
	- argumenten artsen
	- Gevoel
	- heel erg lastig
	- lastig
	- onderzoek Achmea
	
	Chronische aandoening
	- afhankelijk van huidige DBC
	- combinatie van aandoeningen
	- gebroken been
	- invloed op DBC
	- ipv meerdere diagnosen
	- meer middelen
	
	Comorbiditeit
	- chronische aandoening
	- diabetes
	- meerdere diagnosen
	
	Diabetes
	
	Doorverwijzing
	- complexe patienten
	- extra tijd
	- lagere zorgzwaarte
	- misschien invloed
	- niet bij goed verwijsgedrag HA
	- niet eenduidig
	- onafgeronde behandeling
	- second opinion
	- topklinisch/acad
	- twee redenen
	  o geen operatie
	  o lange wachttijden
	- uitgebreid dossier
	- zwaardere cat. patiënten
	
	Leeftijd
	- hele lage leeftijd
	- hoge leeftijd
	- meer tijd
	- niet per definitie
	- samenhang met comorbiditeit
	
	Meerdere diagnosen
	- 365 dagen
	  o Vervuiling data
	- chronische aandoening
	- eerstelijn
	- gerichte diagnosen
	  o COPD/diabetes
	  o gebroken been
	- niet onder behandeling
	- parallelle trajecten
	- sequentieel
	  o Niet ingewikkelder
	- te breed

	- tijdshorizon - van invloed - vernauwen <u>SES</u> - algehele gezondheidstoestand - complicaties - geen zorgzwaarte - invloed op zorgzwaarte - meer comorbiditeit - zelfzorgvermogen <u>VervolgDBC</u> - evt relatie zorgzwaarte - niet afgerond binnen verwachten termijn - onafgeronde behandeling
6	**Wenselijkheid prijscorrectie voor zorgzwaarte**

	<u>Ja</u>
	- beleid zorgverzekeraar
	- dagbehandeling/klinische DBC's
	- in theorie
	- maatschappelijke verantwoordelijkheid
	- reële prijs
	- relatie prijs DBC & cat.instelling
	- wenselijk voor ZBC's
	- wenselijk
	
	<u>Voorwaarden/problemen</u>
	- gebrek significantie
	- gerelateerd aan kosten
	- vereist duidelijk verband (zorgzwaarte&kosten)
	
	<u>Nee</u>
	- middelt uit
	- niet wenselijk
	- tussen of binnen DBC's
	- voldoende tijd
	- voldoende ruimte
	  o vrije onderhandelbare prijzen
	  o zorginhoudelijk onderhandelen

7	**Andere factoren zorgzwaarte**

	- deels SES
	  o beheersing NL taal
	  o combinatie
	- etniciteit
	  o geen zorgzwaarte
	  o incidentie bep. aandoeningen hoog
	  o samenhang overige factoren
	- laagopgeleid
	- lichaamsgewicht
	- maat voor obesitas
	- zelfzorgvermogen
	  o lichamelijke handicap
	  o verstandelijke beperkingen

8	**Mening resultaten**

	- geen aansprekende zaken
	- jammer
	- verbazend/ niet verklaarbaar
	- wel verwacht
	  o aanname zorgzwaarte in prijs
	  o geen isolatie effecten
	  o geen kostprijzen
	  o lagere prijs ZBC's
	  o moeilijk aantoonbaar
	  o significante resultaten mbt cat. instellingen
	  o speelt geen rol
	  o verschillen zijn relatief

9	**Verklaring resultaten**

	- efficiency
	- grotere doorverwijzing
	  o zwaardere patiënt
	- inrichting organisatie (ZBC)
	  o andere zwaarte
	  o ontbreken bepaald IC-level
	  o snelle/jonge patiënt
	- organisatie van instelling
	- prijsvorming B-segment
	  o schoningsprijs
	  o uitgangspunt
	- speelt geen rol voor instellingen
	- uitonderhandelde prijzen

10	**Andere manier om zorgzwaarte mee te nemen**

	- outlierbekostiging
	  o extra vergoeding
	  o ligduur
	  o NFU
	- registratie nevendiagnosen
	  o DOT
	  o maat comorbiditeit

11	**Relevantie resultanten**

	- niet relevant
	  o aannames
	  o geen duidelijke/harde uitkomsten
	  o geen kostprijs
	  o ingewikkeld
	  o kostprijs/onderhandelde prijs
	  o onduidelijk: factoren zorgzwaarte
	  o twijfel aan betrouwbaarheid
	  o zorgzwaarte; geen rol
	- relevant
	- bevestiging vermoeden

12	**Negatieve consequenties meenemen zorgzwaarte**

	- 3e lijns zorgaanbieder
	- complexe patiënten
	- extra prikkel
	- gebruik UMC's
	  o selectie aan de poort
	  o status
	  o complexe patienten
	- selectie op patientencategorie
	- weinig incentive efficiency
	- ZBC's

13	**Gebruik resultaten**

	- achtergrondinformatie
	- afhankelijk van voordeel zorgverzekeraar
	- alleen significante resultaten
	- discussie voeren
	  o alleen via risicoverevening
	  o doorsluizen instellingen
	- kennisname
	- komst DOT
	- lastig onderwerp
	- nee
	- niet direct
	- eerst outliersystematiek
	- terugkoppeling afdeling
	- weinig invloed op inkoop
	  o aandachtverschuiving
	  o zorgzwaarte beter in systeem

14	**Vervolgonderzoek**
	- DOT-systematiek beter - gebruik kostprijzen - gebruik zorgprofielen - harde indicatoren zorgzwaarte - medisch-inhoudelijke elementen van behandeling - meer significante resultaten - parameters risicoverevening o aansluiting bij parameters zorgzwaarte - relatie kosten & zorgzwaarte indicatoren - relatie prijs & zorgzwaarte bij ZBC's - selectie door (cat) instellingen - uniforme definitie zorgzwaarte - vergelijking zorgzwaarte tussen instellingen - zorgzwaarte tussen DBC's

15	**Relevantie zorgzwaarte in de toekomst**

	- aandacht geven
	- afhankelijk van verandering systeem
	- afhankelijk van zorgzwaarte in DOT
	- alleen politieke discussie
	  o macht/overtuigingskracht
	- belangrijk onderdeel
	  o bezuinigingen
	  o toenemende concurrentie
	  o voorkomen onterecht verwijsgedrag
	- concentratie zware patiënten
	- differentiatie productstructuur
	- inzichtelijkheid belangrijker
	  o doorverwijzer
	- meer ervaring
	  o transparanter product
	- nevendiagnosen
	- niet in DOT
	  o andere partijen
	  o belangrijk
	  o tijd nodig voor onderzoek
	- niet relevant
	- reden afwijking
	- ruimte in onderhandeling
	- selectief inkopen complexe zorg
	- specilisatie van behandelingen
	- toename
	- zorgprofielen
	- zwaardere rol in DOT
	  o niet belangrijker