Final report

# Product market definition in hospital care

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# 0 Executive summary

The market for specialist medical care is highly fragmented when it is defined on the basis of possible demand substitution. For example, a patient with an inguinal hernia will not benefit from 99.6% of the remainder of specialist medical care. Product market definition from the demand perspective leads to many different product markets.

On the basis of supply substitution, the product markets for specialist medical care with comparable competition conditions are larger.

This mainly concerns supply substitution within specialisms. Supply substitution between specialisms is limited to 4% to 8% of turnover. We find that substitution in general internal medicine with gastroenterology & hepatology and rheumatology, and for surgery with neurosurgery and orthopedics.

The fact that there is scarcely any substitution of treatments between specialisms does not mean that every specialism constitutes its own product market. On the one hand, they may need to be subdivided, for example into basic care and complex care. On the other hand, a specialism-based definition is too narrow where there is a connection between specialisms.

The conditions under which providers of specialist medical care compete differ between complex care and basic care. Basic care is provided by almost every hospital, whereas complex care is provided by appropriately specialized hospitals (including academic hospitals). Hospitals which provide complex care also provide basic care. The proportion of complex care naturally differs depending on the specialism. Based on our analysis for 2014, we estimate the following key figures for complex care for which travel takes place:

- approximately one-third of the 4,250 Diagnosis Treatment Combination (DTC) care products
- approximately one-tenth of the volume of the 13.6 million DTC care products
- approximately one-fifth of the analyzed turnover of almost €14 billion

The complement to complex care has been analyzed in greater detail. Basic care is supplied by all specialisms with the exception of neurosurgery and cardiothoracic surgery, which both provide only complex care. This concerns 80% (by volume, 65% by turnover) of the DTC care products. On the basis of a cluster analysis looking at the relationship between care and other specialisms and the hospital, we have

identified seven product markets and eleven clusters which possibly also form full or partial product markets. There is also a residual cluster.

- Approximately 28% (by volume, 14% by turnover) of the DTC care products are supplied in seven product markets with the following dominant specialisms: ophthalmology, orthopedics, ENT, dermatology, rheumatology, plastic surgery and surgery. This care can be provided outside the hospital setting. A large part of this care is also provided by independent treatment centers (independent treatment centers). In the case of surgery, that concerns non-complex operations such as the treatment of varicose veins, hemorrhoids and benign tumors. It is possible that more separate product markets can be found through more detailed investigation.

- Approximately 51% (by volume, 49% by turnover) of care is provided in eleven clusters which are connected to care in the remainder of the hospital. Whether there are actually separate product markets depends on whether these clusters have sufficient scale to operate the required facilities themselves, or whether these facilities can also be purchased externally.

    - Two clusters with obstetrics & gynecology (excluding oncology) and pediatrics operate relatively independently of other primary specialisms. However, they do require hospital facilities in order to be able (and permitted) to provide their care. It is possible that due to economic necessity they do not form an entirely separate product market, because they do not have the volume required in order to make sufficient use of the necessary facilities themselves.

    - Five clusters with diagnostic specialisms of internal medicine, neurology, cardiology, gastroenterology & hepatology and pulmonary medicine. Approximately one in nine patients is also seen by surgery.

    - A cluster with gastroenterology & hepatology as the dominant specialism focused on oncological diagnosis and treatment.

    - A cluster with urology as the dominant specialism that also is very similar to the previous six clusters.

    - Two clusters: general internal medicine and surgery. In both clusters there is a relatively strong connection with the other field (surgery and general internal medicine). Of all nineteen clusters, these have by far the most connection with the facilities in a hospital.

The degree to which the product markets suggested above also have uniform conditions for competition also depends on other factors. Many hospitals are engaged

in strategic reorientation and reviewing the way in which they, and the networks in which they operate, organize themselves.

# 1 Detailed summary

ACM commissioned SiRM and Twynstra Gudde to investigate what proportion of hospital care involves complex care and what the connections are in care provision within a hospital.

This question is relevant to the definition of the product market by the competition authorities. This is part of merger assessments and investigations into significant market power, possible abuse of a dominant market position and cartels. Up until now the market for hospital care has usually been seen in terms of outpatient and clinical markets, without any further subdivision. In some cases top referral care is viewed separately. Competition authorities are now beginning to draw a more detailed distinction between different products in the market for hospital care, for example in United Kingdom, where in recent decisions the market has been viewed in terms of (primary or other) specialisms. This debate is now also taking place in Germany, France and the United States.

The degree of complexity of care plays an important role in defining the market. If, for example, the market for two hospitals which do not provide any complex care were investigated, the market shares would have to be corrected to take account of that part of the market in which they do not operate.

The context of hospital care is also important for competition supervision. In the case of care for which a hospital needs specific facilities, such as an IC or emergency unit, and/or for which multiple medical specialisms are required in order to provide that care, the barriers to entry are higher than in the case of care that can be supplied separately from the rest of the hospital.

Our investigation into the part of care that is complex and into the connections in hospital care consists of qualitative and quantitative analyses. The quantitative research has been based on the claimed care products (hereinafter: DTC care products) and underlying care activities in 2014, the most recent year for which a good database is available. For the qualitative part we have drawn on our own experience and various publications. The findings were discussed in three focus groups: with health insurers, hospital directors and medical specialists. We have used the results of the focus groups as input. The ultimate findings are those of SiRM and Twynstra Gudde.

