# Collaboration and Competition among Dutch Healthcare Providers

Wouter van der Schors

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**Colophon**

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**Cover graphic**
Doris Konings, www.doriskonings.nl

**Cover and design**
Anne Geluk

**Printed by**
Optima Grafische Communicatie

**ISBN**
978-94-6361-700-0

# Collaboration and Competition among Dutch Healthcare Providers

**Samenwerking en concurrentie tussen Nederlandse zorgaanbieders**

Proefschrift
ter verkrijging van de graad van doctor aan de
Erasmus Universiteit Rotterdam
op gezag van de
rector magnificus

Prof. dr. A.L. Bredenoord

en volgens besluit van het college voor promoties.
De openbare verdediging zal plaatsvinden op
vrijdag 1 juli 2022 om 13:00

door

**Wouter van der Schors**
geboren te Groningen

**Erasmus University Rotterdam**

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Van der Schors, W., Roos, A-F., Kemp, R. & Varkevisser, M. (2021). Inter-organizational collaboration between healthcare providers. *Health Services Management Review.* 34(1): 36-46.

**Chapter 3**

Van der Schors, W., Roos, A-F., Kemp, R. & Varkevisser, M. (2021). Marriage or living apart together? An insight into the trade-off between merging and collaborating in health-care. *Manuscript submitted for publication.*

**Chapter 4**

Van der Schors, W. & Varkevisser, M. (2021). Does enforcement of the cartel prohibition in healthcare reflect public and political attitudes towards competition? A longitudinal study from the Netherlands. *Manuscript submitted for publication.*

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Van der Schors, W., Kemp, R., Van Hoeve, J., Tjan-Heijnen V., Maduro, J. Vrancken Peeters, M, Siesling, S., Varkevisser, M. (2021). Associations of hospital volume and hospital competition with short-, middle- and long-term patient outcomes after breast cancer surgery: A retrospective population-based study. *BMJ Open*

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Van der Schors, W., Kemp, R. & Varkevisser, M. (2020). Collaboration and competition policy in a market-based hospital system: a case study from the Netherlands *Journal of Competition Law & Economics.* 16(2): 262-288

# Chapter 1


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# General introduction

# BACKGROUND

## 1.1 Introduction

Over the last decades, in many OECD countries healthcare spending rises and accounts for a large share of the Gross Domestic Product (OECD, 2021). Furthermore, many health systems face challenges such as a shrinking workforce, changing demographics, rising complexity of care and higher incidence of multimorbidity. These challenges increasingly demand for efficient allocation of scarce resources in healthcare. Therefore, by means of two organizing principles, health systems have attempted to design and redesign healthcare provision in an efficient manner: by introducing competition and by introducing collaboration between healthcare provider organizations. Collaboration and competition can both be regarded as instruments to improve quality of care and allocate scarce resources (Baker et al., 2015; Gaynor & Town, 2012). However, from a health policy and competition policy perspective, it is crucially important to take into account that competition as well as inter-organizational collaboration can both have benefits and drawbacks.

In the last thirty years, inspired by the United States, many European countries reformed their systems with market-based elements in order to curb rising costs, reduce waiting lists, promote efficient resource allocation and stimulate innovation (Cutler, 2002; Gaynor et al., 2016; Propper, 2018). The main rationale behind pro-competitive reforms is to foster efficiency: more value for money, or in healthcare terms, better quality at a the lowest costs (Barros et al., 2016). Broadly speaking, the introduction of market-based incentives can be regarded as the third wave of healthcare reforms, after a reform aimed at introducing universal coverage for all inhabitants and a reform focusing on cost containment (Cutler, 2002). Dependent on type of treatment and the specific context of price-setting, evidence highlights that the introduction of competition can result in a positive effect on quality (Nicholas Bloom et al., 2015; Colla et al., 2016; Gaynor & Town, 2012; Kessler & McClellan, 2000) and a reduction of hospital prices (Cooper et al., 2019; Gaynor & Town, 2011; Gowrisankaran & Town, 2003). An acknowledged drawback arising from competition is the fragmentation and the lack of coordination between providers (Cebul et al., 2010). Furthermore, it can result in inefficient duplication of services (Gaynor, 2021). The introduction of competition was also found to be associated with negative effects on quality of care and waiting times when focus had been placed on reducing losses (Moscelli et al., 2021).

Therefore, competition between providers cannot be regarded as a silver bullet for the addressed challenges above. Instead, inter-organizational collaboration (IOC) between healthcare providers may also be a beneficial tool to improve outcomes for patients

(Dessers & Mohr, 2019; Palumbo et al., 2020; Thrasher et al., 2010). In an inter-organizational collaboration, healthcare provider organizations work formally together or integrate a part of their activities, while retaining their autonomy (Löfström, 2009). Hence, IOC substantially differs from mergers, in which independent organizations waive their autonomy and integrate all activities. IOC can be regarded as an umbrella term covering many types of integration between organizations who do not merge into one new legal entity. Examples comprise for instance healthcare networks (Addicott et al., 2010; De Regge et al., 2019; Tremblay et al., 2016), centralization of care by reallocation of services (Büchner et al., 2015; Ho et al., 2012) or integrated care agreements (Dessers & Mohr, 2019; Lyngsø et al., 2016). However, IOC can sometimes result in concentration of markets or can be used to form cartels between healthcare providers, which can be regarded as impermissible from a competition policy perspective. Conversely, healthcare organizations may refrain from establishing a collaboration agreement because they wrongfully assume that a collaboration may be anti-competitive (Baarsma et al., 2012).

The benefits and drawbacks presented above indicate that the interaction between market-based elements and IOC is important to take into account in health system design, as the principles of competition and collaboration can a priori be conflicting. By way of illustration, this tension has been addressed by Baicker and Levy: "*well-integrated provider networks may promote coordinated care that improves the allocation of health care resources, but they are likely to undermine competitive pressures to keep prices down while maintaining high quality. […] Competitive markets may do a better job of keeping prices low, but with the well-documented drawbacks of fragmentation* (Baicker & Levy, 2013). Although incentives aimed at competition and collaboration often coexist (Ham, 2012), above highlights a potential challenge for healthcare providers, third-party payers and regulators in reaping the efficiency gains from both collaboration and competition (Choné, 2017; Siciliani et al., 2017). This is especially true for competition authorities, who are – also in competitive health care markets – delegated with the responsibility for competition oversight.

The tension becomes apparent for hospital volume as a driver of collaboration and competition. Hospital volume, measured as the number of yearly surgical procedures or treatments, is often part of quality standards of professional and scientific associations and minimum volume standards are introduced globally with the aim to safeguard quality of care, predominantly for highly specialized surgical procedures (Morche et al., 2018). In order to satisfy the quality requirements and minimum volume standards, complex hospital care is increasingly centralized at a selected number of hospitals (Mesman et al., 2017). Increased integration, whether by mergers or IOCs, may have resulted in a loss of competition, as the number of alternatives for patients and purchasers decreased. On the other hand, the introduction of minimum volume standards may

also have strengthened quality competition between hospitals, as patients or purchasers select the hospital that satisfies the standards and their preferences (Kronebusch, 2009; Vallejo-Torres et al., 2018). Minimum volume standards are particularly visible in oncological care (Tremblay et al., 2016). Hence, volume thresholds and hospital volume in oncological care provide a suitable setting to explore whether competition and collaboration are mutually reinforcing or excluding.

This dissertation studies the (potential) trade-off or tension between collaboration and competition in market-based healthcare systems. Special attention will be given to the effects of hospital volume as a driver for collaboration and competition, and the related challenges. I adopt a health system and competition policy perspective. The general introduction is structured as following. First, the setting of the Dutch healthcare system with regulated competition is discussed, because it is the relevant context for the chapters included in this dissertation. Second, emphasis is placed on the legal framework for competition policy and the enforcement of the cartel prohibition. In the third part, the five research questions and their scientific relevance are discussed as well as the further outline of this dissertation.

# STUDY SETTING

## 1.2 The Dutch setting: competition in healthcare provision

An analysis of the interaction between IOC collaboration and competition requires insight into the specific health system attributes. In this dissertation, the Dutch setting lies at the heart of this analysis. Competition in Dutch healthcare takes the form of regulated or managed competition, referring to an introduction of market-based incentives that are regulated by the government (Van de Ven et al., 2013), based on a model developed by Alain Enthoven (Enthoven, 1993) Elements of regulated competition in a similar form have been introduced in Switzerland, Belgium, United States, Israel and Germany (Barros et al., 2016; Gaynor et al., 2015; Propper, 2018; Van de Ven et al., 2013)

In 2006, the Dutch health system has undergone a major reform. Strict government regulation has been replaced by a system based on demand-driven managed competition (Enthoven, 1993; Schut & van de Ven, 2011). With this health system reform, the Dutch government aimed to solve several structural problems, including the growth in health expenditures, long waiting lists, and the lack of pressure on suppliers to achieve better performance. This long-lasting reform started decades before 2006 and thus can best be regarded as a series of small and incremental policy and institutional adjustments that include a couple of key moments (Bertens & Vonk, 2020; Helderman et al., 2005) (See Figure 1). The release of the document Willingness to Change *("Bereidheid tot*

*verandering"*) by the Dekker Commission in 1987 marked the first steps towards competition in Dutch healthcare. The follow-up report *"Vraag aan bod"* in 2001 was largely similar with regards to content but had a more implementable and actionable form.

January 1st 2006, can be marked as a significant date because of the introduction of regulated competition in Dutch health systems. Among other legislative changes, the introduction of the Health Insurance Act (*Zorgverzekeringswet, Zvw*) made private health insurance obligatory for all Dutch inhabitants. A few months later, on October 1st, 2006, the Health Care Market Regulation Act became active (*Wet marktordening gezondheidszorg, Wmg*). This law stipulated, among other things, the role of the new-founded Dutch Healthcare Authority (*NZa*) as a sector-specific regulation and monitoring body (Maarse et al., 2016). This law also lays down rules with regards to the Diagnosis Treatment Combinations (DTC) system. This system has been introduced in order to facilitate health insurer-health provider contract negotiations and is regulated by NZa. A DTC contains all care activities from diagnosis to final check-up and has similarities with Diagnosis Related Groups (DRG) as originally established in the United States (Busse et al., 2013). This system has been implemented in both hospital care and mental care.

Competition has been introduced in curative, long-term care and mental care. However, substantial differences exist with regards to extent of market-based incentives, whether competition is possible on both the healthcare provision or purchasing side, financing regimes and level of deregulation. For instance, in institutionalized long-term nursing home and disability care, regulated competition is only possible between providers of care. In mental and curative care there is scope for competition both on the provider and purchaser side.

*Hospital care*

The most advanced example of regulated competition has been introduced in curative care, of which hospital care is the most important sector. Both patients and health insurers, functioning as purchasers of care, can exercise choice. When patients seek healthcare, they can go to the provider that meets their preferences best. However, health insurers can selectively contract healthcare providers for their enrollees, which potentially restricts patient choice, or use (financial) instruments for steering patients to health providers offering high quality of care for a reasonable price. The interaction between patients, providers and purchasers theoretically results in payer-driven and patient-driven competition. The underlying theoretical assumption is that health providers focus on either price or quality, dependent on the responsiveness of demand on both dimensions. This implies that *ceteris paribus* quality will increase if the quality elasticity of demand increases or the price elasticity of demand declines, and vice versa.

Quality will also increase if price increases relative to the marginal cost of quality and falls if the opposite happens (Roos et al., 2020)

To facilitate quality competition and healthcare purchasing based on reliable quality information, continuous efforts have been taken to increase availability, transparency and comparability of quality information. Selective contracting by health insurers based on quality information remains scarce (Maarse et al., 2016). Furthermore, although patients can be steered by quality information, GP referral patterns and travel time remain the most important determinants of patient hospital choice (Menting et al., 2020; Schut & Varkevisser, 2017).

With regards to price competition, the major health care reform of 2006 resulted in the introduction of two different segments, i.e., an A-segment with regulated prices administered by NZa and a B-segment with freely negotiable prices. To further strengthen hospital competition and increase efficiency, the freely negotiable B-segment – and thus the extent of hospital-insurer negotiations – was gradually expanded from 10% to 70% (Kroneman et al., 2016). Nowadays, only highly complex procedures such as organ transplantations or pediatric surgery, or not-plannable trauma care, belong to the regulated A-segment.

*Mental care*

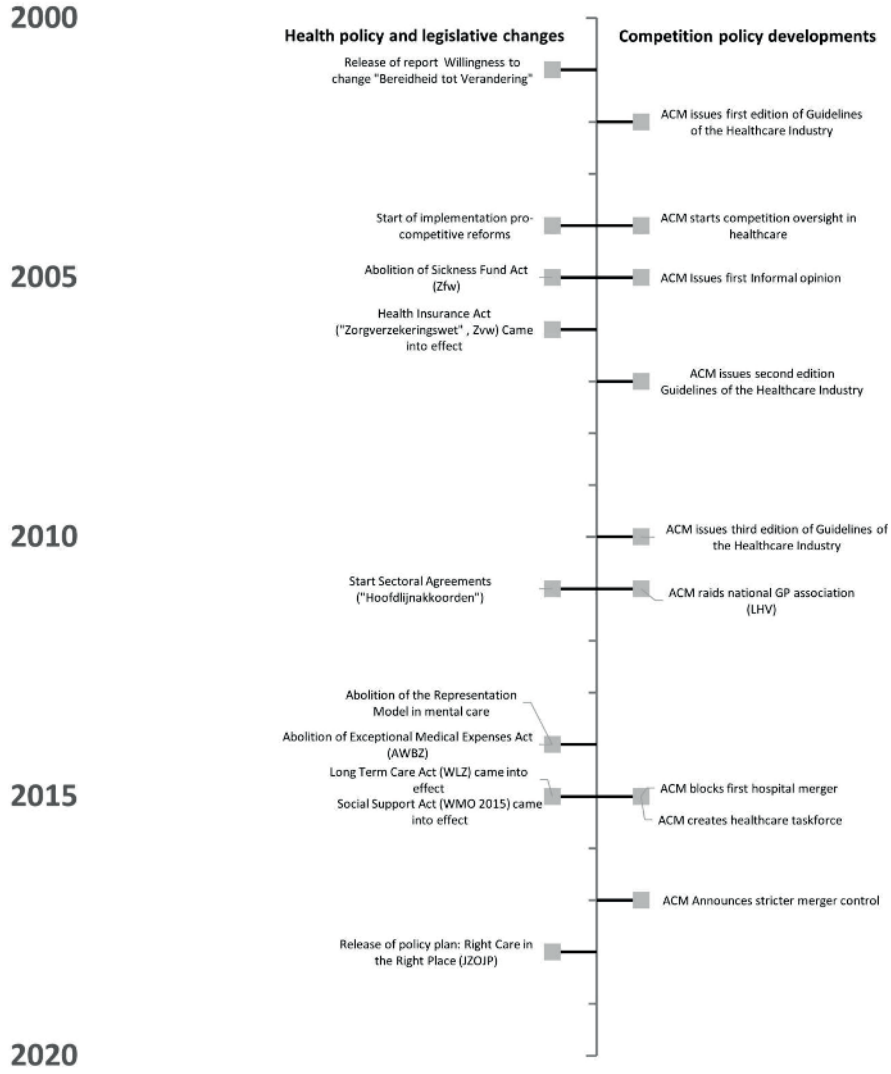
In mental care, steps have been taken to gradually expand the scope for competition and replicate market-based incentives from the hospital sector. Starting in 2008, regulated competition was introduced and providers are reimbursed on their case-mix, following a diagnosis treatment combination (Douven et al., 2015). In 2014 the so-called representation model (*representatie model*) in mental care, in which a healthcare provider negotiated with one representative health insurer on behalf of the other health insurers, has been abolished. Under the new situation, health insurers can independently negotiate or selectively contract mental healthcare providers. This policy change has resulted in higher negotiated prices for mental care organizations with a larger market share (Brouns et al., 2021). Health insurers became fully risk bearing from 2017 onwards for mental care, as well for hospital care and community care.

*Long-term care*

Long-term care was reformed in 2015 with the implementation of the Social Support Act *("Wet maatschappelijke ondersteuning"; Wmo 2015*) as well as the Long-Term Care Act ("*Wet langdurige zorg*"; *Wlz*). These acts have been introduced in order to replace the former Exceptional Medical Expenses Act (*AWBZ*). As community nursing has been transferred from *AWBZ* to the *Zvw* financing regime, the role for the regional procurement offices that purchase care became smaller while the role of health insurers expanded. Municipalities became responsible for the non-institutionalized care for elderly and peo-

ple with a disability, thus implying a decentralization from central government to local government. Under the new decentralized financing scheme, municipalities and health insurers have become fully risk bearing for their healthcare expenditures and thus have much stronger incentives to negotiate lower prices or turnover limits. Regional procurement offices remained responsible for institutionalized long-term care leaving the Dutch government risk-bearing for these types of care. An extensive overview of the policy and institutional developments in the Dutch health system are presented in chapter 2.

**Figure 1:** Timeline of health policy and legislative changes (left) and competition policy developments (right)



## 1.3 The Dutch setting: competition policy and competition enforcement

In systems based on competition between providers, competition authorities are expected to monitor and enforce competition rules (Barros et al., 2016). In the Netherlands, as in all EU member states, the competition rules follow European competition law. As a result, national competition enforcement agencies can i) take legal action against abuse of dominant positions, ii) exert merger control and iii) enforce the prohibition on cartels.

The third pillar of competition enforcement plays a fundamental role when assessing collaboration agreements. Collaboration between healthcare providers in market-based systems, such as the Netherlands, falls within a legislative framework of the Competition Act (Mw), which came into effect in 1988. This Competition Act is largely based on the European counterpart, Article 101 of the Treaty on the functioning of the European Union. Legislation for collaboration is defined in Article 6(1): *"Agreements between undertakings, decisions by associations of undertakings and concerted practices of undertakings, which have the intention to or will result in hindrance, impediment or distortion of competition on the Dutch market or on a part there of, are prohibited"*. IOCs can be impermissible if the objection is anti-competitive, or if it leads to anti-competitive conduct or outcomes (Loozen, 2015).

The responsibility for antitrust enforcement has been delegated to Dutch Authority for Consumers and Markets *(ACM)*[1]. In two position papers issued in 2004, one focused on hospital care and one focused on long-term care, ACM concluded that the legal and economic preconditions for effective competition were satisfied. Therefore, 2004 was indicated as the starting year of competition enforcement by ACM in Dutch healthcare (See Figure 1). The sector-specific application of the general competition rules is described in "Guidelines for the Healthcare Industry *(Richtsnoeren voor de gezondheidszorg*). An updated version of these guidelines was released in 2007 and 2010 (Van den Gronden, 2010). A specific department (*Directie Zorg*) entirely dedicated to competition in Dutch healthcare was founded in 2015 (See Figure 1).

The assessment whether the cartel prohibition applies on the collaboration agreement involves different aspects that need to be considered in numerical order. This step-by-step sequence of conditions is outlined below. The numbers in brackets refer to the numbers as presented in Table 1. Further explanation of the relevant legislation is presented in Box 1. In general, the cartel prohibition only applies to organizations that exercise economic activities **[1]**. Healthcare provider organizations, for instance GPs and hospitals can be characterized as such undertakings. Agreements within an organization generally do not fall under the cartel prohibition. An agreement between

1 Until 1 April 2013, the NMa was the legal predecessor of the ACM.

organizations should also have the aim to restrict competition (Article 6(1) Mw) **[2]**. Agreements on quality standards, administration or development of technology usually are not aimed at restricting competition and are therefore often allowed. Agreements on price, boycotting, entry barriers or market-sharing generally have the aim to restrict competition and thus fall under the scope of the cartel prohibition. Furthermore, for the applicability of the cartel prohibition, it is important to assess the relevant market **[3, 4]**. This assessment differs for horizontal and non-horizontal agreements. For horizontal agreements, organizations should be active on the same product market, which means that the involved companies provide the same product. For instance, a collaboration agreement between two hospitals performing hip surgeries is active on the same product market. The demarcation of geographical markets depends on the type of care. Low-complex care such as GP care is provided by many providers. Generally, patients have a low willingness to travel for a GP consult. Therefore, the geographical market of GP care is often defined as local. For specialized treatments, the geographical market of high-complex care can be characterized as regional, or even national. The market demarcation is less relevant for non-horizontal agreements. In non-horizontal agreements, such as vertical relationships, organizations belong to different healthcare sectors and are not active on the same product market. For instance, an integrated care agreement between GP's, social care and hospital care organizations.

*Exemptions*

As laid down by Article 7(1), qualified as the bagatelle exemption, Article 6(1) shall not apply to agreements in which no more than eight undertakings are involved **[5]**. Furthermore, the cartel prohibition does not apply when the turnover of the association of undertakings does not exceed €5,500,000 and if the agreement involves only undertakings whose core activity is the supply of goods. For other cases, the exemption threshold amounts €1,100,000. If the requirements of Article 7(1) are not fulfilled, Article 7(2) provides a second exemption possibility, namely when the combined market share is smaller than 10% and when the agreement of cooperation does not affect the trade between the member states of the European Union. When the bagatelle exemptions of Article 7(1) and Article 7(2) do not apply, companies can make use of group exemptions established by the European Commission or the Dutch legislator on both non-horizontal and horizontal agreements **[6]**. In general, group exemptions only cover agreements with a low combined market share and do not apply to hard-core violations, such as price agreements or entry barriers. Besides the aim to restrict competition, as discussed as condition [2], the potential outcomes are also relevant to assess for the permissibility of an agreement. Hence, ACM should substantiate why the agreement could result in anti-competitive outcomes before disapproving the agreement **[7].** When the agreement between companies falls under the scope of the cartel prohibition following the

step-by-step method, and none of the three exemptions apply, it can potentially be allowed by the efficiency criteria of Article 6(3) **[8].** Healthcare providers then determine by a self-assessment whether the agreement meets the four criteria of Article 6(3) mentioned in Box 1. In practice, these criteria are commonly used for (informally) assessing whether the benefits of collaboration for patients or clients in healthcare outweigh the anti-competitive drawbacks, and whether patients or clients receive a fair share of the resulting benefits. To provide guidance, ACM issued several informal views in which they followed the same steps and considerations as the health providers should take. In practice, in a self-assessment, healthcare organizations need to prove that competition is not unnecessarily limited by the collaboration, and the benefits for patients outweigh any anti-competitive effects of collaboration (Article 6(4)) (See Box 1).

**Table 1:** Preconditions for applicability of the cartel prohibition

| **Condition** | **Relevant legislation** |
|---|---|
| [1] Organizations are undertakings? | Article 1(f) |
| [2] Agreement with aim to restrict competition? | Article 6(1) |
| [3] Active on same product market? | |
| [4] Active on same geographical market? | |
| [5] Excluded by bagatelle exemptions? | Article 7(1), Article 7(2) |
| [6] Excluded by group exemptions? | European regulation: 1217/2010<br>2018/2010: 330/2010 |
| [7] Appreciable restriction of competition (outcomes)? | Article 6(1) |
| [8] Efficiency defense? | Article 6(3) |

**Box 1.** Relevant legislation for collaboration in healthcare from the Competition Act (Mw)

Article 6(1), Mw.
Agreements between undertakings, decisions by associations of undertakings and concerted practices of undertakings, which have the intention to or will result in hindrance, impediment or distortion of competition on the Dutch market or on a part thereof, are prohibited.

Article 6(3) Mw
Paragraph (1) shall not apply to agreements, decisions and concerted practices which contribute to the improvement of production or distribution, or to the promotion of technical or economic progress, while allowing consumers a fair share of the resulting benefits, and which do not:
a. impose any restrictions on the undertakings concerned, ones that are not indispensable to the attainment of these objectives, or
b. afford such undertakings the possibility of eliminating competition in respect of a substantial part of the products and services in question.

Article 6(4) Mw
Any undertaking or association of undertakings invoking paragraph (3) shall provide proof that the conditions of that paragraph are met.

# CENTRAL AIM AND OUTLINE OF THE DISSERTATION

## 1.4 Central aim and research questions

This dissertation aims to improve the understanding of IOC between healthcare providers in market-based health care systems, against the backdrop of the Dutch setting with regulated competition. Emphasis will primarily be based on examining (i) the interplay between competition rules and organizational behavior, and the relationship between institutional developments and establishment of IOCs, and (ii) the relationship between hospital volume and hospital competition as instruments to improve quality in oncological care. These main research objectives are addressed in the following two parts of the dissertation.

**Part 1: Exploring collaboration between healthcare providers in the setting of regulated competition**

The first part of this dissertation studies both why and how in Dutch healthcare IOCs are established, and what role competition and competition policy play in this process. The findings from this part of the dissertation make several contributions to the current literature. First, much of the current literature on IOC suffers from a one-sided focus on the organizational or healthcare management perspective (Karlsson et al., 2020; Palumbo et al., 2020). However, less emphasis is placed on the competition policy perspective. Therefore, we made a commonly used distinction between horizontal, non-horizontal and mixed agreements based to distinguish between types of IOC for assessing how competition rules are enforced (ACM, 2010c; European Trade Commission, 2008). Second, research explicitly surveying the (deliberate) choice of healthcare providers between the two types of integration, collaboration and mergers, is lacking. As mergers in healthcare often fail to realize the expectations with regards to health systems outcomes (Beaulieu et al., 2020; Broers & Kemp, 2017), scholars have suggested a stricter approach towards mergers in healthcare (Roos, 2018; Varkevisser & Schut, 2017). Furthermore, organizations that seek approval for a merger need to substantiate whether a lighter form of inter-organizational relationship can be an alternative to reach the intended objectives, because competition on subdomains remains possible (Box 1) (ACM, 2010c). Therefore, part 1 seeks to examine whether collaboration and merging are regarded as potential substitutes from the perspective of healthcare executives. Third, much uncertainty exists about the relationship between institutional developments and the establishment of IOC. Therefore, we assess how the institutional and policy context affects healthcare IOC, and whether differences can be observed between healthcare sectors. Fourth, a number of studies have examined the application of the cartel prohibition in Dutch healthcare (Guy, 2019; Loozen, 2015; Sauter, 2014; Schut & Varkevisser, 2017; Van der Schors et al., 2020). Nonetheless, in contrast to merger activities, no studies have investigated both formal and informal competition policy documentation on IOCs in a systematic and integrated manner. In part 1, three research questions are addressed.

**Q1.** How does inter-organizational collaboration in the Netherlands differ across healthcare sectors with regards to characteristics, motives, and considerations? (Chapter 2)
**Q2.** To what extent do Dutch healthcare executives choose between mergers and IOCs, and which reasons or perceived barriers are decisive in their trade-off? (Chapter 3)
**Q3.** How are competition rules concerning IOCs enforced in Dutch healthcare and is there a relationship with societal and political attitudes towards competition in healthcare? (Chapter 4)

**Part 2: Case studies on competition and collaboration in oncological care**

Part 2 examines the role of hospital volume and minimum volume standards in healthcare as drivers for both collaboration and competition. In contrast to part 1, focus is only placed on the hospital sector, as minimum volume standards are frequently and increasingly implemented here. Moreover, the hospital sector can be regarded as the most deregulated sector of the Dutch health system, and theoretically provides the most incentives for competition between providers. Hence, horizontal agreements might have a greater risk of restricting competition. The empirical findings in this part assist in our understanding of the effects of collaboration and competition in two ways. First, networks and collaboration agreements in oncological care are often established to increase hospital volume or meet volume standards, with the underlying rationale to improve quality of care. However, increasing volume by collaborating may reduce incentives for quality competition, as the number of available providers decreases. Therefore, it is important to take the effect of competition into account in the volume standards discussions. Yet, in contrast to settings with regulated prices it is not yet fully understood how competition affects quality in a setting with liberalized price setting (Gaynor & Town, 2012; Roos et al., 2020). Second, on a health system level, quality gains stemming from collaboration can be offset by increase of hospital prices or prolonged travel time (Birkmeyer, 2003; Ho et al., 2012; Stitzenberg et al., 2009). However, literature often lacks a combined assessment of quality, price and travel time after horizontal collaboration between hospitals (Ho et al., 2007). Hence, in part 2 we attempt to make an assessment of these outcomes after a collaboration agreement. The main research questions addressed in this part are:

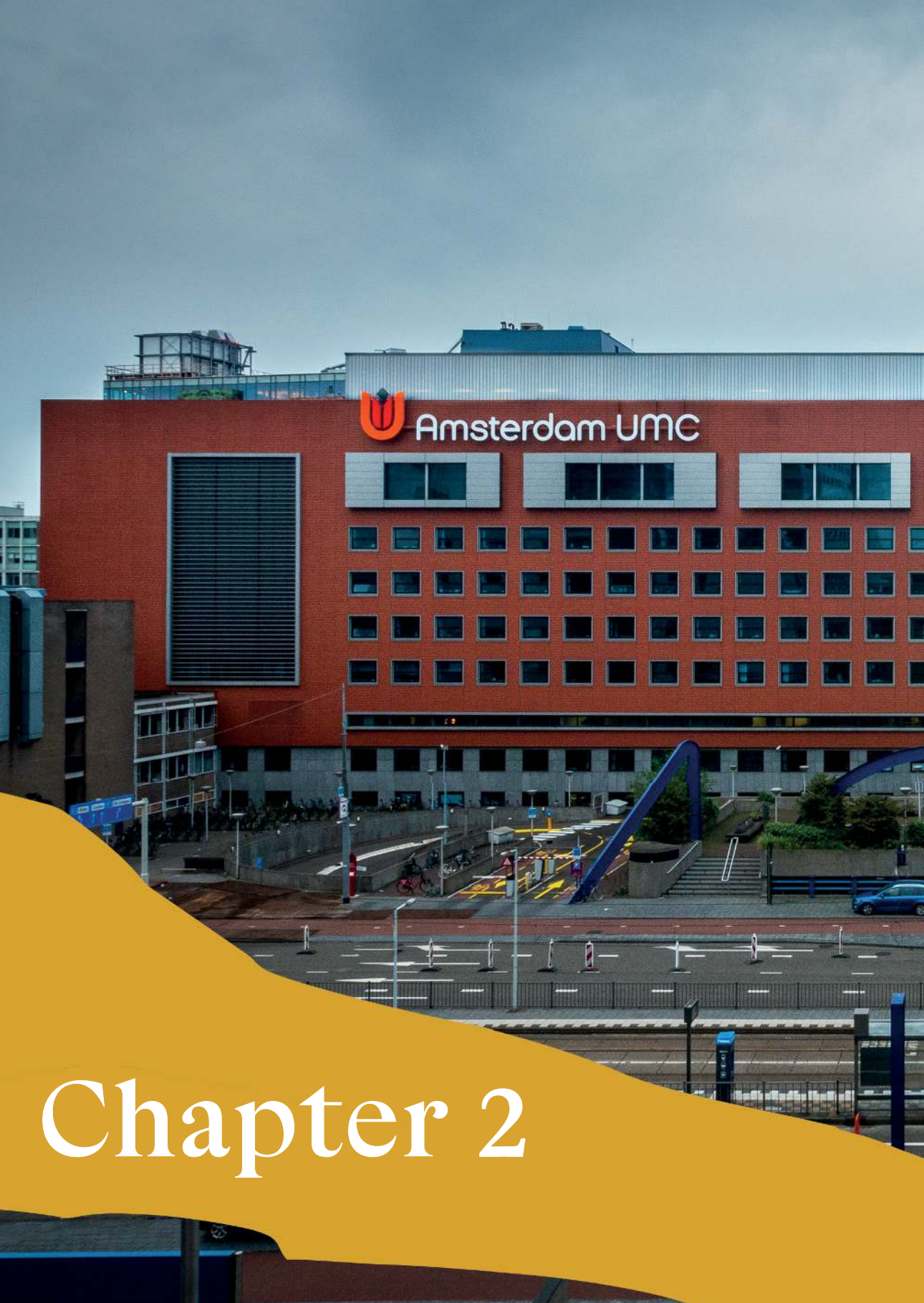
**Q4.** What is the joint influence of hospital volume and hospital competition on outcomes after breast cancer surgery? (Chapter 5)
**Q5.** What are the effects on accessibility, price and quality after centralization of high-complex oncological surgeries? (Chapter 6)

## 1.5 Outline

All chapters of the dissertation are based on articles and thus can be read independently. This remainder of the dissertation is structured as follows. In part 1, chapter 2 explores the characteristics and underlying motives of collaboration in relation to institutional developments in Dutch healthcare. Furthermore, it provides insight into the considerations that healthcare executives made prior to the establishment of an IOC in the hospital, nursing home care, mental care and disability care. Chapter 3 draws a parallel with the most profound and far-reaching form of integration: mergers. We examine whether healthcare executives make a deliberate choice between merging and collaborating, and if so, which reasons or perceived barriers are decisive in this choice.

To assess the potential for substitution between both modes of integration, we compare underlying motives and considerations based on quantitative and qualitive analyses. In chapter 4, focus shifts over to the competition policy perspective. This study provides an extensive overview of all documentation issued by ACM on collaboration agreements and the enforcement of the cartel prohibition and assesses whether there is a relation with the public and political attitudes towards competition in healthcare.

Part 2 contains the results of two empirical study focusing on collaboration agreements in oncological care provision. Chapter 5 analyzes the association between hospital volume, hospital competition and outcomes for patients who underwent surgery for invasive breast cancer. In this population-based study we included surgical margins, re-excision rates and survival as patient outcomes. Chapter 6 examines the ex-post effects with regards to volume, price and travel time in a Dutch case study in which three competing hospitals have collaborated to provide high-complexity low-volume cancer surgery. To conclude the dissertation, chapter 7 summarizes the main findings obtained from the preceding chapters and formulates implications for competition policy and recommendations for future research.




# Chapter 2


*Amsterdam UMC, hospital Amsterdam*

# Inter-organizational collaboration between healthcare providers

*With:*
Anne-Fleur Roos
Ron Kemp
Marco Varkevisser

*Health Services Management Research*

# ABSTRACT

Across OECD countries, healthcare organizations increasingly rely on inter-organizational collaboration (IOC). Yet, systematic insight into the relations across different healthcare sectors is lacking. The aim of this explorative study is therefore twofold. First, to understand how IOC differs across healthcare sectors with regards to characteristics, motives and the role of health policy. Second, to understand which potential effects healthcare executives consider prior to the establishment of the IOCs. For this purpose, a survey was conducted among a representative panel of Dutch healthcare executives from medium-sized or large healthcare organizations. Almost half (n=344, 48%) of the invited executives participated. Our results suggest that differences in policy changes and institutional developments across healthcare sectors affect the scope and type of IOC: hospitals generally operate in small horizontal IOCs, while larger and more complex mixed and non-horizontal IOCs are more present among nursing homes, disability care and mental care organizations. We find that before establishing IOCs, most healthcare executives conduct a self-assessment including the potential effects of the collaboration. The extensive overview of policy developments, collaboration types and intended outcomes presented in our study offers a useful starting point for a more in-depth assessment of the effectiveness of IOCs among healthcare organizations.

# 1. BACKGROUND

Across OECD countries, healthcare organizations increasingly rely on inter-organizational collaboration (IOC) (Mervyn et al., 2019). In these IOCs, healthcare provision organizations work across organizational borders, but maintain their legal identity and autonomy (Luke et al., 1989). IOCs are generally established for a variety of objectives, including the exploitation of economies of scale and scope (Büchner et al., 2015; Walston et al., 1996) or the improvement of the quality of service provision (Mervyn et al., 2019). Furthermore, important challenges like budgetary constraints, changing demographics and a shrinking workforce have spurred IOC (Mervyn et al., 2019; Wells & Weiner, 2007).

IOCs are generally closely linked to health policy or institutional developments, for instance through the government promotion of integrated care or the concentration of complex surgical procedures (Büchner et al., 2015). However, health policy sometimes aims to achieve different, and even potentially conflicting objectives (Roos, 2018). On the one hand, health policy can be aimed on strengthening the role of provider competition in health systems (Cutler, 2002) – as is the case in for example the Netherlands, United States, Germany, Switzerland and the United Kingdom (Joumard et al., 2010; Propper, 2018; Siciliani et al., 2017). On the other hand, health policies can incentivize healthcare organizations to place more emphasis on integration and collaboration (Baicker & Levy, 2013; VWS, 2018). The understanding of healthcare-sector specific organizational motives for IOC's and how these relate to the specific institutional context on a meso-level is indispensable in policy development on the macro-level, and to assess effective elements for successful collaboration (Nicaise et al., 2020).

Current research on IOC and the role of health policy has mainly focused on the hospital sector (Mascia et al., 2015, 2012, 2017; Westra et al., 2016). Few studies have addressed collaboration across different types of healthcare organizations (Nicaise et al., 2020). However, insight into ties within or between health sectors such as long-term care and mental care are important as health systems have become increasingly complex and difficult to understand as a whole (Albert-Cromarias & Dos Santos, 2020; Westra, Angeli, et al., 2017).

From a healthcare management perspective, when establishing IOCs in competitive environments, the responsibility for a careful consideration and balancing of both private and public interests is based on self-regulation by healthcare executives. When healthcare organizations establish IOCs with simultaneous cooperative and competitive motives, often referred to as co-opetition in horizontal IOCs (Bengtsson & Raza-Ullah, 2016), healthcare executives especially play a pivotal role: the responsibility to assess

the legal admissibility of IOC rests at the healthcare organizations and their executives[2]. Although co-opetition and the complexity of establishing successful IOCs has received attention in the context of healthcare and healthcare management (Albert-Cromarias & Dos Santos, 2020; Mascia et al., 2012), it is yet unknown what considerations healthcare executives take into account when establishing IOCs.

With insights provided by healthcare executives, this study aims to develop a comprehensive understanding of (i) how IOC differs across healthcare sectors in characteristics and motives, and (ii) which considerations healthcare executives made prior to the establishment of the IOC.

The contribution of this study for health policy and healthcare management is twofold. First, for policymakers, it is important to understand why IOCs are established, and how healthcare organizations and their executives respond to changes in the different institutional settings in which they operate. The consideration of sector-specific motives for IOC is important for a follow-up in depth assessment whether policies attain the intended effects (Westra, Angeli, et al., 2017), and how policy aims interfere in a co-opetition based environment (Albert-Cromarias & Dos Santos, 2020). The assessment whether IOCs attain the intended effects is beyond the scope of this chapter, however.

Second, healthcare management in practice is complex and ongoing health system reforms and increased IOC have made healthcare management even more complicated (D'Aunno et al., 2019). To support healthcare executives, healthcare-specific governance codes have been introduced (Brancheorganisaties zorg, 2017). Furthermore, for instance the Dutch Competition Authority provides guidance on how to make prudent considerations between private interests and competition (ACM, 2010d). Insight to what extent healthcare executives actually make such considerations in practice can contribute in finding directions and policy instruments to support healthcare executives in their decision making.

This study adopts an explorative approach designed as a quantitative survey, based on earlier survey research on merger motives (Postma & Roos, 2016). The Netherlands provides a suitable setting for mapping IOCs in healthcare. First, the environment in which healthcare organizations and healthcare executives operate is subject to continued health policy changes and institutional developments (KPMG, 2020). It offers an opportunity to investigate how healthcare organizations adapt on a meso-level to these challenges. An overview of these developments can be found in Table 6 and Appendix 1.

2 In order to prevent a violation of the prevailing antitrust law, it is especially important to assess the potential effect of competition of collaborations that involve competing organizations. Competition law demands healthcare organizations and their healthcare executives to self-assess the effects on competition (see Appendix 2).

Second, the Netherlands is illustrative for how managed competition in healthcare can be introduced (Enthoven & Van De Ven, 2007). In the Dutch healthcare system, managed competition implies that healthcare providers are expected to compete for patients and contracts with competing health insurers. Important from the perspective of IOC: the general cartel prohibition therefore applies to healthcare providers' behavior. When deciding on collaboration or concentration of care, healthcare organizations thus have to take the competition rules into account. Hence, insights from the Netherlands into the potential underlying tension with collaboration and the role of healthcare executives in the decision-making process can be valuable for many health systems based on some level of provider competition.

This chapter proceeds as following. The second section explains the methodology used for this study. Then the third section presents the principal findings concerning the characteristics, motives and considerations of IOCs in the Netherlands. The chapter ends with a brief discussion of our findings and the link with policy as well as recommendations for policymakers, healthcare management as well as future research.

## 2. METHODS

An online questionnaire was sent to 714 Dutch healthcare executives in order to investigate the motives and considerations for IOCs. Healthcare executives are generally well informed about and involved in internal and external decision-making processes associated with the establishment of IOCs. Moreover, they have insight into developments on various domains in their organization, such as financial, organizational and healthcare specific topics. In our questionnaire, we asked healthcare executives to describe *the most recently initiated collaboration in which their organizations were involved*[3]. This approach contributes to a more detailed understanding of the decision-making process in specific IOCs and limits recall bias. The collaboration agreement required some form of written or formal agreement

Healthcare executives were contacted through the Dutch Association of Healthcare Executives (NVZD), which is the representative body for healthcare executives in the Netherlands. On January 1st, 2019, 714 healthcare executives were member of NVZD, representing 65% of the healthcare executives who work for medium-sized or large healthcare organizations (annual turnover ≥ €15 million). Earlier research, as well as internal documents on the distribution of healthcare organizations among the NVZD

3 Following a previous study by Postma and Roos (2016), we used a seven-year recall period (i.e., 2012-2018).

members, demonstrated the representativeness of the panel for Dutch healthcare executives (Bijloos et al., 2017; Postma & Roos, 2016; Van der Scheer & Noordegraaf, 2007).

The questionnaire was developed based on earlier research among Dutch healthcare executives on motives for mergers as conducted by Postma and Roos (2016)[4]. In their study, five main categories for collaborative motives were introduced, based on earlier research (Bazzoli et al., 2002; Bogue et al., 1995) and a discourse analysis: improving healthcare provision, efficiency, labor market, market/bargaining position and pressure from internal or external stakeholders. These five main categories were divided into thirty sub-motives, which were presented to the healthcare executives as follow-up questions. Each sub-motive was measured as a single-item question on a three-point scale consisting of "not important", "important" and "very important". The sub-motives presented in this study were similar to the questions used in the previous study (Postma & Roos, 2016) and complemented with collaboration-specific response options. These new sub-motives were based on the consultation of Dutch healthcare executives (expert consultation) and frequently mentioned motives in Dutch professional literature and news outlets (discourse analysis).

Prior to the distribution of the survey, the questionnaire was piloted among four healthcare executives from different healthcare sectors and five academic researchers in the field of governance and healthcare management. This pilot was followed by personal interviews with the 4 healthcare executives for comprehensibility and validity checks. On January 18th, 2019, the hyperlink to the online questionnaire was distributed among healthcare executives[5]. Two reminders were sent out on February 1st and February 8th respectively. The questionnaire closed on February 11th. A total of 344 healthcare executives filled out the questionnaire, resulting in a response rate of 48%.

The survey was processed anonymously, both on health executive and health organization level. Chi-square tests for independence were performed to determine significant differences[6]. All statistical analyses were carried out using Stata version 15.

4 Postma and Roos also conducted a discourse analysis to establish an overview of the underlying motives for merging.

5 Prior to commencing the study, healthcare executives were informed about the research through NVZD's bi-monthly newsletter, and they were offered the chance to opt-out of the sample. None of the executives receiving the newsletter opted-out.

6 Bonferroni correction was used to mitigate the increased probability of type 1 errors due to running multiple tests for subgroup comparison in Table 4.

# 3. RESULTS

## 3.1 Collaborations in Dutch healthcare

Of the 344 respondents, 74% (N=256) were involved in at least one IOC over the period 2012-2018. The self-reported total number of collaborations amounts to 1,058 IOCs. The healthcare executives involved in at least one collaboration, were on average involved in four IOCs over our study period (2012-2018). As mentioned above, the questions on motives focused on the *most recent established collaboration from the healthcare executives' organization perspective*. Of the 247 most recent IOCs, most were established by healthcare executives working for nursing homes and home care organizations (24%) followed by hospitals (18%), mental care organizations (14%), and disability care organizations (14%). The remainder (12%) consists of conglomerate healthcare organizations focusing on multiple healthcare sectors or preventive healthcare organizations.

Table 1 presents the general characteristics of the most recently established collaboration. The table is organized by the executives' healthcare sector: column A represents the healthcare executives from the four largest healthcare sectors in terms of revenue (i.e., hospitals, nursing homes, disability care, mental care,), whereas column B refers to organizations active in smaller healthcare sectors. The partner organization in a col-

**Table 1:** Description of most recently established collaborations according to healthcare executives

| | **Total** ***(N=247)*** | **A. Organization belongs to one of four largest healthcare sectors[1]** ***(N=167)*** | **B. Organization belongs to another healthcare sector[2]** ***(N=80)*** |
|---|---|---|---|
| **Number of organizations involved (including own organization)** | | | |
| 2-3 | 38% | 41% | 32% |
| 4-5 | 27% | 32% | 14% |
| 6-7 | 15% | 11% | 23% |
| 8 or more | 21% | 16% | 31% |
| **Nature of collaboration[3]** | | | |
| Exchange of knowledge and information | 48% | 52% | 40% |
| Joint purchase of medical technology/ pharmaceuticals/services | 11% | 9% | 14% |
| Coordination of complex healthcare provision | 42% | 48% | 29% |
| Coordination of general healthcare provision | 48% | 45% | 55% |
| Deployment of personnel | 9% | 9% | 8% |
| **(Planned) duration of the collaboration** | | | |
| No end date | 84% | 87% | 75% |
| Fixed end date | 16% | 13% | 25% |

*Percentages indicate the share of healthcare executives per healthcare sector that chose for the response category.*

[1] *Nursing homes, disability care, mental care, hospitals.*

[2] *Youth care, GP care, revalidation care, home care and miscellaneous.*

[3] *Multiple answers possible, percentages will not add up to 100%.*

laboration can belong to a different sector than the healthcare executives' sector. The table shows that most of the reported IOCs focus on the exchange of information and knowledge (48%), and the coordination of general care (48%) and complex care (42%). Most healthcare organizations participate in a collaboration of two or three organizations (including themselves) (38%). Larger IOCs are also reported: 21% of the IOCs consist of eight or more healthcare organizations (with the largest three IOCs containing 31, 36 and 38 organizations each). Furthermore, it is observed that according to healthcare executives most IOCs have no fixed end date.

### *Collaborations in the four largest healthcare sectors*

The general characteristics of the four largest healthcare sectors (i.e., nursing homes, disability care, mental care and hospitals) are presented in column A of Table 1. In our study sample, most recent IOCs were established in one or more of these healthcare sectors (70%). In the remainder of this chapter, we will focus on these 167 IOCs[7]. Of all IOCs in these four sectors, 41% includes one or two partners. Larger IOCs with five or six partner organizations (11%) or seven or more (16%) occur less frequently. Most frequently, these IOCs focus on the exchange of knowledge and information (52%), the coordination of general care (48%) and the coordination of complex care (45%).

Among all IOCs reported by the respondents, three subtypes can be distinguished (see Table 2). First, there are IOCs that exclusively involve organizations belonging to the *same* healthcare sector. We refer to these as "horizontal IOCs". The largest share of recent IOCs (46%) can be marked as such. There are differences across healthcare sectors. Among hospitals, 77% of the recently started IOCs involve other hospitals only. Concerning the mental care organizations, 21% of the IOCs are with other mental care organizations. Second, non-horizontal IOCs are IOCs with (a) partner(s) from a *different* healthcare sector. For example, IOCs between hospitals and mental healthcare organizations. Overall, 19% of the IOCs belong to this subtype but this percentage differs across the different healthcare sectors. Third, mixed IOCs involve both a partner from the *same*

**Table 2:** Number of different healthcare sectors involved in the recent collaboration

| | Total (N=167) | Nursing homes | Disability care | Mental care | Hospitals |
|---|---|---|---|---|---|
| Horizontal collaboration** | 46% | 44% | 32% | 21% | 77% |
| Non-horizontal collaboration* | 19% | 9% | 26% | 33% | 14% |
| Mixed collaboration** | 36% | 47% | 41% | 45% | 9% |

*Significant difference between healthcare sectors (* = p<0.05; ** = p<0.01).*

7 For clarity reasons, the emphasis of the results is furthermore on hospital care (hospitals), long-term care (disability care and nursing homes) and mental care (mental care organizations). In the Netherlands these are the largest healthcare sectors in terms of expenditure, number of organizations and number of staff (CBS, 2019).

healthcare sector as well as at least one partner from a *different* healthcare sector. For example, IOCs in which a hospital teams up with both another hospital and a mental care organization. As Table 2 shows, 36% of the recent IOCs can be labelled as mixed.

## 3.2 Underlying motives for collaboration

To investigate the rationale behind IOCs, Table 3 displays the five main motives found in this study. Improving healthcare provision is healthcare executives' leading motive for all four healthcare sectors. This reason is most frequently mentioned among mental care organizations (94%) and disability care organizations (91%), followed by nursing homes (89%) and hospitals (84%). Approximately half of the IOCs are established in order to foster efficiency (49%). With that, fostering efficiency is the second most important motive for healthcare collaboration (except for hospitals). For the hospital sector, strengthening market/bargaining position is the second most important collaboration motive (40%). Another difference between healthcare sectors is related to improving staffing or educational position. Compared to hospitals (12%), nursing homes (42%) and disability care organizations (31%) mention reasons related to the retaining and recruitment of staff significantly more frequent.

The subdivision between different collaboration types (horizontal, non-horizontal and mixed) mirrors the division between healthcare sectors: improving healthcare provision is the most important motive followed by efficiency. However, efficiency is mentioned significantly more frequent among mixed IOCs (59% versus 38%, see Table II in Appendix 3) than among horizontal IOCs.

**Table 3:** Main motives for collaboration, subdivided by the four largest healthcare sectors

| | Total | Nursing homes | Disability care | Mental care | Hospitals |
|---|---|---|---|---|---|
| Healthcare provision | 89% | 89% | 91% | 94% | 84% |
| Efficiency | 48% | 55% | 47% | 53% | 37% |
| Market/bargaining position | 32% | 27% | 34% | 25% | 40% |
| Staff or educational position* | 28% | 42% | 31% | 25% | 12% |
| Pressure from internal and/or external stakeholders | 21% | 29% | 16% | 22% | 14% |

*Percentages indicate the share of healthcare executives per healthcare sector that indicated the motive for establishing a collaboration for their healthcare organization.*
**Significant difference between healthcare sectors (p<0,05).*

In the questionnaire, sub-motives were only presented to healthcare executives if the corresponding main motive was selected. In Table 4, we examine these sub-motives for the three most often mentioned categories; healthcare provision, efficiency and market/bargaining position.

**Table 4:** Sub-motives for health provision, efficiency and market and bargaining position for the sample of 4 healthcare sectors (panel A) and per healthcare sector (panel B)

| | A: Entire sample | | | B: Subdivision between four largest healthcare sectors [a, c] | | | |
|---|---|---|---|---|---|---|---|
| | Very important | Important | Not important | Nursing homes (N) | Disability care (D) | Mental care (M) | Hospital (H) |
| **Healthcare provision (n=143)** | | | | | | | |
| Exchanging knowledge/expertise | 64% | 32% | 4% | 96% | 100% | 100% | 92% |
| Improving coordination of healthcare provision | 50% | 32% | 18% | 81% | 79% | 90% | 81% |
| Realizing a broader/more specialized range of healthcare services * [b] | 41% | 36% | 24% | 60% | 86% | 83% | 83% |
| Being able to meet/maintain to meet volume and/or other quality criteria* | 24% | 34% | 42% | 60% | 62% | 37% [H] | 69% [M] |
| Providing healthcare services to new groups of patients * | 22% | 21% | 57% | 42% | 59% [H] | 53% | 22% [D] |
| Reducing waiting lists | 14% | 43% | 43% | 47% | 48% | 76% | 49% |
| Increasing possibilities for small-scale care ** | 11% | 25% | 65% | 19% [D; M] | 55% [N] | 53% [N] | 25% |
| Providing healthcare services in other geographical areas ** | 4% | 16% | 80% | 4% | 38% [H] | 23% | 25% [D] |
| **Efficiency (n=77)** | | | | | | | |
| More efficient deployment of personnel | 42% | 38% | 21% | 79% | 80% | 88% | 69% |
| More efficient use of real estate and/or (bed)capacity | 17% | 35% | 48% | 59% | 60% | 35% | 50% |
| Reduction of overhead | 9% | 36% | 55% | 38% | 73% | 47% | 31% |
| More efficient purchase of pharmaceuticals | 1% | 8% | 91% | 14% | 7% | 0% | 13% |
| More efficient purchase of medical technology* | 0% | 8% | 92% | 7% [D] | 0% [H; N] | 0% | 25% [D] |
| **Market/bargaining position (n=51)** | | | | | | | |
| Improving or maintaining bargaining position vis-à-vis health insurers and/or regional procurement offices | 37% | 45% | 18% | 93% | 72% | 63% | 88% |
| Improving or maintaining bargaining position vis-à-vis municipalities** | 35% | 20% | 45% | 60% [H] | 91% [H] | 88% [H] | 12% [N; D; M] |
| Improving or maintaining position vis-à-vis other healthcare providers | 31% | 53% | 16% | 87% | 91% | 100% | 71% |
| Improving or maintaining political influence | 28% | 45% | 28% | 73% | 82% | 88% | 59% |
| Improving or maintaining bargaining position vis-à-vis suppliers | 8% | 28% | 65% | 53% | 36% | 25% | 24% |

[a] *Percentages indicate the share of healthcare executives per healthcare sector that indicated the sub-motive as 'important' or 'very important' These were all multiple response questions.*

[b] *On the multiple response sets, we performed Chi-square tests of independence (* = p<0.05; ** = p<0.01).*

[c] *Post-hoc Chi square test were conducted for pairwise comparison between the different healthcare sectors, in order to assess which healthcare sector differs significantly from each other. Significant pairs are marked with a superscript indicating the first letter of the other healthcare sector (N, D, M or H). Bonferroni corrected for multiple tests (p<0.008).*

For *healthcare provision*, the exchange of knowledge and expertise is (very) important for nearly all recently started IOCs. Exchange of knowledge is most often mentioned in combination with other sub-motives, such as the improvement of coordination partners, and the realization of a broader/more specialized range of healthcare services. Column B of Table 4 reports the subdivision between healthcare sectors. The percentages here indicate the proportion of healthcare executives that rate the sub-motive as 'very important' or 'important'. Several differences between sectors with regards to attached importance stand out. For instance, hospitals mention the volume and quality criteria significantly more often as drivers for collaboration compared to mental care organizations. Disability care organizations attach significantly more importance to the provision of healthcare in other geographical areas or to new patient groups compared to hospitals. Collaboration aimed at increasing the possibilities for small-scale care is significantly more important for disability care (55%) and mental care (52%) organizations compared to nursing homes (19%).

Concerning the sub-motives for *efficiency*, for all healthcare sectors efficient deployment of personnel appears to be the most important reason for setting up a collaboration. The objective of purchasing efficiencies is rarely mentioned as a driver for collaboration. Collaboration to purchase medical technology more efficiently is significantly more important for hospitals than for the other healthcare sectors.

The sub-motives for reasons related to the *market/bargaining position* reveal that executives initiate IOCs in order to improve or maintain their position vis-à-vis other healthcare providers. This is important to all healthcare sectors. Furthermore, healthcare organizations collaborate to improve or maintain their market/bargaining position vis-à-vis health insurers or regional procurement offices. This especially applies to hospitals and nursing homes. However, disability care, nursing homes and mental care organizations consider the market/bargaining position vis-à-vis municipalities significantly more important than hospitals.

## 3.3 The ex-ante assessment of potential effects

For assessing what potential effects healthcare executives considered when initiating IOCs, we asked them if a self-assessment was executed prior to the establishment of the collaboration. And if so, what topics were included. In 89% of the reported IOCs, some form of self-assessment was conducted according to the respondents. Although healthcare sectors do not differ in whether they self-assess their IOCs, healthcare sectors did differ in the effects that were assessed (Table 5). The potential effects of quality of care are most often assessed (85%). Healthcare executives in IOCs focused on improving *healthcare provision* mainly made considerations with regards to potential effects on

quality (86%). Of the *efficiency*-oriented IOCs, 60% made considerations on the effects of the health organization's costs. Significant differences are visible for the assessment of potential effects on patient travel time. Nursing homes (8%) and disability care organizations (7%) significantly less often incorporate these potential effects in their self-assessment when compared to mental care organizations and hospitals.

On an aggregate level, 49% of the IOCs was preceded by an assessment of the potential effects on competition. Furthermore, it can be derived from Table 5 that 64% of the hospitals included an assessment on competitive effects, whereas 38% of the mental healthcare organizations took potential competitive effects into account. The subdivision between the types of collaboration reveals that 54% of the mixed IOCs that performed a self-assessment, included potential effects on competition in their self-assessment, compared to 42% of the horizontal IOCs and 31% of the non-horizontal IOCs (Table III in Appendix 3). Of the IOCs that were motivated by *market/bargaining position*, 65% performed a self-assessment that included the potential effects on competition.

**Table 5:** Percentage assessed potential effects prior to collaboration

| | Total | Nursing homes | Disability care | Mental care | Hospitals |
|---|---|---|---|---|---|
| Potential effects on quality of care | 85% | 77% | 82% | 93% | 92% |
| Potential effects on competition | 49% | 48% | 50% | 38% | 64% |
| Potential effects on travel time for patients/clients* | 24% | 8% | 7% | 31% | 51% |
| Potential effects on health organization costs | 49% | 35% | 50% | 55% | 62% |
| Potential effects on the available choices for patients/clients | 59% | 56% | 71% | 66% | 51% |
| Whether there is a match between the organizational cultures | 52% | 52% | 54% | 62% | 44% |
| Whether there is a match between healthcare executives | 43% | 38% | 43% | 55% | 41% |

** Significant difference between healthcare sectors (p<0.01).*

# 4. DISCUSSION

To the best of our knowledge, this is the first study systematically examining the characteristics and underlying motives of IOC across healthcare sectors. Using the setting of the Dutch healthcare system, this study contributes to the literature in two ways.

First, we compare the characteristics and motives of IOCs across healthcare sectors and establish links with general and sector-specific policy and institutional developments in Dutch healthcare (See Table 6)[8] . Generally, collaboration among healthcare providers appears to be mainly driven by the desire to improve healthcare provision

8 Table 6 summarizes the most important institution and policy developments, which are more in depth discussed in Appendix 1, where we also give an overview of financial regimes and policy developments and the legal framework for collaboration between (potential) competitors.

and quality of care. This finding is in accordance with earlier research on integrated care (Van Raak et al., 2005) and healthcare mergers (Postma & Roos, 2016). The comparison across sectors shows a crude distinction between the hospital sector on the one hand and nursing homes, mental care and disability care on the other. In hospital care, IOCs are mostly horizontal and often only include one or two partners. These IOCs focus on either complex care or generic care provision. In four out of five of these IOCs, volume or quality norms are mentioned as a (very) important drivers, which might be explained by the stricter volume and quality criteria (See Table 6, B). Our findings fit the trend of the emergence of clinical hospital care networks both in the Netherlands (Middelveldt et al., 2018) and internationally (Addicott et al., 2010; De Regge et al., 2019). These networks usually focus on specific types of treatment or patient groups to achieve economies of scale and scope.

Among nursing homes, mental care organizations and disability care organizations, mixed and non-horizontal IOCs are identified as the predominant collaboration forms. Although descriptively, this finding displays a considerable overlap with sector-specific challenges and health policy developments (See Table 6, B). For instance, in the mental care sector, collaboration is considered a promising avenue for reducing waiting lists and is therefore actively promoted by the Dutch government (IGJ, 2018). In our study, we indeed find that healthcare executives from mental care organizations mention reducing waiting lists as an important driver for initiating IOCs. Among nursing homes, as part of the 2017 Quality Framework, funds are made available only when staffing requirements are satisfied (Zorginstituut Nederland, 2017). Accordingly, staffing position turns out to be a (very) important driver for collaboration in nursing home care. It follows from our study that larger IOCs consisting of a vast number of partners are initiated to meet these staffing objectives. In disability care, organizations seem to attract new patient groups and focus on safeguarding their future survival. This could be a response to the policy developments directed at deinstitutionalization, which might lead to increased uncertainty in patient inflow.

Second, we investigate the role of healthcare executives in IOC decision making when operating in a competition-based healthcare system. The exploration of motives reveals that some healthcare organizations primarily started IOCs in order to strengthen their market/bargaining position vis-à-vis third-party payers like health insurers (hospitals and mental care organizations), regional procurement offices (nursing homes) and municipalities (providers of mental health care and disability care) (See Table I, Appendix 1). Hence, just like in healthcare mergers (Bazzoli et al., 2002), creating greater negotiation leverage is – especially for hospitals – found to be an important driver for IOC. From a managerial perspective, it is important to notice that most healthcare executives conduct a self-assessment before starting to collaborate with other organizations. These assessments mainly focus on quality considerations, and thus show similarities with the

**Table 6:** Overview of institutional developments, and its consequences for healthcare organizations in The Netherlands

| **A. General policy and institutional developments** | | | |
|---|---|---|---|
| Budget cuts and introduction of maximum binding *allowed expenditure growth* per healthcare sector. Higher expenditures than allowed can be reclaimed by the government.<br>→ Healthcare organizations face tighter budgets or less budgetary resources to expand their volume. | | | |
| Introduction of policies aimed on *deinstitutionalization*, driven by promotion of self-reliance and reduction of healthcare expenditure.<br>→ Healthcare organizations are incentivized to provide more ambulatory care instead of institutionalized care, and to collaborate with other organizations to relocate the care to the most cost-efficient environment. | | | |
| Ongoing *staff shortages;* partly caused by the expanded demand through increased life-expectancy.<br>→ Healthcare organizations have difficulties in the continuity of care and experience higher staffing costs. | | | |
| **B. Sector-specific policy and institutional developments** | | | |
| **Nursing homes** | **Disability care** | **Mental care** | **Hospitals** |
| Introduction of Long-term Care Act (2015). | Introduction of Long-term Care Act and new Social Support Act (2015).<br>→ Shift in purchasers through division between municipalities (non-institutionalized) and regional procurement offices (institutionalized). | Increased waiting times.<br>→ Mental care organizations are expected to intensify regional collaboration to reduce waiting lists. | Expansion of share freely negotiable hospital prices without maximum tariffs, and room for selective contracting.<br>→ Hospitals experience intensified price negotiations with risk bearing health insurers and increased media attention for negotiations. |
| Introduction of a new quality framework (2017).<br>→ Nursing homes receive extra funds or quality improvements when staffing requirements are satisfied; collaboration is recommended. | Risk bearing municipalities became responsible for purchasing non-institutionalized care.<br>→ Disability care organizations are not automatically guaranteed for sufficient financing as under the former situation. | Since 2014, the first three years (instead of one) of (institutionalized) mental treatment are purchased by risk bearing health insurers and abolishment of regional procurement offices.<br>→ Mental care organizations face intensified contract negotiations for budgets. | Stricter volume- and quality standards<br>→ Stimulation of a certain level of coordination or collaboration between partners, for instance for the centralization of care in high-volume centers. |
| | | | Stricter ex-ante merger enforcement by the competition authority (2017).<br>→ Hospitals may switch more to collaboration on subdomains. |

leading found motives of IOCs. For IOCs involving (potential) competitors, an ex-ante assessment of the potential effects on competition is important to safeguard public interests as well as to prevent ex-post fines for a violation of the cartel prohibition. We find that hospitals most often indeed include these considerations, which can potentially be explained by the fact that hospitals collaborate most often horizontally in a competitive environment (Ineveld et al., 2018; Mascia et al., 2012) (See Table 6, B).

## 4.2 Limitations

The representative study sample including healthcare executives from all major sectors allowed us to present a comprehensive overview of IOCs in the Netherlands. The case approach prevented the occurrence of recall bias. However, at least three limitations are acknowledged. First, some results could have been influenced by socially desirable or strategic responses. To mitigate the occurrence, we processed data anonymously. Second, in order to ensure the anonymity of healthcare executives and the organizations they manage, we could not rule out overlap of IOCs in our sample. That is, the same collaboration could be described by more than one healthcare executive. However, as the healthcare executive perspective was the focal point of this study, potential overlap is not problematic. Third, this study focused on IOC between healthcare providers of medium-sized and large organizations only. Further research is therefore recommended to include also small healthcare organizations and other relevant stakeholders such as purchasers of care, social care organizations and municipalities.

## 4.3 Implications

The findings of our study have several practical implications for healthcare managers and policymakers as well as future research.

*Implications for policymakers and future research*

It appears positive that healthcare executives consider the potential effects of collaboration, and that mentioned motives often align with policy goals, such as reducing waiting lists and staffing shortages. A further key policy priority should be to identify the elements of successful collaboration and whether the intended objectives for IOCs are indeed achieved. Our exploration can function as an important starting point to categorize collaboration cases by sector, types and motives. The assessment of effectiveness is particularly interesting for horizontal collaboration in which healthcare providers both collaborate and compete (Mascia et al., 2017). yet even more important due to the potential tension with market incentives (Baicker & Levy, 2013).

As IOC is likely to further rise in significance, it is recommended for policymakers and competition authorities to closely monitor whether self-regulation by healthcare organizations works as envisioned. Our research highlights that a fair share of hospitals

establish IOCs to achieve a better competitive position. Because of their potential anti-competitive effects, these IOCs need monitoring by government bodies and competition authorities to safeguard public interests as affordability and accessibility.

*Managerial implications*

Healthcare executives can benefit from the exploration as it provides insight into the different responses to institutional developments and challenges. Our subdivision in collaboration types and motives can be useful for the exchange of collaboration-specific best-practices. Research highlights the complexity of governing and sustaining IOCs. (D'Aunno et al., 2019; Hearld et al., 2016), and demonstrates that IOC generally takes 5 years to proves its efficiency (Berthod & Segato, 2019). Therefore, interim insight into pitfalls and success factors can support healthcare executives. Professional association as the NVZD and governance codes and guidance can serve as a platform to exchange these learned lessons.

Our study further highlights that among hospitals the most recent IOC is predominantly horizontal. A possible explanation is that hospitals exchange resources and coordinate healthcare provision with other hospitals because these organizational silos sometimes steer IOC decisions (Powell et al., 2005; Shortell et al., 2014). However, many societal and healthcare challenges, such as the substitution of relatively expensive hospital services with other types of health care or integrated care (KPMG, 2020; VWS, 2018; Westra, Kroese, et al., 2017), require non-horizontal or mixed collaboration arrangements including multiple healthcare sectors. Hospital executives should therefore be encouraged to play a leading role in cross-sectoral IOC as well.

# 5. CONCLUSION

This study provided insight into IOCs in healthcare by conducting an empirical study among healthcare executives. We explored differences between healthcare sectors (nursing home care, mental care, hospital care and disability care) and between different types of IOCs (horizontal, non-horizontal, and mixed collaboration). Our findings imply that policy changes and institutional developments seem related to the selected forms of IOCs between healthcare providers. Hospitals generally operate in small horizontal IOCs while larger and more complex mixed and non-horizontal IOCs are more present among the long-term care sectors. Before establishing a collaboration, most healthcare organizations conduct a self-assessment including the potential effects. Our extensive overview of policy developments, collaboration types and intended outcomes presented in our study offers a useful starting point for an in- depth assessment of the effectiveness of IOCs among healthcare organizations.

# APPENDIX 1: INSTITUTIONAL SETTING, SECTOR-SPECIFIC DEVELOPMENTS AND POLICY CHANGES IN THE NETHERLANDS

The emphasis in our exploration is on hospital care (hospitals), long-term care (disability care and nursing homes) and mental care (mental care organizations), as these are the largest sectors in terms of healthcare expenditure, number of organizations and number of staff (CBS, 2019). But before we get to our discussion of sector-specific developments, there are four overall developments relevant for all healthcare sectors.

First, over the past ten years the organization and financing of the Dutch health system has been subject to ongoing changes and reforms in order to increase efficiency (See Table I). Although the 2006 introduction of the Health Insurance Act (*Zorgverzekeringswet; Zvw*) is the most pivotal change, the more recent implementation of the Long-Term Care Act (*Wet langdurige zorg; Wlz*) as well as the Social Support Act ("*Wet maatschappelijke ondersteuning*"; *Wmo*) in 2015 also mark major reforms. After these reforms, the role for the regional procurement offices that purchase care became smaller while the role of health insurers and municipalities as third-party payers for healthcare expanded. Health insures became responsible for the procurement of community nursing and mental care. Municipalities became responsible for the non-institutionalized care for elderly and people with a disability (decentralization from central government to local government). Under the pre-2015 regime, the regional procurement offices did not bear any financial risk, but this risk rested with the central government (Alders & Schut, 2019). Under the new decentralized financing scheme, municipalities and health insurers have become fully risk bearing for their healthcare expenditures. Both municipalities and private health insurers thus have much stronger incentives to negotiate lower prices or turnover limits than the regional procurement offices had. For healthcare organizations providing care that falls under the *Wmo* or *Zvw*, expenditure caps and selective contracting became much more prevalent.

Second, the Dutch central government also aims to lower overall healthcare spending growth. Since 2011, the Ministry of Health, Welfare and Sport negotiates with stakeholders over the annual maximum allowed expenditure growth per healthcare sector. These sector agreements are binding. For example, in 2019, the maximum expenditure growth agreed upon was 0,8% for hospital care and 1,3% for mental care. A macro-budget instrument (MBI) can be deployed by the government to reclaim expenditures from individual healthcare providers if total expenditure is higher than agreed upon (Schut and Varkevisser, 2017). To date, this instrument has not been exercised yet.

Third, the Dutch healthcare sector is in the ongoing process of deinstitutionalization. This trend is predominantly prompted by the aimed reduction of healthcare expenditures but is also driven by the desire to stimulate self-reliance of the Dutch population.

**Table I:** Major legal changes and changes in financers in Dutch healthcare

| | Long term care | | | Hospital care | Mental care |
|---|---|---|---|---|---|
| | **Home care (non-institutionalized)** | **Nursing homes (institutionalized)** | **Disability care**[a] | | |
| **Former Act** | Until 2014: Exceptional Medical Expenses Act (AWBZ)<br>Until 2014 Social Support Act (Wmo) | Until 2014: Exceptional Medical Expenses Act (AWBZ) | Until 2014: Exceptional Medical Expenses Act (AWBZ)<br>Until 2014 Social Support Act | Until 2006 Sickness Fund Act (Zfw) | Until 2008: Exceptional Medical Expenses Act (AWBZ)[a] |
| **Current Act** | Social Support Act 2015 (Wmo 2015) (Home care/social assistance)<br>Health Insurance Act (Zvw) (Community Nursing) | Long-term Care Act (Wlz) | Long-term Care Act (Wlz) (Institutionalized care)<br>Social Support Act 2015 (Wmo 2015) (non-institutionalized) | Health insurance act (Zvw) | Health Insurance Act (Zvw) |
| **Current purchaser of care** | Municipalities (Home care/social assistance)<br>Health insurers (Community nursing) | Regional procurement offices | Regional procurement offices (Institutionalized care)<br>Municipalities (non-institutionalized) | Health insurers | Health insurers<br>Regional procurement offices |

[a] *Since 2008, the first year of mental care is financed under the Health Insurance Act (Zvw). Since 2014, the first three years of (inpatient) mental treatment are financed through the Zvw instead of the Exceptional Medical Expenses Act (former AWBZ)* (Westra et al., 2016).

[b] *Non-institutionalized care for people with a sensory disability is financed under the Health Insurance act.*

*NB: this table is an extension of the one presented in Alders and Schut (2019).*

In the *Wlz*, deinstitutionalization is visible by the replacement of care homes by community nursing and home care (Kroneman et al., 2016). The same pattern is visible for disability care, where institutionalized care is replaced by outpatient ambulatory care. In mental care, more outpatient ambulatory care is introduced. Mild mental disorders are increasingly treated by specialized nurses in primary care facilities. The number of impatient admissions and length of stay in inpatient facilities has decreased (Vektis, 2019). An important example of deinstitutionalization is the policy document "The Right Care in the Right Place" (*JZOJP*) (VWS, 2018; Westra et al., 2017). This policy plan including subsidies and incentives aims at (1) reducing the use of unnecessary care or unnecessarily costly care, (2) relocating care closer to the patient's living environment or client instead of hospitals or nursing homes and (3) replacing forms of care with for example eHealth solutions. An important example is to relocate certain forms of care, such as COPD or diabetic care, from more expensive hospitals to GPs in order to reduce healthcare expenditures, which demands for intensified coordination and collaboration between healthcare organizations.

Fourth, the healthcare system suffers from substantial staff shortages among all healthcare sectors (UWV, 2018). This leads to higher staffing costs for healthcare organizations, and problems in the continuity of care. This is further complicated by the overall increasing demand for healthcare caused by the steady and ongoing growth of elderly, the growing life-expectancy and higher prevalence of multi-morbid chronic conditions (CBS, 2017; Oostrom et al., 2017).

In addition to the four major developments at the overarching level, sector-specific changes deserve attention. In mental care, increased waiting times for care for specific disorders poses an important challenge. The reduction of waiting times has become one of the government's focal points for this sector. In the summer of 2017, healthcare providers, health insurers and government bodies formulated goals for reduction. Here, the midterm evaluation demonstrated that desired reduction of waiting times would not be achievable given the current organization of mental healthcare (NZa, 2018). The Dutch Health and Youth Inspectorate (IGJ) expressed that increased regional collaboration between mental care organizations, GPs and healthcare organizations is needed for waiting times to be reduced (IGJ, 2018). The second major development in mental care is the introduction of the new basic mental healthcare segment, next to the specialized segment. This introduced short treatment products, limited to roughly five, eight or twelve sessions (van Mens et al., 2018). Third, the abolition of the Representation Model 2014, in which health insurers collectively negotiated and purchased with a healthcare provider. Under the new situation, health insurers can independently negotiate or selectively contract healthcare providers.

In Dutch hospital care, similarly to other countries, reporting and monitoring of quality data has increased in order to foster quality improvements (Kampstra et al., 2018; Vos et al., 2009). A specific form of quality standards are the minimum volume standards set by the medical professionals and are used by healthcare purchasers to gain insight into performance and selectively contract healthcare providers. Especially for complex (oncological) surgical procedures (Mesman *et al.*, 2018), these standards demand for a certain level of coordination or collaboration between partners, for instance for the centralization of care in high-volume centers.

For nursing homes, in January 2017 a new quality framework became effective ("*Kwaliteitskader Verpleeghuiszorg*") (Zorginstituut Nederland, 2017). The Dutch government has made 2,1 billion euros available for the implementation of this quality framework. These funds are only made available if staffing requirements are satisfied, and smaller organizations are advised to collaborate with other organizations for enough expertise.

# APPENDIX 2: COLLABORATIONS AND COMPETITION POLICY

In a market-based health care system with provider competition, like in the Netherlands, it is important for collaborating healthcare providers to check whether their collaboration is accordance with Competition Law. However, this legislation does not apply to all forms of collaboration: a collaboration could fall outside the scope of the Cartel Prohibition, because (1) the collaboration does not reduce competition (2) the common turnover of collaborating parties (maximum of 8) does not exceed 1,100,000 euros or (3) the collaborating parties have a weak market position. When the conditions above do not apply, IOCs could only be considered compatible with the exemptions for the cartel prohibition when a group exemption applies, or in individual cases, when the realized efficiencies justify the decrease of competition.

When collaboration, first, healthcare organizations need to demonstrate whether the collaboration falls under the scope of the Cartel Prohibition. Second, when the collaboration falls under the scope, for the applicability of the exemption criteria healthcare organizations need to prove that competition is not unnecessarily limited by the collaboration. Furthermore, the benefits for patients or clients should outweigh any anti-competitive effects of collaboration. Both elements one and two should be substantiated in an ex-ante self-assessment, which should include the role of competition.

# APPENDIX 3: TABLES

**Table II:** Main motives for collaboration, subdivided by subtypes of collaborations

| | Horizontal | Non-horizontal | Mixed |
|---|---|---|---|
| Healthcare provision | 89% | 90% | 89% |
| Efficiency* | 38% | 55% | 59% |
| Market/bargaining position | 31% | 31% | 33% |
| Staff or educational position | 23% | 31% | 35% |
| Pressure from internal and/or external stakeholders | 20% | 17% | 24% |

*Significant difference between collaboration types (* = p<0.05).*

**Table III:** Included elements in a self-assessment, subdivided by subtypes of collaboration

| | Horizontal | Non-horizontal | Mixed |
|---|---|---|---|
| Potential effects on quality of care | 83% | 69% | 70% |
| Potential effects on competition | 42% | 31% | 54% |
| Potential effects on travel time for patients/clients | 28% | 14% | 17% |
| Potential effects on health organization costs | 46% | 48% | 39% |
| Potential effects on the available choices for patients/clients | 54% | 52% | 54% |
| Organizational cultures | 54% | 52% | 33% |
| Whether the healthcare executives can work together | 31% | 52% | 43% |


# Chapter 5

*'S Heeren Loo, disability care*
*Ermelo*

# Associations of hospital volume and hospital competition with short-, middle- and long-term patient outcomes after breast cancer surgery: A retrospective population-based study

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# ABSTRACT

For oncological care, there is a clear trend towards centralization and collaboration aiming at improving patient outcomes. However, in market-based health care systems this trend is related to the potential trade-off between hospital volume and hospital competition. In this study, we analyze the association between hospital volume, competition from neighboring hospitals and outcomes for patients who underwent surgery for invasive breast cancer (IBC). We use data from the Netherlands Cancer Registry (NCR). Our study sample consists of 136,958 patients who underwent surgery between in 2004 and 2014. The selected patient outcomes in this study are surgical margins, 90-days re-excision and overall survival.

Our findings show that treatment types as well as patient and tumor characteristics explain most of the variation in all outcomes. After adjusting for confounding variables and intra-hospital correlation, hospital volume and competition from neighboring hospitals did not show significant associations with surgical margins and re-excision rates. For patients who underwent surgery in hospitals annually performing 250 surgeries or more, multilevel models show that survival was somewhat higher. Concerning the effect of hospital competition, survival in hospitals with four or more (potential) competitors within 30-kilometer was slightly higher, but this effect did not hold after changing this proxy for hospital competition

Based on the selection of patient outcomes, hospital volume and regional competition appear to play only a limited role in the explanation of variation in IBC outcomes across Dutch hospitals. However, further research into hospital variation for high-volume tumors like the one studied here is recommended to (i) use consistently measured quality indicators that better reflect multidisciplinary clinical practice and patient and provider decision-making, (ii) include more sophisticated measures for hospital competition, and (iii) assess the entire process of care within the hospital, as well as care provided by other providers in cancer networks. This could reveal other actionable factors for further improving the quality of breast cancer care.

# 1. BACKGROUND

In the past decades, oncological healthcare provision for breast cancer, currently being the most common form of cancer within women, has undergone major changes and advances (National Cancer Institute, 2020; WHO, 2021). As the complexity and multidisciplinary character of oncological care continually increases, the organization of high-quality care provision in health systems is an ever-growing challenge. The introduction of clinical (transmural) pathways, national audits like the NABON breast cancer audit (NBCA), centralization of low-volume oncological surgeries, the establishment of hospital networks and the introduction of competition can be regarded as policy measures aimed at maintaining and improving the quality of care in order to obtain the best outcomes for patients (Mesman et al., 2015; Tremblay et al., 2016; Vallejo-Torres et al., 2018; Van Hoeve et al., 2014). Yet, the optimum design and organization of oncological care is still debated and subject to research for frequently occurring cancer types, such as breast cancer, which are often not centralized (Parry et al., 2019; Scharl & Göhring, 2009). Among others, two factors – one on the hospital level and one on the health system level – are central to this debate: hospital volume and hospital competition.

*Hospital volume*

On the hospital level, the volume-outcome relationship for surgical procedures has been subject for research since the late 1970s. Starting with Luft and his colleagues (1979), literature has demonstrated the presence of the volume-outcome relationship for many interventions, especially those of high complexity (Luft et al., 1979; Bauer & Honselmann, 2017; Birkmeyer et al., 2002; Gooiker et al., 2010; Wouters et al., 2012). This has resulted in increased centralization for procedures. More recently, interest is shifting over to procedures for frequently occurring tumors, such as breast cancer surgery. Literature mainly reveals a positive relationship between surgical volume and patient outcomes, predominantly when using survival as an outcome measure (Avdic et al., 2019; Greenup et al., 2018; Pezzin et al., 2015; Siesling et al., 2014; Vrijens et al., 2012). Generally, the existence of the volume-outcome relationship can be attributed to a combination of different explanations such as learning by doing, work in multidisciplinary teams, enhanced recovery plans and technical and IT support (Avdic et al., 2019; Mesman et al., 2015). Total hospital volume is commonly used as indicator in this literature since it best reflects the multidisciplinary and comprehensive nature of contemporary provision of breast cancer, compared to individual surgeon volume (Vrijens et al., 2012). Since 2012, in the Netherlands the minimum volume threshold for hospital-level breast cancer surgical volume is set at 50 (SONCOS, 2012). The European quality assurance scheme, published in 2020, uses a higher number, namely 50 per surgeon and 150 per hospital (Biganzoli et al., 2020; Janusch-Roi et al., 2021).

*Hospital competition*

On the health system level, recent literature focuses on the effect of competition between proximate hospitals. In countries with market-based hospital systems, including the Netherlands, competition between hospitals has been introduced as a tool to improve efficiency and quality (Barros et al., 2016; Schut & Varkevisser, 2017; Siciliani et al., 2017). It is expected that the presence of competitors might incentivize hospitals to increase quality relative to other hospitals in order to attract more patients (either directly by exercising hospital choice or indirectly through referrals by general practitioners and/or selectively purchasing of care by health insurers) (See Box 1). However, in contrast to hospital systems with regulated prices, the effect of competition on quality in hospital markets with freely negotiable prices with purchasers is less investigated, especially in cancer care (Aggarwal, Lewis, Mason, Purushotham, et al., 2017; Gaynor & Town, 2012; Roos et al., 2020). Studies considering the relationship found evidence that increased hospital competition was associated with improved quality outcomes for a limited number of interventions, such as Coronary Artery Bypass Grafting in the acute setting (Bijlsma & Koning, 2013; Gowrisankaran & Town, 2003; Rogowski et al., 2007). As the current tendency towards centralization of procedures aimed at increasing volume will further reduce the number of hospitals offering this care, it is important to acknowledge that surgical consolidation potentially lowers incentives for quality competition among hospitals (Ho et al., 2012).

**Box 1:** Hospital competition and quality

> The relationship between hospital competition and quality depends on the structural characteristics of the health system and the public availability of quality information. If competition on both price and quality is possible, as is the case for breast cancer surgery in the Netherlands since prices are freely negotiable, it follows from economic theory that hospitals place most emphasis on either price or quality, dependent of the responsiveness of demand by patients or healthcare purchasers and the availability, transparency and comparability of quality or price information (Gaynor et al., 2015).

## Study aim

An adequate analysis of hospital variation in patient outcomes should thus address the joint impact of both surgical volume on the hospital level and hospital competition on the health system level. In our study, this interaction is analyzed for three different patient outcomes: surgical margins, re-excision rates, and overall survival. Our study focuses on surgery for IBC in the Netherlands. The reason for this focus is threefold. First,

IBC surgery in the Netherlands has not undergone the same degree of centralization compared to low-volume tumors. Hospital variation in relation to volume and competition might therefore still be present. Second, in contrast to low-volume tumors, literature demonstrates contradicting and country-specific volume effects with regards to IBC surgical procedures (Greenup et al., 2018). Moreover, in previously performed studies on volume-outcome correction for unobserved differences across hospitals has not been performed (Kim et al., 2016). Therefore, we here use a multilevel approach. Third, over the past years, quality indicators in national and international breast cancer guidelines have been repeatedly subject to change (Biganzoli et al., 2020; NBCA, 2020; Van Bommel et al., 2017) We aim to contribute to knowledge on the use of patient outcomes in both clinical and policy decision-making. The outcome parameters surgical margins and re-excision rate are known to be associated with psychological stress, increased disease burden and potentially worse cosmetic outcomes (Barrio & Morrow, 2016; Tamburelli et al., 2020). Survival was included in our study as it has the benefit of the long follow-up assessment of potential hospital variation and suitability for international comparison in clinical and applied research.

## 2. THEORY

### Hospital volume

On the individual hospital level, hospital size has received ample attention in literature, especially in relationship with overall or relative survival as primary outcome indicator. Generally, three theoretical underlying mechanisms can be distinguished to explain the causal link in this relationship: (i) the compliance to evidence based processes of care, (ii) the level of specialization, and (iii) factors on hospital level, such as the availability of resources (Mesman et al. 2015). In practice, the existence of the volume-outcome relationship can be attributed to a combination of different explanations and contextual factors. When focusing on breast cancer care`, potential explanations for the inverse relationship between hospital volume and patient mortality include the positive influence of multidisciplinary consultations, the more frequent use of breast conservation and the choice of adjuvant chemotherapy (Greenup et al., 2018).

The existing empirical literature on hospital volume and survival in breast cancer research is extensive. Gooiker et al., (2010) reviewed eight articles published between 2003 and 2007 (Gooiker et al., 2010). In six studies, a significant effect in favor of high volume was found. In most recent studies the same pattern is visible when 5-year survival is used as the primary endpoint. Skinner et al., (2003) Gilligan et al., (2007) and Chen et al., (2008) & Greenup et al., (2018) all reported a positive relationship (Chen et al., 2008; Gilligan et al., 2007; Greenup et al., 2018; Skinner et al., 2003). Yet, effect

sizes and cut-off levels for discriminating high- and low volume differ strongly between studies which hamper external validity and stating country specific minimum volume standards (Scharl & Göhring, 2009). For instance, in the study of Gilligan et al., (2007) high volume is defined as more than 40 surgeries a year in a single hospital, whereas Chen (2008) discriminates high volume above 585 surgeries. Studies with 10-year follow up as endpoint are much scarcer. Yet, the high volume and good prognosis highlight the importance of the long-term follow-up. In addition, Nomura et al., (2006) found no relationship between relative 10-year survival hospital volume (Nomura et al., 2006). Contrary, Greenup et al., (2018) with the largest study to date found that volume was an independent predictor for improved 10-year survival. In the Dutch setting, in the last study with substantial follow-up, Siesling et al., found only a small difference in survival between hospitals with a volume of 75-99 annual surgeries and hospitals with over 200 surgeries a year (Siesling et al., 2014). Vrijens et al. (2012) found better rates of application of scientific guidelines and prolonged survival in high-volume hospitals (Vrijens et al., 2012).

Most studies in the field of the volume-outcome relationship for breast cancer focused on survival. However, scholars have also examined hospital volume in relation to short-term outcome indicators, such as surgical margins and re-excision rates. Previous research has for instance indicated that hospital volume was a significant predictor for negative surgical margins and partially explain the volume-survival relationship (Yen et al., 2017). In The Netherlands, no relationship was found between hospital volume and surgical margins (Van Der Heiden-Van Der Loo et al., 2012). With regards to re-excision after primary surgery, it was found that low volume hospitals were associated with a higher overall probability of re-excision within 90 days (Van Leeuwen et al., 2018). Similarly, an inverse relationship was found for surgeon volume and 90-days re-excision rates, implying that high volume surgeons reported lower rates of re-excisions (Isaacs et al., 2016). The combination of both hospital volume and surgeon volume demonstrated that women who underwent surgery in low-volume hospitals by low-volume surgeons had a significantly increased risk of re-excision (de Camargo Cancela et al., 2013).

## Hospital competition

Additional to considering possible causes of quality differences on the individual hospital level, increasing emphasis is being placed on factors at the health system level. This includes the introduction of patient choice and competition on quality outcomes. The effects of such factors dependent on the structure of the market, for instance whether hospitals prices are liberalized or regulated (Gaynor et al., 2015; Gaynor & Town, 2012). Economic theory predicts that in markets or market segments with regulated price-setting hospitals will compete solely on quality. Currently, the NHS in the UK is an example of a hospital system without competition on prices. Consequently, when hospitals face

tougher competition, the assumption is that they will increase their quality in order to attract and/or retain consumers (often referred to as consumer driven competition) or health insurers (often referred to as payer driven competition) (Gaynor et al., 2015). In empirical literature, the relationship between competition and quality in settings with administered prices, showing a predominantly positive effect of increased competition on quality (Gaynor & Town, 2012). With regards to cancer outcomes, Aggarwal et al., (2017) reported a positive association between successful hospital competition and short-term outcomes after prostate surgery, which can also be regarded as tumors of high volume (Aggarwal et al., 2017).

The mechanism for competition in markets where hospitals compete both on quality and price, as is the case in the US or The Netherlands, is more complex and supposes an interplay between both price and quality (Gaynor et al., 2015). Economic theory then predicts that health providers place most emphasis on either price or quality, dependent of the responsiveness of demand by patients or healthcare purchasers on both elements: quality will raise if the quality elasticity of demand increases relative to the price elasticity. Quality will also increase if price increases relative to the marginal cost of quality and falls if the opposite happens (Dranove & Satterthwaite, 2000; Gaynor et al., 2015; Roos et al., 2020) . Publicly available quality information is an important prerequisite: quality must be observable for either patients or purchasers. If price information is better accessible or comparable, competition mainly occurs on price instead of quality.

The effect of competition on quality in hospital markets with unregulated price-setting is less investigated. The results are rather inconsistent and often lack external validity through endogeneity limitations (Gaynor & Town, 2012; Roos et al., 2020). Most studies focus on acute care (CABG) in the US setting, demonstrating increased hospital competition or less concentration is associated with better outcomes (Gowrisankaran & Town, 2003; Rogowski et al., 2007).

In the Dutch setting, it was found that better quality scores were reported for bladder tumors in more competitive hospital environments (Croes et al., 2018). It was also demonstrated that increased competition led to a larger percentage of available test outcomes within five days, as a process indicator for quality of care (Bijlsma & Koning, 2013). Additionally, the importance of observable quality information for successful hospital competition was confirmed: consumer satisfaction increased more rapidly in areas with more competition (Ikkersheim & Koolman, 2012). Another study found no evidence that increased exposure to price competition reduces quality measured by readmission rates for hip-replacements (Roos et al., 2020). Moreover, a temporary, positive impact on quality was reported. These four studies, however, did not assess the outcomes of exposure to competition on the long run.

# 3. METHODS

## Data source

The Netherlands Cancer Registry (NCR), hosted by the Netherlands Comprehensive Cancer Organization (IKNL), is used as our primary data source. This population-based registry covers the complete Dutch population and all Dutch hospitals. It is based on a notification of all newly diagnosed malignancies by the national automated pathological archive (PALGA). Additional notification sources are the national registry of hospital discharges and radiotherapy institutions. Specially trained data managers of the NCR routinely extract information on patient characteristics, diagnosis, tumor characteristics, and treatment directly from the medical records. Co-morbidity was available only for hospitals in the southern part of the Netherlands. Each patient's vital status was retrieved from the Dutch Municipality Register (GBA). Follow-up was completed until February 2020. Our dataset was combined with information on the location of all Dutch hospitals and outpatient facilities defined by zip codes enabling us to calculate competition measures. This data was retrieved from the National Institute for Public Health and the Environment (RIVM).

## Patient selection criteria

In our study, 136,958 breast cancer patients were included who underwent a first surgery (breast conserving or mastectomy) for a primary invasive breast cancer tumor in the Netherlands between 1 January 2004 and 31 December 2014 in any Dutch hospital. Patients with Ductal carcinoma in situ (only DCIS) or metastasis at diagnosis were excluded. The same applies if the name of the hospital where the surgery was performed was missing (N=37, <1%). For patients with multiple surgeries on the same day (N=1337, <1%), only the first surgery was included.

## Patient and public involvement

Patient perspectives are important for the Netherlands Comprehensive Cancer Organization to reduce the impact of cancer and are therefore involved in the evaluation for the application for the use of data by means of a patient advisory board. We used data on an aggregated level. Patients were thus not directly involved in the data collection phase, nor in defining the research question or the outcome measures, nor were patients asked to advise on interpretation or writing up of results. However, the patient's perspective was incorporated in the definition of these quality indicators by scientific associations, such as the NBCA. The results of this study will be broadly disseminated through patient organizations, patient communities and scientific associations, both digitally and in-person.

## Measures

*Patient outcomes*

Survival was calculated as follow-up from the date of diagnosis to date of the event. As the actionability of volume-outcome research is limited in daily clinical practice due to the complexity of the relationship with survival and uncontrolled confounding factors, surgical margins and 90-days re-excision were therefore also included as short and middle-term outcomes. Based on the definition of the Dutch Healthcare Inspectorate, surgical margins were defined as margins free when the pathologist found no cancer cells at the edge of the tissue and focally positive when cancer cells are found (available for 2011-2014, only calculated for patients who underwent a lumpectomy). For re-excision, it was assessed whether a patient underwent a second surgery within 90 days after the first surgery irrespective of the reason (available for 2009-2014).

*Hospital volume*

Hospital volume has been defined as the total number of annual IBC surgeries following EUSOMA guidelines, operationalized as the rolling average over three years. Hence, as expressed in the following formula it refers to the annual mean based on the year of surgery ($T_0$) and the two preceding years ($T_{-1}$ and $T_{-2}$): $\frac{Volume_{T_0}+Volume_{T-1}+Volume_{T-2}}{3}$. For 2004, only the year $T_0$ was used. For 2005, the average was taken over the years $T_0$ and $T_{-1}$. Hospitals that merged in the study period were included separately up to the year of merging. Post-merger, the volumes of the merged hospitals' locations were aggregated. Following this approach, 15 hospital mergers were processed. Based on the latest population-based study, hospital surgical volume was categorized in six groups (i.e., less than 75 surgeries, 75-99 surgeries, 100-149 surgeries, 50-199 surgeries, 200-249 surgeries, and 250 or more surgeries) [17]. The 200-250 category was added to account for the overall increase in hospital volumes in the Netherlands during our study period.

*Hospital competition*

Hospital competition has been operationalized through the number of proximate hospitals within a fixed radius. This so-called *fascia count* is a simple but commonly used proxy for the level of hospital competition (Bijlsma & Koning, 2013; Westra et al., 2021). We assessed the number of hospitals within a fixed isodistance. This is a more accurate measure compared to a simple circular radius since it takes into account differences in road networks (and thus differences in travel time). Isodistance was calculated based on a dataset containing travel times between all combinations of Dutch zip codes. From previous studies, it followed that patients' average willingness to travel for hospital care in the Netherlands equals about 20 minutes by car which can be translated into 30km (Varkevisser et al., 2009, 2012). Therefore, in this study regional hospital markets

were operationalized by the 30km isodistance. Both 20 km and 40 km isodistance were included as sensitivity checks. For hospitals with multiple locations, we identified the number of unique competitors on the organizational level instead of the location level. Because financial operation and contract negotiations with health insurers take place on the organizational level, hospital locations that are part of the same organization do not compete with each other. Hospital locations that are part of the same (merged) organization are thus not counted as unique hospitals. Hence, mergers did not necessarily influence the travel time for patients on the organizational level, since hospital locations were most often not closed post-merger.

*Control variables*

Control variables were categorized into four groups: (i) patient characteristics, (ii) tumor characteristics, (iii) treatment characteristics, and (iv) hospital characteristics. In all multivariate analyses, we corrected for age at diagnosis, socioeconomic status, tumor morphology (invasive ductal, invasive lobular, other), TNM stage ($6^{th}$ edition), tumor grade, surgical procedure (mastectomy/lumpectomy), hospital type (general hospital and tertiary /university hospital), and year of surgery. Patients' socio-economic status was based on the scores for their postal codes at time of diagnosis and grouped using guidelines from Statistics Netherlands. Survival analyses were also corrected for the use of neoadjuvant chemotherapy, hormone receptor status based on estrogen (ER) and progesterone (PR) receptors. Additionally, for 25% of the patient population comorbidity status was available and included as a control variable.

## Statistical analyses

Baseline statistics on the individual patient level included proportions, standard deviations and uncorrected five- and ten-year survival rates with 95% confidence intervals to test uncorrected significant differences. Baseline statistics on the hospital level included the distribution of hospitals across volume groups, the number of proximate hospitals and hospital type. We performed multivariate logistic regressions using 90-days re-excision and surgical margins as outcome variables. Surgical margins were only calculated for patients who underwent a lumpectomy. Standard errors were clustered on the hospital organizational level to account for intra-hospital correlation (i.e., patients treated in the same center). Multilevel Cox proportional hazard regression models with hospital and year of surgery random effects were used to examine the association between hospital volume, the number of proximate hospitals and covariates with patient survival. These analyses were executed for the entire cohort and, as an additional analysis for the sub cohort with available comorbidity status. The reference category for annual hospital volume was set at 100-149 surgeries, as this category included most hospitals and the highest number of treated patients. Sensitivity checks were conducted to test

the robustness of our findings. These checks included amongst others (i) the alternative categorizations of the number of proximate hospitals and alternative fixed isodistances for calculating the number of proximate hospitals (20 and 40 km), (ii) the use of continuous variables for hospital volume and number of proximate hospitals instead of categorized variables and (iii) the use of continuous variables for hospital volume and number of proximate hospitals, scaled by the interquartile range ($75^{th}$ percentile minus $25^{th}$ percentile). Potential violation of the proportional hazard assumption was tested by the inclusion of time-varying covariates and graphing of Schoefeld Residuals. No clear violations were found. All analyses were performed in STATA version 16.1.

# 4. RESULTS

## Patient characteristics

Patient level descriptive statistics are presented in Table 1. Median age at diagnosis was 60 years. Of all patients, 48% had Stage 1 breast cancer and 39% had Stage 2 breast cancer, 60% underwent a lumpectomy and 40% a mastectomy. Of all patients, 76% were diagnosed with an invasive ductal type. Furthermore, 18% of patients received surgery in hospitals annually performing 100 or less surgeries and 28% of the patients received surgery in hospitals with on average 100-149 surgeries per year. The proportion of patients who underwent surgery in a hospital with zero to three proximate hospitals (indicating weak competition) was equal to the proportion of patients who had surgery in a hospital with four or more proximate hospitals (indicating stronger competition).

*Uncorrected survival*

Higher rates of uncorrected 5-and 10-year survival were reported with the increase of annual hospital volume. No clear differences were observed for the hospital proximity measure. When assessing control variables, the largest significant differences in overall survival were found for age and TNM stage. Briefly, uncorrected for other factors, female patients, younger patients, and patients who underwent a lumpectomy showed a significantly improved 5-year and 10-year overall survival rates.

## Hospital characteristics

In Table 2, the hospital level characteristics are described for the years 2004, 2009 and 2014. This comparison over time reveals that the number of Dutch hospitals performing surgery for IBC decreased from 96 in 2004 to 82 in 2014, mainly due to mergers. This decrease in number of hospitals predominantly occurred among the general hospitals, whereas the number of tertiary/university hospitals remained stable over the study period. The proportion of hospitals that performed 250 or more surgical procedures

**Table 1:** Patient characteristics and overall survival of the first invasive breast cancer surgery

| | Baseline | | 5-year overall survival (*N*=136 958) | | | 10-year overall survival (*N*=52513) | | |
|---|---|---|---|---|---|---|---|---|
| | N | % | % | CI L | CI U | % | CI L | CI U |
| **Sex**[5 10] | | | | | | | | |
| Female | 136099 | 99.4% | 87.7% | 87.5% | 87.9% | 74.5% | 74.2% | 74.8% |
| Male | 859 | 0.6% | 76.7% | 73.7% | 79.4% | 55.1% | 51.3% | 58.8% |
| **Age at diagnosis**[5 10] | | | | | | | | |
| 15-29 | 712 | 0.5% | 89.9% | 87.5% | 91.9% | 83.8% | 80.6% | 86.5% |
| 30-44 | 15500 | 11.3% | 91.5% | 91.1% | 92.0% | 84.7% | 84.1% | 85.3% |
| 45-59 | 51292 | 37.5% | 92.9% | 92.7% | 93.1% | 85.3% | 85.0% | 85.6% |
| 60-74 | 50989 | 37.2% | 89.4% | 89.2% | 89.7% | 75.3% | 74.8% | 75.7% |
| 75+ | 18465 | 13.5% | 64.6% | 63.9% | 65.3% | 32.2% | 31.4% | 32.9% |
| **Socioeconomic status**[5 10] | | | | | | | | |
| Low | 39084 | 28.5% | 86.1% | 85.8% | 86.4% | 71.2% | 70.7% | 71.7% |
| Middle | 54533 | 39.8% | 87.6% | 87.3% | 87.8% | 74.5% | 74.1% | 74.9% |
| High | 43341 | 31.7% | 89.1% | 88.8% | 89.4% | 77.1% | 76.6% | 77.5% |
| Year of surgery[5 10] | | | | | | | | |
| 2004 | 10409 | 7.6% | 84.3% | 83.6% | 85.0% | 69.7% | 68.8% | 70.5% |
| 2005 | 11340 | 8.3% | 85.9% | 85.3% | 86.5% | 71.7% | 70.9% | 72.5% |
| 2006 | 11676 | 8.5% | 86.3% | 85.7% | 86.9% | 73.0% | 72.2% | 73.8% |
| 2007 | 12235 | 8.9% | 86.7% | 86.1% | 87.3% | 73.4% | 72.6% | 74.2% |
| 2008 | 12200 | 8.9% | 86.9% | 86.3% | 87.5% | 73.9% | 73.1% | 74.7% |
| 2009 | 12712 | 9.3% | 87.9% | 87.3% | 88.4% | 74.5% | 73.8% | 75.3% |
| 2010 | 12585 | 9.2% | 88.2% | 87.6% | 88.7% | 75.8% | 75.0% | 76.5% |
| 2011 | 13175 | 9.6% | 89.0% | 88.4% | 89.5% | | | |
| 2012 | 13355 | 9.8% | 89.1% | 88.6% | 89.6% | | | |
| 2013 | 13576 | 9.9% | 89.1% | 88.6% | 89.6% | | | |
| 2014 | 13568 | 9.9% | 89.5% | 88.9% | 90.0% | | | |
| **Morphology**[5 10] | | | | | | | | |
| Invasive ductal | 103537 | 75.6% | 87.8% | 87.6% | 88.0% | 75.0% | 74.7% | 75.3% |
| Invasive lobular | 15018 | 11.0% | 87.2% | 86.7% | 87.7% | 70.8% | 70.0% | 71.6% |
| Other | 18403 | 13.4% | 87.3% | 86.8% | 87.8% | 73.8% | 73.1% | 74.5% |
| **Surgical procedure**[5 10] | | | | | | | | |
| Lumpectomy | 81714 | 59.7% | 92.3% | 92.1% | 92.5% | 81.8% | 81.5% | 82.1% |
| Mastectomy | 55033 | 40.2% | 80.7% | 80.3% | 81.0% | 63.5% | 63.0% | 63.9% |
| Other | 211 | 0.2% | 89.5% | 84.5% | 93.0% | 80.5% | 74.2% | 85.4% |
| **TNM Stage**[5 10] | | | | | | | | |
| 1 | 65333 | 47.7% | 93.0% | 92.8% | 93.2% | 81.9% | 81.6% | 82.2% |
| 2 | 53495 | 39.1% | 86.4% | 86.1% | 86.7% | 72.3% | 71.9% | 72.7% |
| 3 | 17899 | 13.1% | 72.0% | 71.3% | 72.6% | 53.8% | 53.0% | 54.6% |
| Unknown | 230 | 0.2% | 87.4% | 82.4% | 91.1% | 75.7% | 69.1% | 81.1% |

**Table 1:** Patient characteristics and overall survival of the first invasive breast cancer surgery (**continued**)

| | Baseline | | 5-year overall survival (*N*=136 958) | | | 10-year overall survival (*N*=52513) | | |
|---|---|---|---|---|---|---|---|---|
| | N | % | % | CI L | CI U | % | CI L | CI U |
| **Grade**[5 10] | | | | | | | | |
| I | 29971 | 21.9% | 92.6% | 92.3% | 92.9% | 80.8% | 80.3% | 81.3% |
| II | 56832 | 41.6% | 89.4% | 89.2% | 89.7% | 75.2% | 74.8% | 75.6% |
| III or undifferentiated | 37811 | 27.6% | 81.8% | 81.4% | 82.1% | 68.9% | 68.4% | 69.4% |
| Unknown | 12344 | 9.0% | 85.1% | 84.5% | 85.8% | 71.9% | 71.0% | 72.8% |
| **ER/PR** [5 10] | | | | | | | | |
| -/- | 21428 | 16.6% | 77.6% | 77.0% | 78.1% | 67.6% | 66.9% | 68.2% |
| -/+ | 1026 | 0.8% | 82.7% | 80.2% | 84.9% | 72.8% | 69.9% | 75.5% |
| +/- | 20993 | 16.2% | 86.0% | 85.5% | 86.5% | 70.3% | 69.6% | 71.0% |
| +/+ | 85958 | 66.4% | 90.7% | 90.5% | 90.9% | 77.3% | 77.0% | 77.6% |
| **Radiotherapy** [5 10] | | | | | | | | |
| No | 45997 | 33.6% | 82.6% | 82.3% | 83.0% | 66.3% | 65.8% | 66.7% |
| Yes | 90961 | 66.4% | 90.2% | 90.0% | 90.4% | 78.6% | 78.3% | 78.9% |
| **Chemotherapy**[5 10] | | | | | | | | |
| No | 90193 | 65.9% | 85.7% | 85.5% | 86.0% | 70.1% | 69.8% | 70.4% |
| Yes | 46765 | 34.2% | 91.3% | 91.0% | 91.6% | 82.5% | 82.2% | 82.9% |
| **Hormone therapy**[5 10] | | | | | | | | |
| No | 66198 | 48.3% | 86.6% | 86.4% | 86.9% | 75.1% | 74.8% | 75.5% |
| Yes | 70760 | 51.7% | 88.6% | 88.3% | 88.8% | 73.6% | 73.2% | 74.0% |
| **Neo-adjuvant chemotherapy**[5 10] | | | | | | | | |
| No | 127,141 | 92,8% | 88,0% | 87,9% | 88,2% | 74,7% | 74,4& | 74,9% |
| Yes | 9817 | 7,17% | 82,5% | 81,7% | 83,2% | 70,8% | 69,7% | 71,8% |
| **Hospital type** [5 10] | | | | | | | | |
| General | 68217 | 49.7% | 87.4% | 87.2% | 87.7% | 74.2% | 73.8% | 74.6% |
| Tertiary/University | 68992 | 50.3% | 87.8% | 87.6% | 88.1% | 74.6% | 74.2% | 74.9% |
| **Annual hospital volume**[5 10] **(three-year rolling average)** | | | | | | | | |
| Less than 75 | 10099 | 7.4% | 85.8% | 85.1% | 86.4% | 72.0% | 71.1% | 73.0% |
| 75-99 | 17309 | 12.7% | 86.9% | 86.4% | 87.4% | 73.2% | 72.5% | 73.9% |
| 100-149 | 37997 | 27.8% | 87.2% | 86.9% | 87.6% | 74.0% | 73.6% | 74.5% |
| 150-199 | 27329 | 20.0% | 87.9% | 87.5% | 88.3% | 74.5% | 73.9% | 75.0% |
| 200-249 | 25775 | 18.8% | 88.1% | 87.7% | 88.4% | 74.8% | 74.2% | 75.4% |
| 250 or more | 18322 | 13.4% | 89.2% | 88.7% | 89.6% | 77.5% | 76.7% | 78.2% |

**Table 1:** Patient characteristics and overall survival of the first invasive breast cancer surgery (**continued**)

| | Baseline | | 5-year overall survival (*N*=136 958) | | | 10-year overall survival (*N*=52513) | | |
|---|---|---|---|---|---|---|---|---|
| | N | % | % | CI L | CI U | % | CI L | CI U |
| **Number of hospitals in the proximity of hospital *i* within 30km radius** | | | | | | | | |
| 3 or less (no or weak competition) | 68197 | 50.0% | 87.4% | 87.2% | 87.7% | 74.1% | 73.7% | 74.4% |
| 4 or more (strong competition) | 68306 | 50.0% | 87.9% | 87.6% | 88.1% | 74.7% | 74.4% | 75.1% |

[5] *p<0,05, uncorrected significant differences in 5-year survival rates based on confidence intervals*
[10] *p<0,05, uncorrected significant differences in 10-year survival rates based on confidence intervals*

**Table 2:** hospital level characteristics for start (2004), middle (2009) and end (2014) of the study period

| | 2004 | | 2009 | | 2014 | |
|---|---|---|---|---|---|---|
| | N | % | N | % | N | % |
| **Annual hospital volume (absolute)** | | | | | | |
| Less than 75 | 26 | 27.1% | 16 | 17.6% | 9 | 11.0% |
| 75-99 | 25 | 26.0% | 15 | 16.5% | 7 | 8.5% |
| 100-149 | 29 | 30.2% | 29 | 31.9% | 28 | 34.2% |
| 150-199 | 8 | 8.3% | 12 | 13.2% | 16 | 19.5% |
| 200-249 | 7 | 7.3% | 12 | 13.2% | 8 | 9.8% |
| 250 or more | 1 | 1.0% | 7 | 7.7% | 14 | 17.1% |
| **Number of hospitals in the proximity of hospital *i* within 30km radius** | | | | | | |
| 3 or less | 48 | 50.0% | 46 | 51.1% | 42 | 51.2% |
| 4 or more | 48 | 50.0% | 44 | 48.9% | 40 | 48.8% |
| **Hospital type** | | | | | | |
| General | 61 | 63.5% | 55 | 60.4% | 48 | 58.5% |
| Tertiary/University | 35 | 36.5% | 36 | 39.6% | 34 | 41.5% |

| | Median | IQR | Median | IQR | Median | IQR |
|---|---|---|---|---|---|---|
| Annual hospital volume (absolute) | 118 | 84-173 | 170 | 117-230 | 191 | 234-272 |
| Number of hospitals in the proximity of hospital *i* within 30km radius | 4 | 2-10 | 3 | 2-11 | 3 | 2-8 |

annually increased, whereas the proportion of hospitals performing less than 100 sharply decreased. An overall volume growth can also be derived from the median annual hospital, which increased from 118 in 2004 to 191 in 2014. At the start of the study period, the number of hospitals having three or less hospitals within a 30km radius were equal to the number of hospitals having four or more proximate hospitals.

## Multivariate analyses

For the multivariate analysis, male patients (N=859, <1%), patients with an unregistered surgery type (N=200, <1%), and patients who had an unknown TNM stage (N=230, <1%) were excluded. As a result, the final 11-year study cohort comprised 135,179 patients. Multivariate logistic regression results shown in Table 3 indicate that surgical margins for patients who underwent a lumpectomy were mainly influenced by tumor-specific variables (left columns). Positive margins were significantly more often reported for invasive lobular carcinoma and for TNM stage 2 and 3. Differences in hospital volume or the number of proximate hospitals were not associated with significantly higher or lower probabilities for positive margins.

**Table 3:** Multivariate logistic regression with surgical margins status (2011-2014, N=31 593) and 90-days re-excision (2009-2014, N=77 965) as dependent variables

| | **Surgical margins (0=Margins free, 1=Focally positive** | | **90 days re-excision rate (0=No re-excision, 1=re-excision)** | |
|---|---|---|---|---|
| | *OR* | *CI* | *OR* | *CI* |
| **Annual hospital volume** | | | | |
| <75 | 0.815 | 0.607 - 1.094 | 1.060 | 0.818 - 1.374 |
| 75-99 | 0.874 | 0.740 - 1.033 | 1.026 | 0.870 - 1.211 |
| 100-149 | 1 | | 1 | |
| 150-199 | 0.847 | 0.656 - 1.094 | 0.864 | 0.688 - 1.086 |
| 200-249 | 0.869 | 0.674 - 1.119 | 0.857 | 0.708 - 1.038 |
| 250 or more | 0.847 | 0.626 - 1.146 | 0.807 | 0.601 - 1.083 |
| **Number of other hospitals in the proximity of hospital *i* in 30km radius** | | | | |
| 0-3 | 1 | | 1 | |
| 4 or more | 0.945 | 0.806 - 1.110 | 0.875 | 0.755 - 1.013 |
| **Age at diagnosis** | | | | |
| 15-29 | 1 | | 1 | |
| 30-44 | 1.943 | 0.923 - 4.089 | 0.927 | 0.545 - 1.579 |
| 45-59 | 1.920 | 0.886 - 4.161 | 0.764 | 0.453 - 1.286 |
| 60-74 | 1.768 | 0.804 - 3.891 | 0.605 | 0.361 - 1.013 |
| 75+ | 1.907 | 0.868 - 4.192 | 0.547* | 0.319 - 0.937 |
| **Socioeconomic status** | | | | |
| Low | 1 | | 1 | |
| Middle | 0.947 | 0.838 - 1.069 | 0.992 | 0.901 - 1.091 |
| High | 0.989 | 0.858 - 1.141 | 1.081 | 0.965 - 1.211 |
| **Surgical procedure** | | | | |
| Lumpectomy | N/A | | 1 | |
| Mastectomy | N/A | | 0.033** | 0.0236 - 0.0447 |

**Table 3:** Multivariate logistic regression with surgical margins status (2011-2014, N=31 593) and 90-days re-excision (2009-2014, N=77 965) as dependent variables (*continued*)

| | **Surgical margins (0=Margins free, 1=Focally positive** | | **90 days re-excision rate (0=No re-excision, 1=re-excision)** | |
|---|---|---|---|---|
| | *OR* | *CI* | *OR* | *CI* |
| **Morphology** | | | | |
| Ductal | 1 | | 1 | |
| Lobular | 2.941** | 2.637 - 3.281 | 2.161** | 1.959 - 2.383 |
| Other | 1.405** | 1.248 - 1.582 | 1.579** | 1.452 - 1.717 |
| **TNM Stage** | | | | |
| 1 | 1 | | 1 | |
| 2 | 2.216** | 2.019 - 2.433 | 1.552** | 1.441 - 1.672 |
| 3 | 5.016** | 4.245 - 5.927 | 2.837** | 2.454 - 3.279 |
| **Tumor grade** | | | | |
| I | 1 | | 1 | |
| II | 1.173** | 1.061 - 1.297 | 1.318** | 1.205 - 1.442 |
| III or undifferentiated | 0.928 | 0.838 - 1.027 | 1.159* | 1.030 - 1.303 |
| Unknown | 1.108 | 0.923 - 1.331 | 1.361** | 1.128 - 1.642 |
| **Hospital type** | | | | |
| General | 1 | | 1 | |
| Tertiary/University | 1.131 | 0.919 - 1.392 | 1.163 | 0.985 - 1.374 |

*Also corrected for year of surgery*
**p<0,05, **p<0,01*
*Adjusted explained variance: surgical margins: 6%, 90 days re-excision: 14%*
*Surgical margins were only calculated for patients who underwent a lumpectomy. Therefore, the variable 'surgical procedure' has been excluded from this analysis.*

Hospital volume was associated with reduced re-excision rates within 90-days after surgery (Table 3, right column). Patients who underwent surgery in a hospital performing 200-249 surgeries (OR 0.86) or 250 or more (OR 0.81) had lower re-excision rates compared to patients who underwent surgery in a hospital with 100-149 surgeries. Patients treated in hospitals performing 100 or less surgeries reported higher re-excision rates. These associations were not significant after clustering for intra-hospital correlation. Patients who underwent a mastectomy during primary surgery seldom had a re-excision (OR 0.03). A significantly higher probability of re-excision was found for patients with a high socio-economic status, patients who were diagnosed with an invasive lobular tumor and patients with TNM stage 2. Finally, a substantial and significant lower rate of re-excision was reported for patients with the age of 75 years and older.

The median follow-up for the cohort was 8.7 years. When studying the entire population in a multilevel model, survival was significantly higher when patients had surgery in a hospital with a three-year rolling average of 250 or more surgical procedures, compared to 100-149 annual surgeries (HR 0.94) (see Table 4). For patients who had surgery in a hospital with four or more proximate hospitals, i.e., in a hospital facing stronger competition, survival was slightly higher compared to patients who had surgery in a hospital with none to three proximate hospitals (HR 0.97). After adjusting for comorbidity status as a sensitivity check, the relationship between hospital volume and survival weakened and did not remain significant for the largest volume group. However, the distribution of low-volume and high-volume hospitals substantially differed between the entire population and this substantially smaller, and regionally biased, subsample for which comorbidity status was available. When treating hospital volume and hospital competition as a continuous variable scaled for interquartile range, the direction of the relationship did not alter and remained significant (see Table 4, model B). Moreover, effect sizes and significance of the controls did not alter compared to model A.

Larger differences in survival became visible when inspecting patient, tumor and treatment related variables. Higher age, a lower socio-economic status, a diagnosis of an invasive ductal tumor, higher TNM stage or higher tumor grade were all associated with reduced survival. From the sensitivity check where comorbidities were taken into account, it followed that having one or more comorbidities was independently associated with significantly reduced survival (HR 1.54, data not shown in table).

Several sensitivity checks were performed to assess the robustness of our findings for hospital volume and hospital competition (See Table 5). For this purpose, we used continuous variables for hospital volume and hospital competition instead of categorized variables. Based on these sensitivity analyses, it can be concluded that the direction and significance of the relationships presented in Table 3 and 4 did not change. Furthermore, the checks confirmed the small volume effect for both the scaled and uncorrected variables for three-year rolling average and absolute hospital volume. For the significant coefficients, effect sizes were somewhat larger for scaled variables, but overall, very small. In the analyses with surgical margins and 90-days re-excision rates as patient outcomes, the use of continuous variables for hospital volume did not yield to significant findings, in line with Table 3.

Lastly, when using alternative categories for measuring regional hospital competition, we found a significant association with survival for two or less versus three or more hospitals, while zero versus one or more hospitals was not significant. Changing the 30km radius to a 20 km radius resulted in a small but significant improved survival effect for hospitals with four or more competitors, while an effect was absent when using 40 km radius.

**Table 4:** Multilevel Cox survival regression model with hospital and year of surgery random effects (hospital volume and hospital competition as categorized variables (a) and continuous scaled variables for Interquartile range (95% confidence intervals; N=127 886)

| | **Model A: survival model with categorized variables for hospital volume and competition** | | **Model B: survival model with continuous IQR scaled variables for hospital volume and competition** | |
|---|---|---|---|---|
| | *HR* | *CI* | *HR* | *CI* |
| **Annual hospital volume** | | | | |
| <75 | 1.016 | 0.970-1.064 | | |
| 75-99 | 0.991 | 0.953-1.032 | | |
| 100-149 | 1 | | | |
| 150-199 | 0.958* | 0.922-0.994 | | |
| 200-249 | 0.976 | 0.938-1.016 | | |
| 250 or more | 0.941* | 0.897-0.987 | | |
| Continuous (scaled for interquartile range) | - | | 0.968** | 0.948-0.989 |
| **Number of other hospitals in the proximity of hospital *i* in 30km radius** | | | | |
| 0-3 | 1 | | | |
| 4 or more | 0.973* | 0.949-0.999 | | |
| Continuous (scaled for interquartile range) | | | 0.972* | 0.950-0.994 |
| **Age at diagnosis** | | | | |
| 15-29 | 1 | | | |
| 30-44 | 1.105 | 0.907-1.349 | 1.104 | 0.905-1.347 |
| 45-59 | 1.30* | 1.065-1.577 | 1.229 | 1.063-1.574 |
| 60-74 | 2.731** | 2.245-3.321 | 2.725** | 2.241-3.315 |
| 75+ | 8.858** | 7.282-10.774 | 8.838** | 7.266-10.750 |
| **Socioeconomic status** | | | | |
| Low | 1 | | 1 | |
| Middle | 0.924 | 0.901-0.949 | 0.924** | 0.900-0.948 |
| High | 0.869 | 0.845-0.895 | 0.869** | 0.844-0.894 |
| **Surgical procedure** | | | | |
| Lumpectomy | 1 | | 1 | |
| Mastectomy | 1.411** | 1.377-1.445 | 1.411** | 1.377-1/445 |
| **Morphology** | | | | |
| Ductal | 1 | | 1 | |
| Lobular | 1.000 | 0.967-1.035 | 1.000 | 0.9665-1.035 |
| Other | 0.942** | 0.913-0.973 | 0.943** | 0.913-0.974 |
| **TNM Stage** | | | | |
| 1 | 1 | | | |
| 2 | 1.277** | 1.243-1.311 | 1.276** | 1.243-1.310 |
| 3 | 2.400** | 2.322-2.480 | 2.398** | 2.321-2.479 |

**Table 4:** Multilevel Cox survival regression model with hospital and year of surgery random effects (hospital volume and hospital competition as categorized variables (a) and continuous scaled variables for Inter-quartile range (95% confidence intervals; N=127 886) (*continued*)

| | **Model A: survival model with categorized variables for hospital volume and competition** | | **Model B: survival model with continuous IQR scaled variables for hospital volume and competition** | |
|---|---|---|---|---|
| | *HR* | *CI* | *HR* | *CI* |
| **Tumor grade** | | | | |
| I | 1 | | | |
| II | 1.092** | 1.058-1.128 | 1.093** | 1.060-1.129 |
| III or undifferentiated | 1.332** | 1.285-1.381 | 1.334** | 1.287-1.383 |
| Unknown | 1.118** | 1.062-1.177 | 1.118** | 1.063-1.177 |
| **Hospital type** | | | | |
| General | 1 | | 1 | |
| Tertiary/University | 1.044** | 1.014-1.074 | 1.046** | 1.018-1.076 |
| **Neo-adjuvant chemotherapy** | | | | |
| No | 1 | | 1 | |
| Yes | 1.319** | 1.253-1.389 | 1.321** | 1.255-1.391 |
| **ER/PR Receptor status** | | | | |
| -/- | 1 | | 1 | |
| -/+ | 0.859** | 0.765-0.965 | 0.858** | 0.765-0.964 |
| +/- | 0.832** | 0.802-0.862 | 0.832** | 0.802-0.862 |
| +/+ | 0.702** | 0.680-0.723 | 0.702** | 0.680-0.723 |

*Also corrected for year of surgery*
**p<0,05, **p<0,01*

**Table 5:** Sensitivity checks for surgical margins, 90 days re-excision and overall survival

| | **Surgical margins[a] (0=Margins free. 1=Focally positive** | | **90 days re-excision[b] (0=No re-excision. 1=re-excision)** | | **Overall survival[c]** | |
|---|---|---|---|---|---|---|
| | OR | *p* | OR | *p* | HR | *p* |
| Hospital volume (*rolling average as continuous variable*) | 0.99 | 0.60 | 0.99 | 0.09 | 0.99 | 0.00** |
| Number of other hospitals in the proximity of hospital *I* in 30km radius (*continuous variable*) | 0.99 | 0.72 | 0.98 | 0.03* | 0.99 | 0.01* |
| Hospital volume (absolute volume as continuous variable) | 0.99 | 0.61 | 0.99 | 0.07 | 0.99 | 0.00** |
| Number of other hospitals in the proximity of hospital *I* in 30km radius (*continuous variable*) | 0.99 | 0.72 | 0.98 | 0.03* | 0.99 | 0.01* |
| Hospital volume (*rolling average as continuous variable, scaled by interquartile range*) | 0.96 | 0.57 | 0.89 | 0.07 | 0.97 | 0.00** |
| Number of other hospitals in the proximity of hospital *I* in 30km radius (*continuous variable. scaled by interquartile range*) | 0.98 | 0.71 | 0.87 | 0.03* | 0.97 | 0.01* |
| Hospital volume (*absolute volume as continuous variable, scaled by interquartile range*) | 0.96 | 0.62 | 0.89 | 0.07 | 0.97 | 0.00** |
| Number of other hospitals in the proximity of hospital *I* in 30km radius (*continuous variable. scaled by interquartile range*) | 0.98 | 0.72 | 0.87 | 0.03* | 0.97 | 0.01* |
| Hospital volume (*rolling average as continuous variable, scaled by interquartile range*) | 0.95 | 0.55 | 0.89 | 0.08 | 0.97 | 0.00** |
| Number of other hospitals in the proximity of hospital *I* in 20km radius (*continuous variable. scaled by interquartile range*) | 0.95 | 0.45 | 0.88 | 0.08 | 0.97 | 0.00** |
| Hospital volume (*rolling average as continuous variable, scaled by interquartile range*) | 0.96 | 0.58 | 0.89 | 0.07 | 0.97 | 0.00** |
| Number of other hospitals in the proximity of hospital *I* in 40km radius (*continuous variable. scaled by interquartile range*) | 0.99 | 0.98 | 0.87 | 0.05 | 0.97 | 0.02* |

[a] *Logistic regression with clustered standard errors. Corrected for age, socio-economic status, morphology, TNM stage, tumor grade, hospital type, year of surgery*

[b] *Logistic regression with clustered standard errors. Corrected for age, socio-economic status, surgical procedure morphology, TNM Stage, tumor grade, hospital type, year of surgery*

[c] *Multilevel Cox Proportional Hazards model with hospital and year of surgery random effects, corrected for age, socio-economic status, surgical procedure, morphology, TNM Stage, tumor grade, hormone status, neo-adjuvant chemotherapy, hospital type, year of surgery*

**p<0.05; **p<0.01*

# 5. DISCUSSION

The optimal design of oncological care provision in hospital markets requires taking into account both hospital and system level factors. Our study aims to examine the relation between hospital surgical volume on the hospital level and the intensity of regional hospital competition on the system level. Both assessed in relation to three different types of patient outcomes (surgical margins, re-excision, and survival). After adjusting for confounders and intra-hospital correlation, hospital volume and competition from neighboring hospitals did not explain differences in surgical margins and re-excision rates, although re-excision rates were lower for higher volume groups. Surgery in higher volume hospitals with on average 150-200 or 250 or more surgeries per year was associated with prolonged survival. This positive relationship was also visible when treating hospital volume as a continuous variable. However, differences were small, and the effect weakened after correction for comorbidity status which was available for 25% of the population. For the effect of hospital competition, it was found that patient survival was higher in hospitals with four or more (potential) competitors within a 30-kilometer distance. However, this effect was small and not robust for changes in our proxy for hospital competition. Treatment type, patient and tumor-level characteristics explained most variation in outcomes after correction for confounding variables.

Overall, our findings for hospital volume are in accordance with earlier Dutch studies using comparable endpoints (Siesling et al., 2014; Van Der Heiden-Van Der Loo et al., 2012). Furthermore, the relatively high volume threshold for effects on patient outcomes found in our study mirror the high cut-off points found in international research (Chen et al., 2008; Greenup et al., 2018). Three developments in the Dutch setting might explain the limited influence of hospital volume. First, the ongoing implementation of pre- and post-operative multidisciplinary meetings, intensified regional collaboration and introduction of oncological care pathways and a strict quality assurance system may have reduced variation in care between hospitals (Schreuder et al., 2017; Van Bommel et al., 2017; Van Hoeve et al., 2014). Second, the share of low-volume hospitals during the study period was relatively low due to the elapsed time since the introduction of volume standard, as is also observed in other countries (Morche et al., 2018). Three, hospital volume may not accurately reflect other attributes such as the level of specialization or the use of novel treatments.

With regards to hospital competition, there are at least two plausible theoretical explanations for the absence of a robust relationship with patient outcomes. First, the role of competition among hospitals in breast cancer care is limited through the rare use of selective contracting by health purchasers in the Netherlands (Ineveld et al., 2018). Additionally, hospital competition in this market does also not seem to be strengthened by active patient choice (Geraedts et al., 2018). Recent research suggested that most

breast cancer patients agreed on being referred to the nearest hospital by their general partitioner (Menting et al., 2020). Second, as competition and collaboration often co-exists in health systems, the competition-effect might be mitigated by an unobserved collaboration-effect or network-effect since neighboring hospitals might work closely together within a regional network rather than compete with each other (Mascia et al., 2012).

## Strengths and limitations

The key strengths of this study are its long follow-up, nationwide inclusion of all hospitals and patients and the use of a multilevel survival analysis. Also, the use of rolling average instead of hospital volume or each separate year enabled us to encompass the weighted scale effects in the two years before the surgery and has the benefit of smoothening potential non-recurring changes in hospital volume. In practice, minimum volume standards are often calculated based on the three year average (SONCOS, 2020). Furthermore, the additional operationalization of hospital volume as a continuous variable next to the discrete categorization facilitates comparability with other studies.

Our study suffers from at least five limitations. First, due to retrospective character there is some inconsistency with contemporary practice, such as collaboration and division of tasks in networks, as well as developments of quality indicators, such as the shift towards patient reported outcomes and quality of life measures (Van Bommel et al., 2017). Second, we were not able to account for the role of physician, patient and/or shared decision making on treatment options. This may affect hospital variation but does not necessarily imply differences in quality of care. Third, due to absence of data, it was not possible to calculate the follow-up from date of surgical procedure. Alternatively, we calculated survival from the date of diagnosis, which may have resulted in a small overestimation of length of survival, as all patients underwent a surgical procedure and thus survived up and until the date of surgery. However, it is not likely that this has resulted in a large source of bias, as the vast majority of patients in the Netherlands has been operated within five weeks of diagnosis (Vos et al., 2020). Fourth, although commonly used, our measure for hospital competition is rather crude and may therefore not accurately reflect all competitive pressures faced by hospitals. Fifth, it was not possible to assess surgical margins, re-excision rates and the influence of comorbidity for the entire study cohort, since retrospective data was not fully available.

## Implications

Overall, based on our selection of patient outcomes, hospital volume and regional competition appear to play only a limited role in the explanation of variation in IBC outcomes across Dutch hospitals. Hence, from a health policy perspective, based on our selection of outcomes, the present study provides no reasons to adjust volume standards

or stimulate generic policy aimed at further centralization of IBC surgical procedures. Although this study did not provide insight into the underlying mechanisms for quality improvement, it attempted to contribute to the longstanding volume-outcome debate in oncological care by including the influence of neighboring hospitals.

From a methodological perspective, our study contributes to insight into the actionability of using patient outcomes as quality indicators. Although the conjoint use of three endpoints to assess hospital variation might be beneficial, the interpretation of the available patient outcomes in our study is accompanied with sensitivity problems and definition ambiguity (Michal-Teitelbaum, 2015; Tamburelli et al., 2020; Vos et al., 2020). Hence, it emphasizes the need for routinely collected outcome measures for high-volume tumors to adequately assess quality variation based. In our opinion, besides validity and reliability at least two cumulative conditions then need to be fulfilled. First, indicators should have explanatory power for both patients (to select their preferred hospital, as patients prefer to choose based on outcome information (Salampessy et al., 2019), physicians (to disseminate effective feedback information and improve guidelines) and policymakers as well as third-party payers (to benchmark, monitor and potentially select hospitals). There should thus be a multidisciplinary consensus about breast cancer care quality. Second, the collection and presentation of indicators should ideally be consistent over time and have an adequate coverage of hospitals across the health system to facilitate benchmarking and longitudinal research.

For future research, aimed at better understanding the interaction between hospital volume, competition across hospitals and quality for high-volume tumors, it is recommended to (i) assess the entire multidisciplinary process of care within the hospital, as well as care provided by other hospitals or providers in cancer networks, (ii) include a qualitative approach to take patient' and physician decision-making on treatment choices into account, and (iii) include more sophisticated measures for hospital competition, such as Willingness-to-Pay (WTP) or the Logit Competition Index (LOCI) (Berden et al., 2019), while taking account into collaboration in hospital networks.

# Chapter 6

*St Antonius, hospital Nieuwegein*


ZIEKENHUIS
St. antonius

# Collaboration and competition policy in a market-based hospital system: a case study from the Netherlands

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*Journal of Competition Law and Economics*

# ABSTRACT

In the Dutch healthcare system, provider competition is used as a tool to improve efficiency. From a competition policy perspective, little is known about how collaboration among healthcare providers contributes to overall patient welfare, and how a balance is achieved between scale benefits and preventing anti-competitive collusion. This paper examines the ex-post effects of a Dutch case study in which three competing hospitals have collaborated to provide high-complexity low-volume cancer surgery, an arrangement that tests the limits of permissibility under the Dutch cartel prohibition. Our preliminary empirical research demonstrated only a modest increase in price and travel time for some of the tumor surgeries. Volume analysis showed that the intended centralization of surgical procedures has not been fully realized. Our findings highlight the importance of a comprehensive self-assessment by the collaborating hospitals to ex-ante assess (potential) efficiencies and antitrust risks. Such self-assessments could benefit from research focused on which collaborations are most appropriate to achieve quality gains. For the ex-post assessment by competition authorities following the cartel prohibition, a more thorough insight into the (long-term) changes in hospital prices, profitability, and quality after collaboration is needed.

# 1. INTRODUCTION

## Background

When hospital competition is used as a tool for improving the efficiency of healthcare (Barros et al., 2016) an interesting challenge arises from the perspective of competition law and economics: i.e. how to deal with the pros & cons of horizontal consolidation and coordination between (potential) competitors?[22] To date, in the literature most attention is being paid to the ex-ante scrutiny and ex-post effects of hospital consolidation. Empirical evidence so far demonstrates that hospital mergers often do not lower costs and/or improve quality (Broers & Kemp, 2017; Cooper et al., 2019; Gaynor et al., 2015). In a recent study, including 246 acquired hospitals and 1986 control hospitals that did not merge, Beaulieu et al. (2020) find that in the US hospital market concentration did not result in significantly lower readmission or mortality rates while it was associated with a modestly worsening in patient experiences (Beaulieu et al., 2020)

Despite their growing importance, IOCs among hospitals have not been the subject of the same degree of scrutiny and scientific research compared to mergers. Collaboration can be understood as intermediate or hybrid (network) forms of coordination in which the hospital' autonomy is retained. A prominent example of collaboration between hospitals is a clinical care network (Brown et al., 2016; De Regge et al., 2019). Quality considerations – often operationalized as minimum volume standards – are increasingly incentivizing hospitals to coordinate and/or centralizeBravo1995!!00 their delivery of (complex) treatments in these networks. This is especially true for complex surgical procedures, since volume norms have been introduced that require hospitals to perform a minimum number of surgeries for some treatments (Morche et al., 2018). In general, these norms are prompted by the volume-outcome relationship, i.e., performing a treatment more often results in higher quality. This relationship is confirmed in literature, especially for complex surgical procedures (Gaynor et al., 2005; Burgers et al., 2007; Ho et al., 2007; Rademakers et al., 2012; Gooiker et al., 2014).

In this chapter we study collaboration among hospitals within the market-based Dutch hospital system, where the general prohibition on cartels applies. Therefore, in the Netherlands all arrangements among hospitals are subject to scrutiny under competition law. The increased use of IOCs in hospital markets presents competition authorities with a difficult dilemma (Broers and Kemp, 2017): how to achieve a balance between the potential scale benefits of collaboration while at the same time safeguarding sufficient competition and preventing anti-competitive collusion. Moreover, such cases are highly complex for competition authorities to assess, since a thorough antitrust assessment requires all patient welfare implications to be considered, including effects on quality, price and accessibility. In the international literature, Ho *et al*., (2007) were the first to

22 See for example (Baicker & Levy, 2013)

incorporate both quality, price and travel time effects into a single analysis in order to assess the effects of the centralization of care. However, the existing literature currently lacks both integrated ex-ante and ex-post evaluation studies of horizontal collaboration between hospitals. This case study on collaboration in the Dutch hospital market provides an interesting opportunity in this context.

The case study involves plans drawn up by three hospitals to collaborate intensively through a Comprehensive Cancer Network involving the provision of high-complexity low-volume surgical procedures. The case was informally approved by the Dutch competition authority (ACM) by means of an extensively described informal opinion (See Box 1). This informal opinion, in combination with three datasets containing confidential data on negotiated hospital prices, patient volumes and patient travel times, allowed us to analyze market outcomes shortly after implementation. As price and travel time received less attention in the ex-ante informal opinion, most emphasis will be placed on these elements of collaboration that potentially reduce patient welfare. The assessment of the quality effects (efficiencies) will be based on volume analysis, complemented with a brief review of the contemporary literature.

The evaluation of the case study is relevant on three points. First, our study provides insight into the challenges faced by hospitals aiming to improve the quality of care through collaboration, as well as the competition authority who is responsible for preventing anti-competitive collusion. Second, in contrast to the more extensive body of research that is available on hospital mergers, little is known about outcomes of hospital collaboration in terms of price, quality and accessibility. This is an omission, because 'collaboration-without-merging' in networks is likely to play an increasingly important role in international hospital markets under the influence of volume norms, costs containment and a stricter approach by competition authorities towards hospital mergers. Third, we demonstrate the possibilities and (data) restrictions in assessing ex-post patient welfare effects of hospital collaboration.

This chapter is structured as follows. After the case description (Box 1), the first section briefly outlines the Dutch healthcare system and the role of competition policy within it. In the second section, we will reflect on the (potential) impact on prices, patient travel times[23] and quality. Preliminary empirical evidence on price and travel time effects is presented for this purpose. The chapter ends with the discussion and conclusion sections. Appendix 1 concerns an extensive case description, while Appendix 2 provides a detailed description of our calculation of the preliminary price effects of the hospital collaboration studied here.

23 Please note that the impact on travel time is included here because patients, although generally willing to travel beyond their nearest provider for better care (Aggarwal, Lewis, Mason, Sullivan, et al., 2017), prefer hospitals close to their homes. Loosing access to a hospital nearby for a particular service due to centralization may therefore result in lower patient welfare. Additionally, increased travel times for cancer care could reduce treatment uptake for specific patient groups (Parry et al., 2019)

**Box 1:** Case description[23, 24, 25]

This study is based on ACM's informal opinion of the collaboration between three hospitals located in or near the city of Utrecht, the fourth largest city in the Netherlands (See Figure 1). An informal opinion is a non-binding informal decision from the ACM on whether a proposed form of collaboration is presumed to be permissible under the Competition Act, with the aim to provide guidance.[24] The major reason for collaboration mentioned by the hospitals was to meet the minimum volume standards for complex cancer surgery, which are set at twenty procedures per hospital per year, averaged over three years.[25] In the years 2011-2014, the Antonius Hospital missed or only just met the volume standards for esophageal, pancreatic and stomach cancer. The same was true for UMCU and MMC, concerning the volume norms for stomach cancer. Among other changes, under the proposed collaboration St. Antonius hospital would perform surgical procedures for pancreatic cancer and minor liver tumors, UMCU hospital would perform surgical procedures for esophageal cancer and major liver tumors and MMC hospital would perform surgical procedures for stomach cancer and minor liver tumors.[26] ACM informally approved the proposed collaboration between the three hospitals in December 2015, after which the collaboration came into effect. The ACM assessed the likely improvement in quality of the complex oncological surgery and the retention of complex surgical procedures in the Utrecht region as beneficial for patients. These positive effects of the collaboration were likely to outweigh potential anti-competitive effects such as reduced freedom of choice and potential price increases. The reduction in competition following the collaboration, argued the ACM, would be permissible since the efficiencies would also benefit patients, as is required in the exemption criteria of Article 6 (3) of the Competition Act. Another important point for informal approval was the broad support for the collaboration expressed by both the relevant health insurers in the region and the client councils of the three hospitals. In the realized situation, depending on the geographical market definition, the fascia count in the province of Utrecht decreases from three hospitals to one hospital for each of the complex surgical procedures involved. This implies a substantial increase in market share for the only hospital offering the centralized procedures. The nearest alternative hospitals providing cancer surgery, for instance pancreas procedures, are 35, 44 or 64 km away by car (as calculated from UMCU). An extensive overview of the claimed efficiencies by the hospitals and potential competition drawbacks can be found in Appendix 1.

24 The Netherlands has 73 hospital organizations, of which 66 are general hospitals and 7 are university hospitals (NVZ, 2018). In 2017, 27 hospitals performed liver resections, 17 hospitals performed stomach or esophageal surgery and 18 performed pancreas surgery (source: minimumkwaliteitsnormen.nl).

25 As shown by the annual BDO Hospital Benchmark (see https://www.bdo.nl/en-gb/industries/healthcare/benchmarks), none of the three hospitals was in financial distress.

26 For the exemption criteria, See Article 6(3) https://wetten.overheid.nl/BWBR0008691/2019-01-01

**Figure 1.** Map of the Netherlands (left) and the province of Utrecht (right), showing the three collaborating hospitals, and travel times by car between their locations.


## The Dutch healthcare system

*General overview*

In the Netherlands, the healthcare system has undergone major reform in recent decades. Strict government regulation has been replaced by a system based on the concept of managed competition (Enthoven, 1993; Schut and van de Ven, 2011). A significant date in this process was 1 January 2006, from which point on the Health Insurance Act *(Zvw)* made private health insurance mandatory for all residents of the Netherlands. A few months later, on 1 October 2006, the Health Care Market Regulation Act came into force, stipulating, among other things, the role of the newly established Dutch Healthcare Authority (NZa) as the regulatory and monitoring body for the healthcare market (Maarse et al., 2016). These market-oriented reforms resulted in a healthcare system organized around three interconnected sub-markets in which the health providers, health insurers and patients interact. Health insurers in the Netherlands are expected to act as prudent buyers of healthcare services (Schut & Varkevisser, 2017). To fulfil this role, each health insurer is expected to negotiate with healthcare providers on price, quality and/or volume. Using selective contracting and/or financial incentives for enrollees, health insurers are allowed – and to some extent, expected – to steer patients to those healthcare providers that offer high-quality care for a reasonable price (value for money ratio). Reallocating the provision of complex treatments for the sake of quality can also be regarded as one of the tasks of the health insurers.

*Stimuli for hospital competition*

All Dutch hospitals are private non-profit foundations facing a legally binding non-distribution constraint which prohibits them from distributing any net earnings. Prior to the major health system reform described above, hospitals were financed by a prospective budgeting system with regulated per diem rates. This system resulted in fairly stable revenue flows for all hospitals. However, since 2006 hospitals' revenues depend on their contract negotiations with individual health insurers. These negotiations were facilitated by the introduction of a detailed hospital product classification system categorizing each patient into a Diagnosis Treatment Combination (DTC). These DTCs include all hospital activities and services (both inpatient and outpatient) associated with the patient's demand for care, from the initial consultation or examination to the final check-up. Over time, the number of DTCs for which hospitals and insurers are permitted to negotiate prices (labelled as the B-segment) increased from 10% of hospital revenues at the start, to 20% in 2008, 34% in 2009 and 70% in 2012. For the remainder of the DTCs (labelled as the A-segment), including the most complex ones such as organ transplantations, maximum prices are determined by the NZa. In addition to competing for favorable contracts with health insurers, hospitals also compete directly for patients (Schut and Varkevisser, 2017).[27] Since the introduction of the new Dutch health care system, patients are encouraged to make an active choice between alternative providers. For example, by the provision of consumer information about hospital quality.

*Quality information*

In addition to the supervision on the overall quality by the Health and Youth Care Inspectorate (IGJ) is the public disclosure of quality information considered as an important perquisite for effective hospital competition. Although research suggests the limited role of quality information in selecting healthcare providers by patients (Damman et al., 2009; Faber et al., 2009), steps have been taken in the Netherlands to increase transparency and comparability of these sources. For the surgical procedures for liver, stomach, esophageal, pancreas tumors, hospitals are obliged to provide quality data to the National Health Care Institute annually. These indicators include structure, process and outcome indicators, as for instance the number of patients in a year who underwent surgery, standardized mortality rates, waiting times and length of stay. Besides the National Health Care Institute, overarching professional associations as the Dutch Institute for Clinical Auditing (DICA), also divulge hospital quality indicators for oncological care. However, in The Netherlands the development, selection and presentation of these quality indicators are still work in progress, and both the comparability and accessibility are

27 Except for the university hospitals, most medical specialists in the Netherlands are self-employed entrepreneurs organized in partnerships. These specialists receive a fixed payment for each DTC. Hence, like the hospitals, these specialists have a financial interest in attracting more patients.

still lagging behind (KPMG, 2017). Recent Dutch research on oncological quality indicators highlights that a well-informed hospital selection decision can only be realized with tailored information, preferably outcome indicators, and for a pro-active subset of the population (Salampessy et al., 2019). However, although the publicly available hospital quality ratings are still far from perfect, empirical research indicates that at least to some extent patients — or their GPs offering advice about hospital choice — are sensitive to differences in observed hospital quality (Beukers et al., 2014; Varkevisser et al., 2012)

### Competition enforcement for collaboration agreements

In the Netherlands, collaboration agreements between companies are assessed under the Competition Act (*Mededingingswet*), which came into effect in 1998 and is based on EU competition law. Inter-organizational collaboration – the form of coordination that we focus on in this chapter – can be impermissible under the Competition Act if the objective of that collaboration is anti-competitive, or if it leads to anti-competitive effects (Loozen, 2015). The Authority for Consumers & Markets (ACM) is responsible for applying the Competition Act in all competitive markets, including the market for healthcare[28]. The supervision of cartel prohibition is relevant when there is an agreement of cooperation between (potentially) competing companies and is defined in article 6(1) of the Competition Act. Article 6(3) provides exemption criteria that allow for agreements to be permitted, even though those agreements would be deemed anti-competitive[29]. Generally, the ACM will not initiate an investigation of its own accord in cases where healthcare providers can substantiate in a convincing ex-ante self-assessment that the benefits for patients outweigh any anti-competitive effects of collaboration. Furthermore, all relevant stakeholders (e.g., health insurers, patient organizations) must also verify and approve the plan.

## 2. REFLECTION[30]

### 2.1 Potential price effects

From a welfare perspective, collaborations can lead to inefficiencies due to increased hospital prices. To assess the potential price effects associated with the collaboration studies in this chapter, insight into patient volumes at all three hospital locations is

28 For the entire description of the Competition Act (MW), please see: http://wetten.overheid.nl/BWBR0008691/2016-07-01 (in Dutch).

29 For the exemption criteria, see Article 6(3): https://wetten.overheid.nl/BWBR0008691/2019-01-01.

30 In this section, we present preliminary empirical evidence for the price and travel-time effects of the collaboration studied in this chapter. We do this for the esophageal, stomach and pancreas procedures, and will not present data on liver procedures. For liver tumors, it is important to make the distinction between major and minor tumors in order to assess at which location which patient will be treated. We were not able to make this distinction based on the current data.

required. It can be seen in Table 1 that post-collaboration the centralization has not (yet) been fully materialized for two tumor types. For stomach tumors and pancreas tumors, the percentage of patients that was treated in the hospital where the centralization would take place equaled 70% and 81%, respectively. Only for esophageal tumors, the centralization has been fully realized; 100% of the patients underwent surgery in the same hospital. Table 2 shows the indices on which prices were compared with the nationwide average price for the three specific procedures in 2015 (index 100). The method for the calculation of these indices is extensively outlined in Appendix 2. For the indices, we used negotiated prices between hospitals and health insurers as the best available operationalization for any prices effect. The price effect can be subdivided into two sources: in column A and B we assess the potential occurrence of a concentration effect, while in column C we investigate whether there is any indication of a price effect through the reallocation of care. Column D was included to simulate the price based on the proposed situation, as Table 1 indicates that the proposed allocation in one hospital has not been fully consummated.[31] It is important to stress that our analysis should only be regarded as a tentative insight into post-collaboration price effects based on the available data.[32]

**Table 1:** Percentage of total patient volume centralized in one hospital after collaboration.

| | **Realized** | **Promised** |
|---|---|---|
| Stomach tumors | 70% | 100% |
| Pancreas tumors | 81% | 100% |
| Esophageal tumors | 100% | 100% |

To clarify the indices presented in Table 2, we will first discuss the occurrence of a potential concentration effect. That is**,** the hospitals' potential behavioral change of operating in a now less competitive environment. In column A and column B, we compare the years 2015 and 2017 given a constant case-mix and no re-allocation of care. For stomach procedures, a nationwide price increase of 5 percentage points between 2015 and 2017 is visible (index 105 compared to 100); in the three hospitals concerned in the Utrecht case study, we observe a price decrease of 2 percentage points (index 101 compared

31 It should be noted that we used the situation in which care is provided at one hospital as what would happen without collaboration (counterfactual) instead of 0 hospitals, which refers to the complete disappearance of the tumor surgery in the region. Although the latter scenario was brought forward by the hospitals (Section A of Appendix 1), this counterfactual is highly implausible for three reasons. First, pre-collaboration volumes were sufficiently high enough for insurers to contract at least one hospital, and for some tumors even two hospitals. Second, as selective contracting occurs rarely, not contracting any hospital in the Utrecht region would lead to considerable reputational damage for the health insurers. Third, it is highly implausible to not contract the university hospital as it has an important region function and the nearest other university hospitals are located 42, 64 and 88 km away.

32 Due to the limitations of our analysis, which are outlined in the discussion section, conclusions regarding causality between the abuse of market power and price changes cannot be drawn.

to 103). Since the nationwide price increase was larger than the price increase at the three Utrecht hospitals, the three hospitals do not seem to have exercised their market power to demand higher prices. For pancreas procedures, larger price differences are observed. The price increase at the three Utrecht hospitals between 2015 and 2017 (18 percentage points, index 123 compared to 105) was larger than the nationwide price increase (11 percentage points, index 111 compared to 100). This could indicate a small concentration effect. Substantial differences are also observed for esophageal procedures: pre-collaboration, the 2015 prices at the three Utrecht hospitals were higher than the nationwide group (134 compared to 100). However, the price increase at the three hospitals between 2015 and 2017 (3 percentage points, index 137 compared to 134) was lower than the nationwide increase (13 percentage points, index 113 compared to 100). This difference does not indicate the presence of a concentration effect.

Although we find no clear signals for anti-competitive price increases, we know from the literature that higher hospital market shares are generally associated with higher prices (e.g., Gaynor et al., 2015). As the prices are freely negotiable B-segment prices, healthcare providers have the possibility to ask for higher prices. Also for the Netherlands, there are indications that in more competitive regional hospital markets, measured by HHI or weighted market shares (LOCI),[33] prices are lower (Berden et al., 2019) and quality is higher (Croes et al., 2018). However, most research on market power in relation to price effects applies to consummated hospital mergers (Haas-Wilson and

**Table 2.** Index prices pre-collaboration and post-collaboration for stomach, pancreas and esophageal tumors[34, 35]

| | **A (2015 prices, 2015 case-mix)** | **B (2017 prices, 2015 case-mix)** | **C Realized (2017 prices. 2017 case-mix)** | **D Consummated as proposed (2017 prices, 2017 case-mix, procedure fully centralized in *one* hospital)** |
|---|---|---|---|---|
| **Stomach tumors** | | | | |
| Nationwide | 100 | 105 | 110 | |
| Three hospitals | 103 | 101 | 121 | 123 |
| **Pancreas tumors** | | | | |
| Nationwide | 100 | 111 | 111 | |
| Three hospitals | 105 | 123 | 104 | 101 |
| **Esophageal tumors** | | | | |
| Nationwide | 100 | 113 | 111 | |
| Three hospitals | 134 | 137 | 139 | 139 |

33 LOCI refers to a competition index developed for differentiated product oligopoly markets with logit demand (Akosa Antwi et al., 2013)

Garmon 2011; ACM, 2017; Lewis and Pflum, 2017). It is not yet clear to what extent collaborating, as opposed to merging, hospitals can acquire market power in submarkets and the effect this may have on prices.

Furthermore, we assess price differences caused by the allocation of patients. Insight into this separate source of potential price increase is relevant to assess, since the allocation is not coordinated centrally by health insurers or government bodies but is rather determined by the three hospitals involved. Therefore, strategic motives may have had influence on the allocation decision next to medical or patient safety reasons. For instance, hospitals or self-employed medical specialists may have interest in attracting the procedures with the largest price-cost margins. Although we do not possess price data detailed enough to draw conclusions on the latter, comparing column B and C might indicate the occurrence of any allocation effect. For stomach tumors, this comparison demonstrates a price increase for the collaborating hospitals of 20 percentage points (index 121 compared to 101), which is higher than the 5-percentage point nationwide price increase. Contrary, for pancreas tumors, the price increases were lower (19 percentage points, index 104 compared to 123) than the nationwide price development, which showed no difference at all. For esophageal tumors, we find a fairly similar price development among the nationwide group and among the three hospitals. However, the price level of the three hospitals for esophageal tumors is much higher than the nationwide price level.

Since for both columns B and C the 2017 prices are used, differences in the overall price level could be explained by three potential reasons related to allocation of patients. First, post-collaboration, more patients could be treated in a more expensive hospital. This could be an indication of a potential allocation effect. That is, a price increase because procedures were centralized in a hospital that had higher prices before the collaboration. More patients are then treated for these higher prices, which can result in an upward overall price level after collaboration. This is likely to be the case for the centralization in a university hospital, which generally has higher prices (Douven et al., 2018). Second, it could be the case that the patient population was more complex in 2017 compared to the 2015 patient population (case-mix effect). Third, in addition to a potential case-mix effect, price differences might also be caused by upcoding, implying that a larger share of patients was registered under more complex DTC-codes (Van Herwaarden et al., 2018).

34 Negotiated hospital prices are confidential and competition sensitive, and the exchange of information regarding these prices is forbidden. We therefore made several modifications to the data: 1) we use indices to compare with nationwide prices; 2) every treatment consists of multiple DTC codes; 3) every DTC code consists of multiple prices negotiated by multiple health insurers; 4) the prices are based on averages over the three hospital centres.

35 In addition to the 'eyeball test' presented in Table 2, we performed a, due to data limitations: very basic, difference-in-differences test on comparing column A to C. No significant differences were found. For confidentiality reasons, no standard deviations from the indices are presented here.

As outlined in Table 1, the centralization has not been fully consummated by the collaborating hospitals. Therefore, we simulated the consummated as proposed situation in column D to see whether the non-compliance to the assessed plan resulted in any differences in prices. Column D reflects the situation described in the collaboration plan, i.e., where all treatments would have been centralized in one particular hospital. For stomach tumors, this exercise revealed that the price would then have risen further (123 compared to 121) whereas the price for pancreas tumors would have been lower (101 compared to 104). Presumably, the small increase for stomach tumors is caused by the patients that are still treated in the non-university hospital, which has lower prices. The completion of the proposed centralization in the university hospital would result in slightly higher overall prices. For esophageal tumors, the centralization has been fully realized and therefore a similar index (139) is visible in column C and D.

To summarize, price developments seem to vary for tumor types: the potential price effect of a reduction in competition in comparison to the price effect of other allocation related factors. For stomach tumors, the most substantial price increase is visible, likely caused by the centralization in the university hospital. For pancreas tumors, prices have risen from 2015 to 2017, but this effect has been negated through the centralization in a less expensive hospital. For esophageal tumors, prices in all columns are substantially higher than the nationwide prices. However, the price development does not differ from the nationwide price development. Overall, we do not find a substantial price effect for the three surgical procedures included in the collaboration agreement.

## 2.2 Potential travel time effects

Centralization could potentially increase the travel burden on patients (Middelveldt et al. 2018). Since patients generally dislike travelling for treatment, this could result in significant disutility for some patients, both in terms of increased travel costs and additional travel time (opportunity costs).[36] Based on patients' places of residence in 2015, we calculated how far patients had to travel for treatment in the pre-collaboration situation (Table 3), and how much their simulated post-collaboration travel time would differ from this (Figure 2).[37] We refer to 'simulated' post-collaboration travel time because we calculated how far 2015 patients would have had to travel under the new collaboration arrangements, based on actual patient flows and travel times.

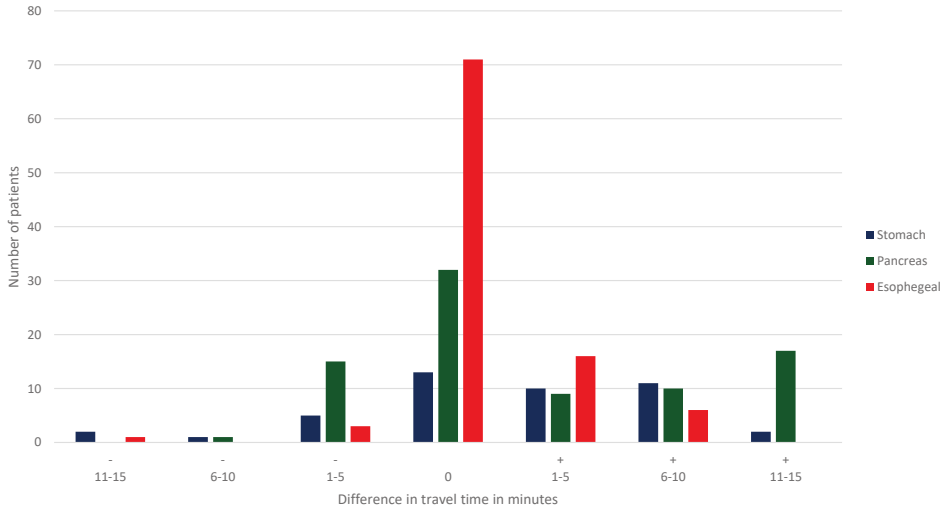
36 See, for example, the comprehensive overview of patient choice literature by Aggarwal *et al*. (2017).

37 Using claims data from Vektis, we were able to determine where patients lived and at which hospital, they were treated in 2015. The database includes data on 99 % of Dutch citizens collected from all Dutch health insurers. Based on research by Varkevisser *et al*. (2012), travel times (in minutes) are defined as the fastest route by car from the patient's home to the relevant hospital.

**Table 3.** Mean travel time in minutes, pre-collaboration

| | Stomach tumors | Pancreas tumors | Esophageal tumors |
|---|---|---|---|
| Nationwide | 24 | 28 | 28 |
| UMCU | 21 | 29 | 25 |
| MMC | 20 | 19 | 15 |
| Antonius | 17 | 16 | 21 |

**Figure 2.** Differences in travel time (minutes) compared to the pre-collaboration situation for the three tumor types




The mean travel time for patients from the three hospitals, as reported in Table 3, is generally slightly lower than the nationwide mean travel time. UMCU reports the highest travel time of the three hospitals for each procedure, which could be explained by the fact that university hospitals – which serve as centers of excellence – generally serve a wider geographical area than general hospitals. Figure 2 shows the travel time differences per patient for the three tumor types. The large bar at zero represents patients who would have received treatment at the same hospital post-collaboration as pre-collaboration, or for whom the travel time to the new hospital would be unchanged post-collaboration. The negative values on the left tail indicate a decrease in travel time. This implies that these patients bypassed their nearest hospital in the pre-collaboration situation, since their travel time post-collaboration situation would be shorter. The values on the right indicate an increase in travel time. The largest increases in travel time are observed for

38 St Antonius hospital has two locations. The complex procedures are performed mainly at the location Nieuwegein. We therefore used this location's postcode for calculating travel times.

pancreatic tumors: 17 patients would have travelled 11-15 minutes further. On average, this equates to a relative increase in travel time of 56% for this group, ranging from 15% to 120% extra travelling time. This group thus might suffer a double utility loss, i.e., patients have to travel further, and are obliged to undergo surgery in a less-preferred hospital, or at least not their first-choice hospital.

As illustrated in Figure 2, for the majority of the patients the post-collaboration travel times would not have differed substantially from the situation before the collaboration. This is unsurprising, as the three collaborating hospitals are all located within proximity of one another in the same city (in Utrecht) or very nearby (in Amersfoort). These findings provide no clear indication of any increase in patients' travel burden. However, even a small relative increase could be disadvantageous for time-sensitive patients, as well for more vulnerable patient groups such as elderly patients or patients of low socio-economic status (Stitzenberg et al., 2009; Balan, 2017; Versteeg et al., 2018). In general, negative effects on travel times resulting from collaboration are likely to be limited for patients in the Netherlands compared to travel time differences in more sparsely populated countries such as the United States, due to the small size of the Netherlands and the absence of remote areas (Birkmeyer, 2003; Stitzenberg et al., 2009; Mesman et al., 2017). However, given the very densely populated area and three very close hospitals, the travel time differences found in the current Utrecht case may not be entirely representative of potential travel time differences that would result from centralization at hospitals in other, less densely populated areas of the Netherlands.

Other aspects regarding accessibility related to centralization also deserve attention. First, collaboration that aims to centralize care will reduce patients' freedom to make a decision based on their own preferences to some extent, whether these preferences relate to travel time, quality or other hospital attributes (Balan, 2017). This may apply particularly to the patients in Figure 2 who report a longer pre-collaboration travel time, and who thus initially (i.e., in the pre-collaboration situation) chose a hospital that was further away. In addition to the absolute travel time differences caused by collaboration, it is therefore important to take patients' willingness to travel into account, and this varies between quality-sensitive and time-sensitive patients. In its informal opinion, the ACM assumed that patients were willing to travel further for better care for complex procedures. This argument is partly supported by the relevant academic literature: it has been shown that some patients are more inclined to travel further for higher quality of care, to a certain extent at least (Tanke and Ikkersheim, 2012; Ikkersheim et al., 2013; Gutacker et al., 2016; Middelveldt et al., 2018; Vallejo-Torres et al., 2018).

Second, in the Utrecht case, there is a clear distinction between the locations where diagnosis, surgery and pre- and after care are provided. This implies that the travel time differences shown in Figure 2 may be an underestimation of the actual travel time following the centralization, since patients would need to transfer between locations during the care process. More importantly, this also leads to additional transfer moments which can be unpleasant and cause distress to cancer patients, as well as their relatives (Payne et al., 2000; Vallejo-Torres et al., 2018). The possible move away from a familiar and preferred hospital and surgeon may also be perceived negatively by patients and their relatives, although these implications are more difficult to quantify (Payne et al., 2000; Schwartz et al., 2017; Middelveldt et al., 2018).

## 2.3 Quality

In the current case, the rationale for the collaboration between the hospitals was to meet the medical professionals' minimum volume standards for rare types of cancer. In the Netherlands, the current threshold for the types of cancer included in the collaboration is set at 20 procedures per year. From this perspective, for some cancer surgeries centralization could be deemed necessary for the hospitals. However, based on our 2017 volume analysis in Table 1, it can be concluded that the centralization has not fully been realized. For stomach and pancreas tumors, also after the start of the collaboration a share of surgical procedures has still been performed in other hospitals than intended. As a result, even post centralization the actual number of surgical procedures in these hospitals is much lower than the minimum volume standard of 20 procedures per year. This finding contradicts – and even undermines – the quality claims brought forward by the collaboration hospitals. Additionally, it should be noted that while the collaboration purely focuses on volume this itself is a means rather than an end. As the hospitals themselves argued in the informal opinion: *"Through centralization and specialization for complex oncological surgery, survival rates and quality of live will improve, due to reduced post-operative complications."* In the absence of reliable quality data, it is not yet possible to say whether the collaboration has indeed led to higher quality, although the volume-outcome relationship for the involved surgical procedures in the Utrecht is confirmed in the literature (e.g. Gooiker et al., 2014). An inhibiting factor in most international volume-quality studies is that the mechanism underlying the volume-quality relationship is often not explicitly stated (Harrison, 2012; Mesman et al., 2015). In practice, the existence of the volume-outcome relationship can be attributed to a combination of different mechanisms, as for instance (1) the learning effects for surgeons (practice-makes-perfect), (2) the organizational scale size, and (3) a reversed causation by selective referrals; i.e. hospitals or physicians that show better outcomes attract more patients (Gaynor et al., 2005; Luft et al., 1987). Moreover, the occurrence of the volume outcome relationship is highly dependent of contextual factors, which

vary according to the procedure in question. In the current case, centralization was also paired with specific attributes that could influence the volume-quality relationship positively or negatively. For instance, pre- and post-operative care is separated from the surgical procedures, surgery is performed by two multidisciplinary teams, and diagnoses are handled at one location. Since the underlying mechanisms and desired quality improvements are unclear, it was ex-ante difficult for the competition authority to assess whether the generally claimed benefits of increased scale would also apply for this case with its specific characteristics. However, ex-post no further research was conducted as well. Neither was any study carried out as to whether collaborations like this one might reduce the incentives for quality competition. A growing body of literature demonstrates the potentially positive effects of hospital competition on quality (Bloom et al., 2015; Escarce et al., 2006; Gaynor et al., 2015), which implies that the benefits of collaboration are (partly) offset by reduced competition on hospital outcomes.[39]

# 3. DISCUSSION

Also in market-based health systems, like in the Netherlands, collaboration between hospitals in clinical care networks is becoming increasingly widespread. This trend is likely to continue due to the influence of both external and internal factors, such as changes in demand, a smaller workforce, stricter volume norms and a stricter approach to mergers on the part of competition authorities (Broers and Kemp, 2017; Glied and Altman, 2017). However, little is known about the total patient welfare effects of collaboration agreements between healthcare providers in competitive markets. From a competition policy perspective, insight into these effects is required in order to enforce antitrust regulations effectively. Uncertainty regarding the conditions under which collaboration is permissible could encourage mergers between hospitals. This is undesirable because mergers can result in permanent and unfavorable changes in the market structure (Schmid and Varkevisser, 2016).

In this chapter, we have discussed a case study involving three Dutch hospitals to illustrate three aspects that are considered important in any evaluation of patient welfare: quality, price and travel times. For two of the three tumor types included in the collaboration, our preliminary findings indicate lower prices compared to the nationwide price development. However, for stomach tumors, a price increase is found, although these price differences are very small. In absolute terms, the calculation of travel time ef-

39 The focus of this literature is on the negative ex-post quality effects of reduced competition caused by hospital integration through mergers rather than by collaboration (Gaynor & Town, 2012; Significant, 2016; Vogt & Town, 2006)

fects revealed a modest increase in the travel burden for patients. Quality gains resulting from the collaboration were not possible to assess at this stage. However, an analysis of patient volumes revealed that the centralization – and thus the collaborating hospitals' quality claims – has no (yet) be fully materialized.

## Limitations

Our study should be regarded as an initial exploratory investigation in which several limitations apply. First, in the absence of cost prices or margins, it is questionable whether negotiated prices are sufficiently suitable as an indicator of price effects. These prices are composed of individual DTC prices. Douven et al. (2018) argue that the setting of DTC prices is somewhat arbitrary and serves primarily an instrumental purpose in the annual overall turnover negotiations between hospitals and health insurers, which hampers the validity of DTC prices. In our study, we have focused on three surgical treatments, each consisting of several DTCs. The effect of individual DTC prices may therefore be mitigated because we calculated the average cost per patient. This introduces a (potential) aggregation bias, but for reasons of confidentiality we are not able to disaggregate the price effect.[40] Second, negotiations between health insurers and health providers are complex and include volume agreements, cross subsidies and joint negotiations for a set of DTCs. For example, hospitals may have agreed with health insurers that higher prices for specific DTCs would be accompanied by treating fewer patients under these more expensive DTCs. This could result in lower overall spending. Finally, our descriptive comparison does not exclude the possibility of confounders that may have influenced price changes. In general, our ex-post study concerns the period just after implementation, which may underestimate or overestimate the actual collaboration effects.

## Challenges

Overall, our findings highlight three important challenges for collaborating hospitals as well as competition authorities assessing such arrangements. First, with regards to the current enforcement method for collaborations, the burden of proof for efficiency claims rests with the healthcare providers concerned. In contrast to merger control, the prohibition on cartels is enforced retrospectively. Our case clearly illustrates the complexity of ex-post assessment, and any ex-ante estimation would thus be even more complex, both for healthcare providers and competition authorities. An effective self-assessment by healthcare providers regarding whether the proposed collaboration complies with competition rules is therefore an essential prerequisite. Healthcare providers should

40 When examining the price effects of a Dutch hospital merger, Roos *et al.* (2019) indeed find evidence of heterogeneous price effects across health insurers, hospital products and hospital locations. These differences depend on the degree of substitution between hospitals, the relative bargaining ability of hospitals and insurers, and the pre-merger price-cost margins of different products delivered by these hospitals.

therefore be encouraged to provide insight into the utility and necessity of the proposed collaboration in accordance with the exemption criteria, and efficiency claims should be supported with relevant literature. With respect to quality, the argumentation provided should be required to take a broader perspective than purely focusing on minimum volumes. The mechanism that underlies the (assumed) relationship between quality and volume, as well as the contextual factors that affect this, should also be addressed. This would require more robust substantiation on the part of the applicants, and it is questionable whether all healthcare providers would be sufficiently equipped to demonstrate the net benefits of collaboration in this way. Additionally, the current enforcement method requires competition authorities to have the knowledge and ability to assess applications, and where necessary to refute or expand on the argumentation presented.

Second, for a convincing burden of proof, the self-assessment should ideally be complemented with scenario analysis to ensure a more comprehensive approach to the best-case and worse-case scenarios. Our ex-post research could be an example of how healthcare providers could utilize their own patient data for ex-ante calculations of the impact of collaboration on travel times in a practical manner. Similarly, the allocation effect could be calculated ex-ante in order to determine the potential implications of concentration at one hospital and could be used in the discussion regarding the extent to which price increases would be justified by quality gains. However, one debate that arises concerns who is responsible for conducting these analyses: the healthcare providers, health insurers or the competition authority? The former (or a trusted consultant/third party) is not legally allowed to share this competition-sensitive information directly, while the latter lacks the capacity and resources to do so for every collaboration agreement.

In addition to the complexity involved in the self-assessment and the related division of tasks, the third challenge is more fundamental and relates to the initiator of collaboration. In the current case, the healthcare providers initiated and designed the allocation of the tumor types among the hospitals. However, requesting an exemption on the cartel prohibition would not have been necessary if health insurers had used their selective buying power by means of selective contracting. The role of health insurers in the current case was limited to examining and approving the plan presented by the providers. More proactive intervention by health insurers could result in a shift in emphasis towards value-for-money considerations. This would match the role of prudent buyers of health care that insurers – or other third-party payers – are expected to play in a market-based health system.

### Further research

Further ex-post research is required to investigate the patient welfare effects of collaboration and centralization agreements in greater depth. To support both the competition authorities and healthcare providers in their ex-ante substantiation of their claims, future research should provide insight into the effects of cases of collaboration and offer competition authorities the opportunity to steer or enforce in response to indications that anti-cartel regulations have been broken. We recommend that future work includes research questions on whether and how quality benefits are actually realized in the context of collaboration, and whether and which collaborations are the right instruments to achieve the intended quality gains. Finally, further research is required into whether the establishment of collaboration between hospitals is associated with anti-competitive drawbacks. For this purpose, any post-collaboration changes in (disaggregated) prices and include price-cost margins need to be monitored closely, as these provide a more thorough insight into the occurrence of any anti-competitive behavior.

## 4. CONCLUSION

In this chapter, we discussed the potential patient welfare implications of collaboration arrangements between three hospitals providing complex cancer surgery in the Netherlands. Based on the informal opinion issued by the competition authority and additional empirical research, we found only a modest increase in price and travel time for some of the tumor types included in the collaboration. Volume analysis showed that the intended centralization of surgical procedures has not been fully realized. Our findings highlight the importance of a comprehensive self-assessment by the collaborating hospitals to assess efficiencies and risks ex-ante. From the competition policy perspective, a comprehensive self-assessment (e.g., based on the relevant literature) by the collaborating hospitals is required in order to reveal the most important pros & cons of the aimed collaboration. Such assessments could benefit from research focused on the ex-post evaluation of the quality effects of collaboration. That is, when are the claimed efficiencies most likely to occur? For the ex-post assessment on the cartel prohibition by competition authorities, a more thorough insight into the (long-term) changes in hospital prices, profitability, and quality is needed.

# APPENDIX 1: CENTRALIZATION OF COMPLEX ONCOLOGICAL CARE IN THE UTRECHT REGION

Before implementing their plan, the hospitals asked ACM to assess their argumentation for the collaboration by issuing an informal opinion regarding their plans. An informal opinion is a non-binding informal decision from the ACM on whether a proposed form of coordination is presumed to be permissible under the Competition Act. It is issued with the aim of providing the parties involved with guidance. Generally, informal opinions are issued at the request of the relevant parties and when (1) the proposed arrangements have not yet been implemented and concern a new legal question, (2) when the issue is of economic or societal importance (3) and when enough information has been provided by the parties to form an informal opinion, without the need for the ACM to conduct its own in-depth study.

This collaboration, which was proposed by the hospitals in 2014/2015, concerns three points: (1) the joint establishment of treatment plans for individual patients by physicians through a multidisciplinary meeting; (2) the introduction of a common healthcare protocol and process for different types of tumors and the exchange of expertise; and (3) the centralization of surgical procedures for each form of liver, esophageal, pancreatic and stomach cancer in one or two of the hospitals concerned. Our prime focus in this study is on the centralization of the latter procedures. Under the proposed collaboration, after centralization, St. Antonius hospital would perform surgical procedures for pancreatic cancer and minor liver tumors, UMCU would perform surgical procedures for esophageal cancer and major liver tumors and MMC would perform surgical procedures for stomach cancer and major liver tumors[41].

## The efficiencies claimed by the hospitals

The major reason for collaboration given by the hospitals was to meet the minimum volume standards for complex cancer surgery. In the Netherlands, these standards are determined by SONCOS, a foundation in which all professional organizations for oncological care in the Netherlands participate. The volume standards for liver, esophageal, pancreatic and stomach cancer surgery are set at twenty procedures per hospital per year, averaged over three years. The three hospitals argued that they would only be able to meet these volume standards if they worked together; otherwise, they feared that high-complex oncological care may disappear from the region since health insurers would no longer contract the individual hospitals because they would not meet the volume requirements. In the years 2011-2014, the Antonius Hospital missed or only just

41 The Netherlands has 73 hospitals, of which 66 are general hospitals and 7 are university hospitals (NVZ, 2018). In 2017, 27 hospitals performed liver resections, 17 hospitals performed stomach or esophageal surgery and 18 performed pancreas surgery (source: miniumukwaliteitsnormen.nl).

met the volume standards for esophageal, pancreatic and stomach cancer. The same was true for UMCU and MMC, concerning the volume norms for stomach cancer.

The three hospitals argued that patients would benefit from this collaboration because specialization and higher volumes would improve care outcomes, improving survival rates and quality of life and reducing postoperative complications. They also argued that the continued availability of complex cancer care in the Utrecht region would be a further major advantage of the collaboration. The hospitals also emphasized that collaboration on high-complexity cancer care would not go beyond what was necessary to achieve the volume norms: the centralization of care in one hospital would only apply to the surgical procedures themselves. Pre- and postoperative care would continue to be provided by the hospital of the patient's choice.

## Antitrust assessment by the ACM

In response of the efficiency claims outlined by the hospitals, the ACM's informal opinion considered two potential anti-competitive effects: reduced freedom of choice and the possibility of price increases. The concentration of surgical procedures in one hospital rather than three hospitals reduces absolute freedom of choice. In the status quo situation, patients and health insurers would be able to choose between the three hospitals in the region. In the proposed new situation, however, the hospitals would decide on behalf of the patient where surgery would take place. Additionally, it was possible that relative freedom of choice would be restricted by the proposed arrangements, since the hospitals would aim to standardize the care process for complex oncological care by establishing joint treatment plans. The effect of this approach would be a more harmonized and standardized care process. Hospitals may therefore offer very similar treatment plans, decreasing patient choice regarding aspects such as quality of care. However, the hospitals claimed that choice would remain available regarding other aspects of care, such as the level of service for pre- and post-operative care.

Second, the hospitals may be subject to less competitive pressure, reducing the incentives for cost-efficiency and quality. Hospitals could also abuse their market position by negotiating higher prices with health insurers. Finally, the collaboration could result higher costs due to duplication in healthcare processes caused by the potential complexity of providing care at several locations (the location for the surgical procedure may be different from the location of pre- and post-operative care, such as chemotherapy), as well in higher management and coordination costs.

But in spite of these possible anti-competitive aspects of the collaboration, the ACM informally approved the proposed collaboration between the three hospitals in December 2015. Accepting the efficiency claims outlined by the hospitals, the competition authority argued that the positive effects of the collaboration were likely to outweigh the negative effects on competition. The ACM assessed the likely improvement in qual-

ity of the complex oncological surgery and the retention of complex surgical procedures in the Utrecht region as beneficial for patients. The reduction in competition following the collaboration, argued the ACM, would be permissible since the efficiencies would also benefit patients, as stated in Article 6 (3) of the Competition Act. Another important point in the approval of the ACM was the broad support for the collaboration expressed by both the relevant health insurers in the region and the client councils of the three hospitals[42]. For example, the largest and therefore most important health insurer in the region argued that it would continue to have sufficient countervailing purchasing power even after the collaboration.

Following the informal approval by the ACM, the three hospitals went on to establish the Regional Academic Cancer Centre Utrecht (RAKU). Two multidisciplinary teams now perform surgical procedures for complex liver, stomach, bile duct and esophageal tumors at UMCU. Pancreas surgery is performed at a location of the St. Antonius hospital, while all three hospitals remain responsible for the minor, less complex liver resections. Note that the actual distribution of surgical procedures thus differs from the initial plan. In the actual situation, MMC only provides minor resections for liver cancer, i.e., stomach procedures are transferred from MMC to UMCU. The reason for the difference between the proposals and the actual situation is that the health insurers consulted as part of the informal opinion suggested centralizing both stomach and esophageal surgeries at one hospital, since this would safeguard quality and patient safety, based on the literature. The hospitals therefore decided to centralize both esophageal and stomach procedures at UMCU.

42 These parties had insight into the same documents as the plan presented to the ACM. In its assessment, the ACM attaches significant value to the opinions of the health insurers and client councils.

# APPENDIX 2: STEP-BY-STEP METHOD FOR CALCULATION OF PRICE EFFECTS

Column A: $\frac{\sum(Q_{2015} \times Price_{2015})}{N(patients)}$

Column B: $\frac{\sum(Q_{2015} \times Price_{2017})}{N(patients)}$

Column C: $\frac{\sum(Q_{2017} \times Price_{2017})}{N(patients)}$

Column D (Stomach/esophageal): $\frac{\sum(Q_{2017} \times Price_{2017\ UMCU})}{N(patients)}$
(Pancreas): $\frac{\sum(Q_{2017} \times Price_{2017\ St\ Antonius})}{N(patients)}$

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1) We determined which DTC codes belonged to each surgical procedure, based on the public DTC website of the Dutch Healthcare Authority (NZa).

2) We made use of the 2015 case- and treatment mix to calculate the mean pre- collaboration prices. This means that we took the population who underwent surgery in 2015 as the starting point for the calculation of 2015 and 2017 prices, to allow for comparability between the years (Column A and B)

3) We then acquired the negotiated hospital-health insurer prices for each DTC code. We did this for the negotiated price in 2015 and 2017. Since hospitals negotiate the prices per DTC annually with their insurer, the price per DTC was likely to be different for 2015 compared to 2017.

4) The total expenditure per hospital was calculated by summing the number of DTCs performed in that hospital multiplied by the price per DTC: $(\sum(Q_{DTC} \times P_{DTC}))$.

5) The mean pre-collaboration price per patient per hospital is calculated by dividing the total expenditure per hospital per tumor (as calculated under point 3) by the number of treated patients: $\frac{\sum(Q_{DTC} \times P_{DTC}))}{N(patients)}$. We did this for 2015 and as a hypothetical benchmark also for 2017, based on the 2015 case- and treatment mix

6) Based on mean prices for the three individual hospitals, we calculated one mean price for the three hospitals, weighted for the number of patients in each hospital.

7) We also conducted steps 1-5 for the *nationwide control group*. The nationwide group refers to the mean price for patients treated by all hospitals in the Netherlands that performed the procedure. The three collaborating hospitals in our case were excluded from the nationwide group.

8) We also conducted steps 1-5 for column C, making use of 2017 case-mix and 2017 prices.

9) To calculate the post-collaboration price based on the consummated as proposed centralization (Column D), we made use of the 2017 case and treatment mix. We made use of 2017 prices for the hospital at which the procedure would have been centralized. For stomach and esophageal cancer, this was the UMCU, for pancreatic cancer, this was the Antonius hospital. The total expenditure was calculated by summing the number of DTCs performed at the three hospitals, multiplied by the price per DTC at the centralized hospital (UMCU or St Antonius): $(\sum(Q_{DTC} \times P_{DTC\ centralized}))$. The mean price was computed by dividing the total expenditure by the total number of patients.

10) Since the negotiated prices are confidential and competition-sensitive, we report the price differences in Table 2 utilizing indices based on the 2015 nationwide prices as the index (100). Therefore, indices above 100 indicate a higher price, indices below 100 indicate a lower price.

# Chapter 7

*De Getijdenmolen, GP care Middelburg*

# Conclusion and discussion

# 7.1 MAIN FINDINGS

## Part 1: Exploring collaboration between providers in the setting of regulated competition

The aim of the first part of this dissertation was threefold. First, to address how and why healthcare providers collaborate. Second, whether collaborations and mergers are regarded as substitutes by healthcare executives. Third, how competition rules are enforced in the context of political and public attitudes towards competition. Part 1 included three chapters. For chapter 2 and 3, a large study among healthcare executives was conducted. Their responses were analyzed both quantitatively and qualitatively. For chapter 4, informal and formal ACM documentation, newspaper articles, parliamentary questions and election programs were selected and analyzed. The main findings of these chapters, answering research questions 1, 2 and 3, are discussed below.

### Q1. How does inter-organizational collaboration differ across healthcare sectors with regards to characteristics, motives, and considerations?

Chapter 2 provides detailed empirical insight into collaboration and the related decision-making processes in all domains of Dutch healthcare. It also examines healthcare executives' underlying motives and ex-ante considerations for collaboration. We find that collaboration among healthcare providers appears to be mainly driven by the desire to improve healthcare provision and quality of care. The comparison across sectors reveals that findings substantially differed between the hospital sector on the one hand and nursing homes, mental care, and disability care on the other. In hospital care, collaborations are mostly horizontal and often only include one or two partners. These collaborations focus on both complex care and generic care provision. Among nursing homes, mental care organizations and disability care organizations, mixed and non-horizontal IOCs predominate. Although descriptively, this difference displays a considerable overlap with sector-specific challenges and health policy developments such as deinstitutionalization in disability care, reduction of waiting lists in mental care and a newly introduced quality framework in nursing home care which was primarily aimed at increasing the patient/staff ratio.

Second, we investigate the role of healthcare executives in IOC decision making when operating in a market-based healthcare system. We find that some healthcare organizations primarily started IOCs in order to strengthen their market/bargaining position vis-à-vis third-party payers like health insurers (hospitals and mental care organizations), regional procurement offices (nursing homes) and municipalities (providers of mental health care and disability care). Hence, creating greater negotiation leverage is – especially for hospitals –an important driver for IOC. Most healthcare executives conducted a self-assessment before starting to collaborate with other organizations.

These assessments mainly focus on quality considerations, and thus show similarities with the leading motives of IOCs.

**Q2. To what extent do healthcare executives choose between mergers and inter-organizational collaborations, and which reasons or perceived barriers are decisive in the potential trade-off?**

Chapter 3 investigated whether healthcare executives deliberately choose between IOCs and mergers, and which motives are decisive to merge or collaborate. Specifically, emphasis is placed on underlying sub motives, considerations in decision-making and perceived barriers for collaboration. Mergers predominantly include one partner organization and occur horizontally, whereas IOCs take place horizontally, non-horizontally or in a mixed form. Improving or broadening healthcare provision is seen as the most important motive for both mergers and IOCs. Collaboration-specific motives include improving quality, satisfying quality and volume standards and implementation of evidence-based practices. Merger specific motives include taking over financially distressed healthcare organizations, strengthening the bargaining position, exploring and opening new geographical markets or patient groups. When considering both types, reducing governance complexity is one of the decisive reasons to opt for a merger; aversion towards a full merger and lack of support base within the own organization convinces healthcare executives to choose for a collaboration. Finally, institutional barriers, such as laws, regulations and financing regimes, appear to be the most restricting for healthcare executives to engage in IOCs. When comparing specific healthcare sectors, the overlap in pursued motives and sub-motives indicates that inter-organizational collaborations and mergers are used for comparable objectives.

**Q3. How are competition rules concerning collaborations enforced in Dutch healthcare and is there a relationship with societal and political attitudes towards competition in healthcare?**

Chapter 4 discussed the cartel prohibition enforcement in Dutch healthcare, as well as the potential impact of public and political attitudes towards competition healthcare. Using both qualitative and sentiment analyses, we assessed 37 formal and informal documents issued by the Dutch Authority for Consumers & Markets (ACM), 126 written parliamentary questions and almost 1500 newspaper articles. Our findings reveal that during the first half of the study period (2004-2012), ex-post punitive formal enforcement of violations of the cartel prohibition, such as market-sharing and price-fixing agreements, predominated. During the second half of the study period (2012-2020), however, the competition authority's focus seems to have shifted toward providing ex-ante informal guidance. During the entire study period, we find negative public and political attitudes towards competition in healthcare. Public attitudes towards competition

did not shift substantially over the years, and the sample of parliamentary questions was too small to draw longitudinal conclusions. Although we can conclude that a distinct shift in enforcement approach has taken place, although we cannot conclude that this is linked to public and political attitudes.

## Part 2: Case studies on competition and collaboration in oncological care

Whereas part 1 applied a general focus, the second part of the dissertation included two case studies in hospital care as most market-based incentives and minimum volume standards are implemented here. Chapter 5 assessed the joint influence of hospital volume and hospital competition on three patient outcomes measures after breast cancer surgery. This study was based on data from all women who underwent surgery for breast cancer in any Dutch hospital between 2004 and 2014. Chapter 6 discussed and analyzed the collaboration between three neighboring hospitals in the Utrecht region. These hospitals started to collaborate to meet the minimum volume standards for surgical procedures for stomach, pancreas, esophageal and liver cancer. This chapter provided preliminary empirical evidence on the ex-post effects of the collaboration for quality of care, negotiated hospital prices and differences in travel time.

### Q4. What is the joint influence of hospital volume and hospital competition on outcomes after breast cancer surgery?

Chapter 5 examined the volume- and competition effects on outcomes after surgery for invasive breast cancer (IBC). After adjusting for confounders and intra-hospital correlation, hospital volume and competition from neighboring hospitals do not explain differences in surgical margins and 90-days re-excision rates, although re-excision rates are lower for higher volume groups. Surgery in higher volume hospitals with on average 150-200 or 250 or more surgeries per year was associated with prolonged survival. However, differences are small, and the effect weakened after correction for comorbidity status, which was available for a smaller, and regionally biased, sub-cohort. For the effect of hospital competition, patient survival is higher in hospitals with four or more (potential) competitors within a 30-kilometer distance. However, this effect is small and not robust for changes in our proxy for hospital competition. Treatment type, patient and tumor-level characteristics explained most variation in outcomes after correction for confounding variables. Based on the selection of patient outcomes, hospital volume and regional competition appear to play only a limited role in the explanation of variation in IBC outcomes across Dutch hospitals. This finding does not provide reasons to adjust volume standards or stimulate generic policy aimed at further centralization of IBC surgical procedures, nor does it suggest that strengthening competition would be beneficial for the patient outcomes studied here.

**Q5. What are the effects on accessibility, price and quality after centralization of high-complex oncological surgeries?**

Chapter 6 concerned the collaboration between three neighboring hospitals on the surgical procedures for stomach, pancreas, esophageal and liver cancer. The study was based on the argumentation of both the three involved hospitals and the Dutch competition authority and was complemented with own preliminary empirical research. Because the hospitals are close competitors, this collaboration can be deemed as an anticompetitive cartel agreement. The (potential) post-collaboration price and travel time effects are calculated based on the pre-collaboration case- and treatment mix for the procedures. Furthermore, the actual negotiated hospital-insurer prices pre-and post-collaboration and the patient's place of residence are used. We find no clear evidence for an ex-post price increase through exhibition of anti-competitive behavior by the combination of demanding higher prices from the health insurer (concentration effect) and the centralization of procedures on the location with the highest ex-ante prices (allocation effect). However, both effects are separately visible for some procedures. Additionally, in this specific case, the increase in patients' travel times appears to be very modest in absolute terms. Unfortunately, given the short time span after implementation, the ex-post quality effects could not yet be studied. As a proxy for potential quality effects, we assess whether quality improvements are likely to occur in this specific case, based on the current state of volume-outcome literature. Although the positive volume-outcome relationship for the corresponding surgical procedures is confirmed in literature, for this specific case it was not possible to assess the actual quality gains associated with increased volume. Volume analysis shows that the intended centralization of surgical procedures has not been fully realized. As a result, the aimed quality improvement may not have been fully realized by the collaborating hospitals.

## 7.2 IMPLICATIONS AND RECOMMENDATIONS

The separate chapters produced several recommendations for policymakers, competition authorities and healthcare executives. To summarize, for policymakers it was recommended that in a market-based healthcare system they should consider the potential drawbacks of increased coordination and consolidation when promoting IOC (chapter 3). For healthcare executives who aim to establish IOC, it was recommended to learn from best practices hereby taking into account the relevant differences across horizontal, non-horizontal and mixed types of collaboration (chapter 2). Furthermore, for competition authorities it was recommended that healthcare organizations should be encouraged and supported to provide more evidence-based insight into the patient

benefits as well as the necessity of proposed collaborations in accordance with the exemption criteria of the cartel prohibition (chapter 6).

*Broader implications for health policy and practice*

Overall, the combined findings from the different chapters lead to two overarching implications for health policy and practice. First, this dissertation attempted to distinguish between different types of IOC. The empirical exploration of a horizontal agreement did not indicate anti-competitive behavior (chapter 6). However, we find that organizations in horizontal agreements with only one or two partners are more often focused on strategic objectives aimed for achieving a stronger market position than organizations in larger non-horizontal or mixed agreements (chapter 2 and 3). Non-horizontal and mixed agreements provide generally little scope for anti-competitive behavior (ACM, 2010c). To prioritize detection and enforcement strategies of competition authorities, it can be recommended to closely monitor potential violations of the cartel prohibition in case of horizontal agreements among providers. This is particularly important for the healthcare sectors with strong incentives for competition and liberalized price-setting, like the Dutch hospital sector. Preventing anti-competitive behavior and distorted market relations is however not only the responsibility of competition authorities (Gaynor, 2014). Therefore, government bodies and third-party payers such as health insurers should consider negative spillover effects on healthcare market functioning when promoting or financing inter-organizational collaboration between horizontal providers.

Second, from our findings it follows that most healthcare executives seem to conduct some form of self-assessment before starting to collaborate with (potential) competitors (chapter 2). It was also found that antitrust enforcement by the ACM is still perceived as an important barrier for IOC in healthcare (chapter 3) despite its efforts to allow beneficial collaborative initiatives and provide guidance on the application of the cartel prohibition (chapter 4). However, chapter 6 highlighted that self-assessments suffer from shortcomings, which hampers an accurate decision by ACM. Given the increase in complexity, amount and comprehensiveness of IOC in Dutch healthcare, self-assessments remain critical to effective enforcement of the cartel prohibition. Therefore, it might be valuable for competition authorities and healthcare providers to pursue and stimulate the public disclosure of self-assessments. This is in line with the JZJOP policy rule recently issued by the ACM and can serve two purposes. First, it allows the competition authority to reflect on the completeness and quality of justification of the self-assessment, which can be useful for other healthcare organizations when preparing their self-assessment. Second, when healthcare providers formulate measurable and clear objectives in self-assessments and make these publicly available, researchers and policymakers can use this information to gain insight into the intended objectives and effectiveness of IOC.

*Recommendations for future research*

In addition to the specific recommendations for policymakers, competition authorities and healthcare executives as well as broader implications for health policy and practice, this dissertation also leads to four recommendations for future research. First, ex-post research on the effects of IOC should explicitly consider the differences among types of collaboration. This is required for policymakers when developing policy, legislative changes or financing instruments as well as for regulators and competition enforcers to create legal opportunities for the right IOCs. In chapter 6, we provided preliminary empirical evidence on the ex-post effects of a horizontal agreement among hospitals. Future studies should validate these findings using a long-term follow-up and include quality indicators that suffice the methodological considerations as discussed in chapter 5. For example, the occurrence of (post-operative) complications, psychosocial and physical functioning after treatment, Patient Reported Outcome Measures (PROMs) or quality of life instruments. A mixed-method research strategy, combining quantitative and qualitative research, is then recommended. This can shed a light on how efficiency gains can be achieved, and which process and structural characteristics are necessary for this purpose. This is especially valuable for non-horizontal or mixed agreements, as these are generally larger, contain more involved organizations and are therefore more difficult to define, demarcate and evaluate. Moreover, earlier Dutch research using such mixed-method approach on IOCs and mergers found that professional' perception and actual outcomes differed substantially (RIVM, 2018; Westra et al., 2021).

Second, as shown in chapter 2 and 3, IOC is widely present across all sectors in Dutch healthcare. Yet, mergers between healthcare providers remain an important mode of integration between healthcare providers (NZa, 2021; Varkevisser & Schut, 2019). From a competition perspective, this can result in increased concentration of the health system. Furthermore, the critical ex-post evaluations of the effects of consummated healthcare mergers on prices and quality demonstrate the risks on the health system level in both the Netherlands (ACM, 2017c; Kemp et al., 2012; Significant, 2016; Westra et al., 2021) and other countries (Beaulieu et al., 2020; Spang et al., 2009; Walia & Boudreaux, 2019a). Therefore, building upon the findings of chapter 3, further empirical research is needed to assess when and how inter-organizational collaboration can be a viable alternative to merging. The recent three Dutch cases of reversed or abandoned mergers in hospital care can be used as a starting point to draw lessons on how competition authorities and regulating bodies can steer or support healthcare providers' merger decision-making in

an early stage, for instance to assess whether there is sufficient legitimacy and support base within the organizations. [43]

Third, it needs to be studied how more formalized horizontal (hospital) networks should be assessed. Competition enforcement is generally based on assessing the compliance of individual organizations with the cartel prohibition. Furthermore, health insurers generally negotiate with independent healthcare organizations. However, larger networks increasingly rely on a centralized organizational structure, in which the autonomy of the network organization has become more important. For example, the Oncological Network Zuidoost-Nederland (OncoZON) consists of ten hospitals but is centrally coordinated by a network department. In some cases, multidisciplinary care provision is reimbursed on the network level, instead of the organizational level by means of bundled payments. The formalization and centralization of networks introduces new challenges with regards to shifted responsibilities and provider-purchaser relationships. Earlier guidance of ACM focused on cross-sectoral agreements in different geographical markets (ACM, 2015d). Additional research will need to be undertaken to determine how these networks are structured and organized, and competition authorities and regulators need to deal with this shift towards more formalized (hospital) network collaboration that operate within the same product and geographical market.

Fourth, a broad definition of a collaboration agreement was applied in this thesis. A necessary preliminary for an inter-organizational collaboration was a written or formal agreement on the intended collaboration by the involved organizations. However, due to potentially different levels of integration among organizations, comparability between inter-organizational collaborations can be complicated. More information on the exact nature of these documents would assist to establish a greater degree of accuracy on collaboration agreements and to facilitate improved comparability. A document analysis on the closed agreements would be a useful method to gain these insights. To conclude, given the challenges faced in healthcare, collaboration will likely play an increasingly important role in the future organization of healthcare provision (Dessers & Mohr, 2019). The Netherlands is no exception to this. In this thesis I have sought to obtain an understanding on the types, motives, and outcomes of collaboration between providers in a system based on regulated competition. I adopted a health system and competition policy perspective to identify the potential tension between the two organizing principles in organizational decision-making (chapter 2 and 3), competition enforcement (chapter 4) and oncological care (chapter 5 and 6). Although the desired

43 These hospital mergers cases are: Slingeland & Beatrix (2020) Laurentius & VieCuri (2020) and Reinier de Graaff, Langeland & Haga (2021).

extent of incentives aimed at collaboration or competition remains a political consideration, the findings in this thesis and their implications can be used for health policy and enforcement of competition policy in healthcare with the aim to achieve efficient, accessible and high quality of care.

# Appendices

*VieCuri, hospital Venlo*

# Appendices

# ACKNOWLEDGEMENTS BY CHAPTER

**Chapter 2**
We kindly thank NVZD for their cooperation in the data collection phase, as well as the healthcare executives who took the time to complete our survey. Furthermore, we thank the participants of the European Healthcare Management Association conference 2019 in Espoo, Finland for their valuable comments, as well as Daan Westra, Erik Schut and Richard Janssen and two anonymous referees.

**Chapter 3**
We are sincerely grateful to the NVZD for their cooperation in the data collection phase, as well as the healthcare executives who took the time to complete our survey. We would also like to thank Erik Schut, Wynand van de Ven and Daniëlle Cattel for their valuable comments.

**Chapter 4**
The authors are sincerely grateful to Merlijn Dries for his contribution to the coding phase of the study. Furthermore, we gratefully acknowledge Henriëtte Ribberink and Ron Kemp for their valuable feedback on an earlier version of this article.

**Chapter 5**
The authors sincerely thank the registration teams of the Netherlands Comprehensive Cancer Organization (IKNL) for the collection of data for the Netherlands Cancer Registry (NCR). We also thank dr. Ajay Aggarwal for his valuable comments on earlier versions of the paper. Furthermore, we thank the participants of the International Health Economics Association conference 2021 for their valuable comments.

**Chapter 6**
The authors sincerely thank Erik Schut and Bart Broers for their valuable comments. Furthermore, we thank the participants of the International Health Economics Association conference 2019 in Basel, Switzerland for their valuable comments, as well as two anonymous referees.

# HEALTHCARE ORGANIZATIONS USED FOR CHAPTER PAGES

Nine healthcare organizations provided pictures for the interior chapter pages of this dissertation. These healthcare organizations are not related to the content of this dissertation in any way.

# SUMMARY

In many OECD countries, inter-organizational collaboration (IOC) and competition have both been introduced in healthcare with the aim to improve quality and accessibility of care and allocate scarce resources efficiently. Yet, empirical evidence on the potential tension between collaboration and competition in healthcare provision has been lacking, which is required for health system design. Hence, the main objective of this dissertation was to investigate inter-organizational collaboration in the Dutch setting of regulated competition between healthcare providers. This dissertation has been divided in two parts. First, the underlying motives for collaboration and the interaction with institutional context, particularly the context related to competition and competition policy, were explored and addressed. Second, based on two case studies in oncological care, the tension between hospital competition and hospital volume, as an important driver for collaboration, was studied. Part 1 of this dissertation consisted of three chapters focusing on sectoral differences in IOC characteristics and motives (chapter 2), the consideration between collaborations and mergers (chapter 3) and developments in competition enforcement and the role of public and political attitudes (chapter 4). Part 2 of the dissertation discussed two ex-post case studies in hospital care focusing on breast cancer surgery (chapter 5) and stomach, liver, pancreas and esophageal cancer surgery (chapter 6).

## Part 1: Exploring collaboration between providers in the setting of regulated competition

In order to tailor health policy recommendations to the different healthcare sectors, systematic insight into the characteristics, motives and considerations of IOC is needed. The research presented in **chapter 2** was based on a survey conducted among a representative panel of Dutch healthcare executives from medium-sized or large healthcare organizations across all major sectors. Our results suggested that differences in policy changes and institutional developments across healthcare sectors may affect the scope and type of IOC. Hospitals generally operate in small horizontal IOCs, while larger and more complex mixed and non-horizontal IOCs were more present among nursing homes, disability care and mental care organizations. We found that before establishing IOCs, most healthcare executives conducted a self-assessment including the potential effects of the collaboration. The extensive overview of policy developments, collaboration types and intended outcomes presented in our study offered a useful starting point for a more in-depth assessment of the effectiveness of IOCs among healthcare organizations.

When establishing relationships with partners, healthcare organizations can roughly choose between two modes: full integration by means of merger, or only integrating a part of their activities in an IOC. Yet, understanding of whether healthcare organizations make an active choice between merging and collaborating is lacking. Hence, **chapter 3** systematically examined (i) healthcare executives' underlying motives for both types of integration, (ii) their potential trade-offs between collaborating or merging, and (iii) perceived barriers to collaborating. We used quantitative analyses together with a qualitative inductive coding approach to analyze the resulting 137 mergers and 235 inter-organizational collaborations that have been established between 2012 and 2018. Improving or broadening healthcare provision is the foremost motive for mergers as well as inter-organizational collaborations. When considering both types, reducing governance complexity is one of the decisive reasons to opt for a merger, whereas aversion towards a full merger and lack of support base within the own organization convinced healthcare executives to choose for a collaboration. When comparing specific healthcare sectors, the overlap in pursued motives and sub-motives indicates that inter-organizational collaborations and mergers are used for comparable objectives. Only a small minority of the responding executives switched between both types of integration. Institutional barriers, such as laws, regulations and financing regimes, appear to be the most restricting for healthcare executives to engage in inter-organizational collaborations. Our integral approach and systematic comparison across sectors could serve policymakers, regulators and healthcare providers in aligning organizational objectives and societal objectives in decision making on collaborations and mergers. Future research is recommended to study multiple collaboration and merger cases qualitatively for a detailed examination of decision-making by healthcare executives, and develop an integral assessment framework for balancing collaborations and mergers based on their effects in the medium to long term.

In market-based healthcare systems, due to the high and increasing level of integration between healthcare providers and purchasers, enforcement of the cartel prohibition is important to prevent from distorted market relations. Next to being complex, little is known about the impact of the public and political context in which competition authorities operate. **Chapter 4** therefore explored how the cartel prohibition was enforced between 2004-2020 and whether a relation can be observed with (changes in) public and political attitudes towards competition in healthcare. Using both qualitative and textual analyses, we assessed 37 formal and informal documents issued by the Dutch Authority for Consumers & Markets (ACM), 126 written parliamentary questions and almost 1500 newspaper articles. We found that that during the first half of the study period (2004-2012), ex-post punitive formal enforcement of violations of the cartel prohibition, such as market-sharing and price-fixing agreements, are most prominent.

In the second half of the study period (2012-2020), the competition authority's focus seems to have has shifted toward the provision of ex-ante informal guidance. During the entire study period, we find negative public and political attitudes towards competition in healthcare. We can conclude that a distinct shift in enforcement approach has taken place, although we cannot conclude that this is linked to public and political attitudes.

## Part 2: Case studies on competition and collaboration in oncological care

There is a clear trend towards centralization and collaboration aiming at increasing volume and improving patient outcomes. In contrast to part 1, focus in the second part is placed on the hospital sector, as minimum volume standards are frequently and increasingly implemented. Moreover, the hospital sector can be regarded as the most deregulated sector of the Dutch health system, and thus provides the most incentives for competition between providers.

Previous studies predominantly focused on a volume-outcome effect for low-volume tumors, and did not include the influence of neighboring hospitals. In **chapter 5**, we therefore analyze the association between hospital volume, competition from neighboring hospitals and outcomes for patients who underwent surgery for invasive breast cancer (IBC). We use data from the Netherlands Cancer Registry (NCR). Our study sample consisted of 136,958 patients who underwent surgery between in 2004 and 2014. The selected patient outcomes in this study were surgical margins, 90-days re-excision and overall survival. Our findings showed that treatment types as well as patient and tumor characteristics explained most of the variation in all outcomes. After adjusting for confounding variables and intra-hospital correlation, hospital volume and competition from neighboring hospitals did not show significant associations with surgical margins and re-excision rates. For patients who underwent surgery in hospitals annually performing 250 surgeries or more, multilevel models show that survival was somewhat higher. Overall, based on the selection of patient outcomes, hospital volume and regional competition appear to play only a limited role in the explanation of variation in IBC outcomes across Dutch hospitals. Further research into hospital variation for high-volume tumors like the one studied here was recommended to include more sophisticated measures for hospital competition and assess the entire process of care within the hospital, as well as care provided by other providers in cancer networks reveal other actionable factors for further improving the quality of breast cancer care.

From a competition policy perspective, little is known about how collaboration among healthcare providers contributes to overall patient welfare, and how a balance is achieved between scale benefits and preventing anti-competitive collusion. Therefore,

**chapter 6** examined the ex-post effects of a case study in which three competing hospitals have collaborated to provide high-complexity low-volume cancer surgery, an arrangement that tests the limits of permissibility under the Dutch cartel prohibition. Our preliminary empirical research demonstrated only a modest increase in price and travel time for some of the tumor surgeries. Volume analysis showed that the intended centralization of surgical procedures has not been fully realized. Our findings highlight the importance of a comprehensive self-assessment by the collaborating hospitals to ex-ante assess (potential) efficiencies and antitrust risks. For the ex-post assessment by competition authorities following the cartel prohibition, a more thorough insight into the (long-term) changes in hospital prices, profitability, and quality after collaboration is needed.

In **chapter 7,** the main findings of this dissertation are discussed. These findings resulted in two implications for policy. First, continued oversight on horizontal IOCs in healthcare is warranted. Special attention in detection and enforcement should be given to hospital care as this is the sector with the greatest extent of market-based incentives. Second, self-assessing the permissibility of IOCs is critical to the appropriate functioning of cartel prohibition enforcement when collaborators are also competitors. Future research is recommended to provide insight into the effectiveness of IOC, to establish how policymakers should deal with increased formalization of networks and to gain insight into the exact nature of the written agreements. Although the desired extent of incentives aimed at collaboration or competition remains a political consideration, the findings in this thesis and their implications can be used for health policy and competition policy in healthcare with the aim to achieve efficient, accessible and high quality of care provision.

# NEDERLANDSTALIGE SAMENVATTING

In de gezondheidszorg is samenwerking en marktwerking tussen aanbieders geïntroduceerd met als doel om kwaliteit en toegankelijkheid van zorg te verbeteren, en om schaarse middelen op een efficiënte wijze te verdelen. Echter, er is veel onbekend over de mogelijke spanning tussen samenwerking en marktwerking tussen zorgaanbieders. Deze kennis is onmisbaar voor een goede inrichting van zorgstelsels. Dit proefschrift is daarom gericht op interorganisationele samenwerkingsverbanden tussen zorgorganisaties in een setting van gereguleerde marktwerking. In het bijzonder zijn er twee thema's die aan bod komen. Ten eerste worden de onderliggende motieven voor samenwerking besproken in relatie tot institutionele context, voornamelijk in de context van marktwerking en mededingingsbeleid. Ten tweede gaat dit proefschrift in op de spanning tussen enerzijds marktwerking en anderzijds ziekenhuisvolume als belangrijke drijfveer voor samenwerking.

Deel 1 van dit proefschrift bestaat uit drie hoofdstukken. Hoofdstuk 2 gaat in op de afweging tussen verschillen tussen zorgsectoren in de kenmerken van en motieven voor interorganisationele samenwerking. Hoofdstuk 3 beschrijft de afweging van zorgorganisaties tussen samenwerkingsverbanden en fusies. In hoofdstuk 4 wordt onderzocht hoe de handhaving van het kartelverbod in de periode van 2004-2020 is veranderd, en wat de rol van publieke en politieke opvattingen hierin is. Deel 2 van het proefschrift omvat een tweetal hoofdstukken gericht op enerzijds borstkankeroperaties (hoofdstuk 5) en anderzijds op maag-, lever-, slokdarm- en alvleesklieroperaties (hoofdstuk 6).

## Deel 1: verkenning van interorganisationele samenwerking tussen zorgaanbieders in de setting van gereguleerde marktwerking

Om beleidssturing gericht op samenwerking toepasbaar te maken voor verschillende sectoren is systematisch inzicht in de karakteristieken en onderliggende motieven van samenwerkingsverbanden nodig. Het onderzoek gepresenteerd in **hoofdstuk 2** is gebaseerd op een vragenlijstonderzoek onder een representatief panel van zorgbestuurders die middelgrote- en grote zorgorganisaties besturen, verdeeld over alle sectoren. Zorgbestuurders geven aan dat ziekenhuizen vaak samenwerken met een relatief klein aantal partners in kleine horizontale verbanden. Verpleeghuizen, gehandicaptenzorgorganisaties en GGZ-instellingen werken juist vaker in grotere gemengde of niet-horizontale verbanden samen. Onze resultaten laten zien dat de verschillen tussen sectoren in typen en motieven parallellen vertonen met beleids- en institutionele ontwikkelingen. Voorafgaand aan de samenwerking voeren veel zorgorganisaties een self-assessment uit waarbij de potentiële effecten van samenwerking worden onderzocht. Het gepresenteerde overzicht van beleidsontwikkelingen, typen samenwerkingsverbanden en

nagestreefde doelen biedt een startpunt voor vervolgstudies naar de effectiviteit van de samenwerking.

Wanneer zorgorganisaties een verband aangaan met andere zorgorganisaties kunnen zij grofweg kiezen tussen volledige integratie door middel van een fusie, of samenwerking voor een deel van de activiteiten in een interorganisationeel samenwerkingsverband. We weten echter niet in hoeverre zorgorganisaties een afgewogen keuze maken tussen beide vormen van integratie. **Hoofdstuk 3** gaat daarom in op de i) onderliggende motieven voor beide vormen van integratie, ii) de mogelijke afweging tussen de twee vormen van integratie en iii) de ervaren barrières voor het aangaan van samenwerkingsverbanden. Met behulp van kwantitatieve onderzoeksmethoden gecombineerd met analyse van open tekstvelden zijn 137 fusies en 235 samenwerkingsverbanden onderzocht die plaatsvonden tussen 2012 en 2018. Voor beide vormen van integratie is het verbeteren of verbreden van het zorgaanbod de belangrijkste reden. Beide vormen van integratie laten een grote mate van overlap zien ten aanzien van nagestreefde doelen. Institutionele barrières zoals wet- en regelgeving en financieringsstromen worden als grootste barrière gezien door de zorgaanbieders bij het aangaan van samenwerkingsverbanden. Dit onderzoek kan beleidsmakers, toezichthouders en zorgaanbieders ondersteunen bij het gelijktijdig nastreven van maatschappelijke- en organisatiedoelen bij de besluitvorming rondom fusies en samenwerkingsverbanden.

In zorgsystemen gebaseerd op marktwerking is de handhaving van het kartelverbod belangrijk om verstoorde markverhoudingen te voorkomen. Dit is te meer belangrijk in zorgsystemen waarin sprake is van een hoge mate van integratie tussen zorgaanbieders. Dit mededingingstoezicht is complex, en kan bovendien beïnvloed worden door politieke en publieke druk. In **hoofdstuk 4** bespreken we hoe het kartelverbod is gehandhaafd tussen 2004 en 2020, en of er een relatie is met veranderende sentimenten ten aanzien van marktwerking in de gezondheidszorg. Hiervoor is gebruik gemaakt van kwalitatieve- en tekstuele analyses op 37 documenten van de mededingingsautoriteit, 126 parlementaire vragen en bijna 1500 krantenartikelen. Uit het onderzoek blijkt dat ACM in het eerste gedeelte van de onderzoeksperiode (2004-2012) vooral bestraffend heeft opgetreden tegen schendingen van het kartelverbod, zoals prijsafspraken en marktverdelingsafspraken. In de tweede helft van de studieperiode (2012-2020) lag de focus juist op het vooraf verschaffen van informatie aan zorgaanbieders. De politieke en publieke opvattingen over marktwerking in de gezondheidszorg zijn tijdens de gehele studieperiode als negatief te bestempelen. Op basis van het onderzoek kan geconcludeerd worden dat een duidelijke verschuiving heeft plaatsgevonden in de manier van handhaving van het kartelverbod. Deze verschuiving kan echter niet direct gerelateerd worden aan veranderingen in publieke en politieke sentimenten.

## Deel 2: Casusstudies over marktwerking en samenwerking in de oncologische zorg

Er is een duidelijke trend zichtbaar van toegenomen centralisatie en samenwerking om ziekenhuisvolume te verhogen en kwaliteit te verbeteren. In tegenstelling tot de brede focus in deel 1 ligt de focus in het tweede deel van het proefschrift alleen op de ziekenhuiszorg. Hier worden volumenormen het meeste toegepast om kwaliteit te waarborgen en te verbeteren. Bovendien is de ziekenhuissector de meest geliberaliseerde sector van de Nederlandse gezondheidszorg. Er is daarom de meeste ruimte voor markwerking tussen zorgaanbieders.

Eerder onderzoek naar de volume-uitkomstrelatie in de oncologische zorg richtte zich voornamelijk op laag-volume tumoren, en nam de rol van naburige ziekenhuizen vaak niet mee. In **hoofdstuk 5** is daarom de samenhang tussen ziekenhuisvolume, concurrentie met naburige ziekenhuizen en patiëntuitkomsten onderzocht. Hiervoor is gebruikt gemaakt van de Nederlandse Kankerregistratie (NKR). De steeproef bestond uit 136 958 patiënten die een operatie voor invasieve borstkanker hebben ondergaan tussen 2004 en 2014. De geselecteerde patiëntuitkomsten zijn schone of niet-vrije snijvlakken, een heroperatie binnen 90 dagen en overleving. Onze resultaten laten zien dat de meeste variatie in uitkomsten verklaard kan worden door patiënt- en tumorkarakteristieken. Na correctie voor correlatie binnen ziekenhuizen zorgen de variabelen ziekenhuisvolume en competitie niet voor statistisch significante samenhang met verschillen in schone of niet-vrije snijvlakken of heroperaties. Voor patiënten die geopereerd zijn in ziekenhuizen die 250 operaties of meer per jaar uitvoerden bleken de overlevingskansen iets beter te zijn. Gebaseerd op de gekozen uitkomstindicatoren kan gesteld worden dat ziekenhuisvolume en ziekenhuiscompetitie geen belangrijke rol lijken te spelen in de verklaring van verschillen in patiëntuitkomsten. Voor vervolgonderzoek gericht op het verklaren van ziekenhuisvariatie voor tumoren zoals borstkanker is het gebruik van geavanceerde indicatoren voor ziekenhuiscompetitie een belangrijke aanbeveling. Daarnaast dient bij toekomstig onderzoek het gehele zorgtraject mee worden genomen; zowel binnen het ziekenhuis, als ook zorg geleverd door andere organisaties.

Vanuit mededingingsperspectief is weinig bekend over hoe samenwerking tussen aanbieders bijdraagt aan patiëntuitkomsten, en hoe een balans gevonden kan worden tussen schaalvoordelen en het voorkomen van anti-competitieve gedragingen. **Hoofdstuk 6** bespreekt een casusstudie tussen drie ziekenhuizen ten aanzien van hoog complexe kankerzorg. Dit samenwerkingsverband is onderzocht door ACM in het kader van een informele zienswijze. De voorlopige empirische bevindingen laten slechts een kleine verhoging in prijs en reistijd zien voor sommige kankeroperaties. De volume-analyse laat zien dat de centralisatie van operaties bij moment van onderzoek nog niet volledig

is gerealiseerd. Het onderzoek wijst op het belang van een uitgebreide self-assessment door de samenwerkende partijen waarin de risico's en effecten worden besproken. Vanuit de kant van de mededingingsautoriteit is meer inzicht nodig in de lange termijn veranderingen kwaliteit, ziekenhuisprijzen en winstgevendheid na het starten van een samenwerkingsverband.

Het proefschrift wordt afgesloten met twee implicaties. Ten eerste is verder toezicht op horizontale verbanden belangrijk, met name in de ziekenhuiszorg, omdat hier de meeste prikkels gericht op marktwerking zijn geïntroduceerd. Ten tweede blijft het toezien op de goede uitvoering van self-assessments van belang. Vervolgonderzoek kan bijdragen door inzicht te geven in de effectiviteit van samenwerking, analyseren hoe beleidsmakers zich kunnen verhouden tot meer geformaliseerde vormen van samenwerking en inzichtelijk maken wat er schriftelijk wordt vastgelegd in samenwerkingsafspraken. Tot slot blijft de gewenste mate van prikkels gericht op samenwerking en concurrentie een politieke afweging. Echter, de bevindingen uit het proefschrift kunnen gebruikt worden voor gezondheidszorgbeleid en mededingingsbeleid in zorgsystemen waarin gelijktijdig samenwerking en marktwerking wordt nagestreefd.

# PHD PORTFOLIO

## Education

| Course | Year |
|---|---|
| Bsc. Sociology | 2011-2014 |
| Health Law (Cum laude) | 2015 |
| Medical Sociology (Cum laude) | 2015-2016 |

### International peer-reviewed publications (published or submitted)

Van der Schors, W., Roos, A.F., Kemp, R. & Varkevisser, M. (2021). Inter-organizational collaboration between healthcare providers. *Health Services Management Review.* 34(1), 36-46.

Van der Schors, W. & Varkevisser, M. (2021). Does enforcement of the cartel prohibition in healthcare reflect public and political attitudes towards competition? A longitudinal study from the Netherlands. *Manuscript submitted to Journal of Competition Law & Economics*

Van der Schors, W., Kemp, R., Van Hoeve, J., Tjan-Heijnen V., Maduro, J. Vrancken Peeters, M, Siesling, S., Varkevisser, M. (2022). Associations of hospital volume and hospital competition with short-, middle- and long-term patient outcomes after breast cancer surgery: A retrospective population-based study. *BMJ Open*

Van der Schors, W., Roos, A.F., Kemp, R. & Varkevisser, M. (2022). Marriage or living apart together? An insight into the trade-off between merging and collaborating in healthcare. *Manuscript submitted to International Journal of Health Planning & Management*

Van der Schors, W., Kemp, R. & Varkevisser, M. (2020). Collaboration and competition policy in a market-based hospital system: a case study from the Netherlands *Journal of Competition Law & Economics.* 16(2), 262-288

Van der Schors, W., Brabers, A., De Jong., J. (2020) Why do people not switch health insurer in a market-based health insurance market? Results from a nationwide survey among the general population and people who suffer from a chronic illness in the Netherlands. *European Journal of Public Health,* 30(4), 633-638

Van der Schors, W., Brabers, A., De Jong., J. (2020) Does the chronically ill population in the Netherlands switch their health insurer as often as the general population? Empirical evidence from a nationwide survey study *BMC Health Services Research* 20(376), 1-11

Galen, L.S. van, Van der Schors, W., Damen, N.L., Kramer, M.H.H., Wagner, C., Nanayakkara, P.W.B. (2016)
Measurement of generic patient reported outcome measures (PROMs) in an acute admission unit: a feasibility study. *Acute Medicine* 15(1), 13-19

**Dutch articles**

Van der Schors, W (2021). Ordeningsbeleid in de Nederlandse gezondheidszorg. Werk in uitvoering. *Sociologisch Antropologisch Periodiek.*

Varkevisser, M. & Van der Schors, W (2020)
Marktwerking en mededingingsbeleid in de zorgsector
*KVS Preadviezen 2020 / Economisch Statistische Berichten*

Van der Schors, W., R. Kemp & M. Varkevisser (2020),
Toepassing kartelverbod in de zorg laat veel ruimte voor samenwerking,
*Economisch Statistische Berichten*

Schut, E., Van der Schors, W., Varkevisser, M. (2019)
Reactie concept beleidsregel samenwerking bij Juiste zorg op de Juiste plek
*Consultatiedocument Autoriteit Consument en Markt*

Van der Schors, W., Brabers, A., Jong, J. De (2017)
Solidariteit in het Nederlandse Zorgstelsel: een onderzoek naar de bereidheid om voor anderen te betalen onder de algemene bevolking.
www.nivel.nl, NIVEL, 2017, 28 p

Van der Schors, W., Brabers, A., Jong, J. de (2017)
Een vijfde van de verzekerden overwoog om te wisselen van zorgverzekeraar, maar zag hier vanaf. Utrecht, NIVEL, 2017, 8 p

Van der Schors, W., Brabers, A.E.M., Jong, J.D. de (2017)
8% wisselt van zorgverzekeraar. Deel verzekerden lijkt steeds vaker inhoudelijke overwegingen mee te nemen bij keuze zorgverzekering. www.nivel.nl, NIVEL, 2017

Brabers, A., Schors, W. van der, Jong, J. de.
Zorggebruikers zien patiëntenorganisatie als belangrijke bron voor lotgenotencontact. www.nivel.nl: NIVEL, 2017.

## PhD training

| Course | Year |
|---|---|
| Basic Didactics | 2018 |
| How to survive your PhD | 2018 |
| Bachelorscriptie begeleidingsmodule | 2018 |
| Applied Econometric, Erasmus School of Economics | 2019 |
| Digital research methods for textual data | 2020 |
| Group dynamics | 2021 |
| Advanced Excel | 2021 |

## Conferences

| Conference | Year |
|---|---|
| Tweede kamer commissie fusies AMC/VUmc | 2018 |
| Mergers and Competition Policy in the Dutch healthcare sector | 2018 |
| Zorgsamen Event | 2018 |
| BNR specialisaties in de gezondheidszorg | 2018 |
| LoLa HESG | 2018 |
| Netwerken in de gezondheidszorg, RadboudMC | 2018 |
| Overnames en samenwerking in de gezondheidszorg, STEK advocaten | 2019 |
| International Health Economics Association Congress, Basel | 2019 |
| European Health Management Association Congress, Helsinki | 2019 |
| European Health Economics Association PhD Congress, Rotterdam | 2020 |
| Congres Oncologische Zorgpaden, IKNL | 2020 |
| Vereniging voor Gezondheidseconomie (VGE) jaarcongres | 2020 |
| KVS Economenvereniging Congres | 2020 |
| European Health Management Association Congress (online) | 2021 |
| International Health Economics Association Congress (online) | 2021 |

## Presentations

| Conference | Year |
|---|---|
| Health systems and insurance, Erasmus University | 2018 |
| International Health Economics Association Congress, Basel | 2019 |
| European Health Management Association Congress, Helsinki | 2019 |
| Health systems and insurance, Erasmus University | 2019 |
| ACM Directie Zorg | 2019 |
| NVZD Board | 2019 |
| Medical Sociology, University of Groningen | 2019 |
| KVS Economenvereniging Congres | 2020 |
| IKNL | 2020 |
| Medical Sociology, University of Groningen | 2020 |

| | |
|---|---|
| Health systems and insurance, Erasmus University | 2020 |
| IKNL | 2021 |
| European Health Management Association Congress (online) | 2021 |
| International Health Economics Association Congress (online) | 2021 |
| Medical Sociology, University of Groningen | 2021 |

## Supervising and teaching

| **Course** | **Year** |
|---|---|
| Tutor in the pre-master course "Statistics B" | 2017-present |
| Supervisor in the pre-master course "Kwanitatief Leeronderzoek" | 2017-2019 |
| Supervisor of bachelor theses | 2017-2019 |
| Tutor in the Bachelor course "Marktordening in de Gezondheidszorg" | 2019-present |
| Co-reader master-thesis | 2020 |

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ACM. (2004b). *Boete prijsafspraken verenigingen van psychologen en psychotherapeuten*. Den Haag: Autoriteit Consument & Markt.

ACM. (2005). *Informele zienswijze preferentiebeleid*. Den Haag: Autoriteit Consument & Markt.

ACM. (2006). *Informele zienswijze regiovertegenwoordiging (zorgsector)*. Den Haag: Autoriteit Consument & Markt

ACM. (2008a). *Boete gebiedsverdeling Thuiszorg Kennemerland*. Den Haag: Autoriteit Consument & Markt.

ACM. (2008b). *Boete samenwerkingsovereenkomst Thuiszorg 't Gooi*. Den Haag: Autoriteit Consument & Markt.

ACM. (2008c). *Toezeggingsbesluit gebiedsverdeling Kinderopvang Amsterdam.* Den Haag: Autoriteit Consument & Markt

ACM. (2010a). *Boete non-concurrentiebeding thuiszorg Midden IJssel*. Den Haag: Autoriteit Consument & Markt.

ACM. (2010b). *Boete tariefafspraken aanbesteding WMO thuiszorg Friesland.* Den Haag: Autoriteit Consument & Markt.

ACM. (2010c). *Richtsnoeren voor de zorgsector*. Den Haag: Autoriteit Consument & Markt.

ACM. (2010d). *Richtsnoeren Zorggroepen*. Den Haag: Autoriteit Consument & Markt.

ACM. (2010e). *Toezeggingsbesluit ziekenhuiszorg Amsterdam*. Den Haag: Autoriteit Consument & Markt

ACM. (2011a). *Boete non-concurrentiebeding samenwerkingsverband Stichting Vierstroom en Careyn Zuwe Aveant*. Den Haag: Autoriteit Consument & Markt.

ACM. (2011b). *Boetebesluit vestigingsadviezen Landelijke Huisartsen Vereniging*. Den Haag: Autoriteit Consument & Markt.

ACM. (2011c). *NMa wijst KNGF op gevaar van collectief optreden richting zorgverzekeraars*. Den Haag: Autoriteit Consument & Markt.

ACM. (2012). *Toezeggingsbesluit Landelijke Huisartsen Vereniging.* Den Haag: Autoriteit Consument & Markt.

ACM. (2013a). *Beoordeling fusies en samenwerkingen ziekenhuiszorg*. Den Haag: Autoriteit Consument & Markt.

ACM. (2013b). *Informele Zienswijze beoordeling concurrentie tussen apotheken*. Den Haag: Autoriteit Consument & Markt.

ACM. (2014a). *ACM wijst zorgverzekeraars op mededingingsrisico bij uitvoering gezamenlijke plannen spoedeisende zorg.*

ACM. (2014b). *Leidraad uitwisselen informatie afbouw capaciteit zorg*. Den Haag: Autoriteit Consument & Markt.

ACM. (2015a). *Informele zienswijze gezamenlijke inkoop medicijn TNFi.* Den Haag: Autoriteit Consument & Markt.

ACM. (2015b). *Informele zienswijze protonentherapie*. Den Haag: Autoriteit Consument & Markt.

ACM. (2015c). *Reactie ACM op praktijksituaties in huisartsenzorg*. Den Haag: Autoriteit Consument & Markt.

ACM. (2015d). *Zes ziekenhuizen mogen samenwerken voor betere borstkankerzorg*. Den Haag: Autoriteit Consument & Markt.

ACM. (2016a). *Informele zienswijze samenwerking ziekenhuizen complexe kankerzorg*. Den Haag: Autoriteit Consument & Markt.

ACM. (2016b). *Leidraad gezamenlijke inkoop geneesmiddelen*. Den Haag: Autoriteit Consument & Markt.

ACM. (2017a). *Explanatory notes merger control hospitals*. Den Haag: Autoriteit Consument & Markt.

ACM. (2017b). *Informele zienswijze over samenwerking zorgaanbieders bij acute thuiszorg*. Den Haag: Autoriteit Consument & Markt.

ACM. (2017c). *Prijs- en volume-effecten van ziekenhuisfusies*. Den Haag: Autoriteit Consument & Markt.

ACM. (2018). *Leidraad beoordeling toetredingscriteria samenwerken geboortezorg*. Den Haag: Autoriteit Consument & Markt.

ACM. (2019a). *ACM Policy Rule on arrangements as part of the movement called "The right care in the right place."* Den Haag: Autoriteit Consument & Markt.

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Wouter van der Schors (Groningen, 1993) completed a bachelor in sociology and additional minor in health law (*cum laude*) in 2014. He obtained his master's degree in medical sociology in 2016 (*cum laude*). He worked as a research assistant and (junior) researcher at the Nivel Institute for Health Services Research. He investigated health insurance decision making, quality measurement tools and solidarity in health insurance markets. This resulted in peer-reviewed scientific papers and various reports. In 2017, Wouter started his PhD trajectory at the Erasmus School of Health Policy and Management (ESHPM, Erasmus University Rotterdam). In his dissertation, Wouter combined quantitative, qualitative and textual research methods to study the implications of collaborations for competition policy and healthcare management, the relationship with institutional developments and the effect of inter-organizational collaboration on quality in oncological care networks. He taught various bachelor and pre-master level courses and was involved in thesis supervision. He volunteers as a mentor for young inhabitants of Rotterdam experiencing difficulties. As of 2022, Wouter works as an advisor for the Dutch Health and Youth Care Inspectorate.