The findings in the report are often shown in terms of the share of DTC care products in the total care provision. We use the following shares: (1) The volume share concerns the share of the DTC care products claimed in 2014 (total almost 14 million), (2) the turnover share concerns the share in the €13.7 billion of turnover we investigated and (3) the number share concerns the share of specific DTC care products of the 4,250 defined care products.

## 1.1 Complexity

There is no shared, standard definition of complexity in care; neither among the care providers themselves, nor among health insurers. Complexity in care can be distinguished in terms of care complexity and case complexity. In the case of care complexity the nature of the treatment determines the extent of complexity. In the case of case complexity, the situation and condition of the patient determine the degree of complexity, for example because there are multiple simultaneous conditions as a result of which an inherently simple procedure becomes complex. We expect care complexity will lead in particular to homogeneously complex DTC care products. Case complexity can result in the same DTC care product encompassing complex care on one occasion but not on another.

### 1.1.1 Travel behavior as a criterion for complexity

One of the characteristics of complex care, particularly with regard to care complexity, is that care is not offered by all hospitals. We use this in an overarching criterion: observed travel behavior. Overall, we find that patients consume less than 60% (by volume) of the DTC care products in the nearest hospital. In the case of over 5% (by volume) of the DTC care products, more than 10 hospitals are closer than the hospital which the patient has attended.

For 13% of the volume of claimed DTC care products (24% by turnover, 38% by number) the "proximity index" was higher than 2.1. This means that for those DTC care products on average more than 2.1 hospitals were closer than the supplying hospital. There are various indications that above this proximity index the degree of complexity is significantly higher than below it. This analysis has been cleaned up to take account of DTC care products for which travel to independent treatment centers and hospitals presumably took place for actual or alleged quality differences.

### 1.1.2 Other criteria for complexity

In addition to travel behavior, for each DTC care product we have defined a further seven (related) criteria of complexity. A large part of the volume of DTC care

products (71%) which we classify on the basis of travel behavior in category C* with possible complex care, was also classified as complex care on at least one of the other seven criteria. These criteria are: top referral and top clinical care, rarity, licenses under the Specialist Medical -Procedures Act (Wbmv), minimum standards, use of medical technology, multidisciplinarity and judgment of medical practitioners. As stated previously, there is a relationship between these criteria, and they are partly overlapping: complex care is often regulated care (Wbmv licenses, volume standards), occurs less frequently (rarity), makes higher demands on the medical-technological infrastructure and often requires multidisciplinary collaboration. Partly for these reasons, complex care is generally concentrated (travel distance) in top clinical hospitals and academic hospitals (top clinical and top referral care).

### 1.1.3 Share of complex care

It is difficult to determine precisely for each DTC care product whether it describes complex care, and whether that then applies to all patients for which that DTC care product has been claimed.

Based on our analysis for 2014, we estimate the following key figures for complex care for which travel takes place:

- over one-third of the 4,250 defined DTC care products
- over one-tenth of the volume of the more than 13 million DTC care products
- over one-fifth of the analyzed turnover of almost €14 billion

## 1.2 Connections

Different types of connections or interrelatedness can be distinguished. Here we analyzed in particular the connections within a hospital. For each patient we investigated the involvement of the primary specialisms and the use of the hospital's facilities. We also investigated which separate clusters of care could be distinguished.

### 1.2.1 Multidisciplinary collaboration

#### Substitution between specialisms

Substitution between specialisms plays a minor role. The top five substitution combinations between specialisms are as follows (in order of the turnover share that is substituted): gastroenterology & hepatology for general internal medicine (17%), gastroenterology & hepatology for surgery (8%), neurosurgery for surgery (8%),

surgery for orthopedics (6%). Supply substitution between specialisms is therefore possible for these combinations. In total it concerns 3.8% (by turnover, 5.7% by volume) with the 2% cut-off limit of 2% substitution applied between specialisms (without that limit it is 7.6% and 9.9% respectively). Supply substitution between specialisms is therefore limited. The product market definition based on supply substitution will be dominated by supply substitution within specialisms.

That does not mean that every primary specialism constitutes its own product market. On the one hand, they may need to be divided, for example into basic care and complex care as discussed above. On the other hand, such a definition may be too narrow due to connections between specialisms. These connections were investigated.

Multidisciplinarity

Across the entire volume of patients, a single primary specialism is involved in approximately 10%, two are involved in 68% of care and three or more in the remainder. In turnover shares, approximately 13% is monodisciplinary, 45% bidisciplinary, while 42% of care turnover is for patients who have seen three or more primary specialisms in the same year. It may also be that these are not related care requirements. In addition, this degree of connection does not mean that care must by definition be provided in that way. It reflects the current working method. It is possible that part of the care could be provided outside or in another hospital without any negative impact on quality or accessibility.

### 1.2.2 Independence of specialisms in independent treatment centers.

Independent treatment center provide approximately 4% (by volume, 3% by turnover) of the care. We estimate that independent treatment centers have a significant presence in 14% to 28% of the market for specialist medical care (by volume, 10% to 16% by turnover). Independent treatment centers compete in almost the entire markets for ophthalmology, dermatology, plastic surgery and allergology. In the case of orthopedics, neurosurgery, cardiology, rehabilitation, gynecology, gastroenterology & hepatology and surgery, competition with independent treatment centers takes place in part of the market.

### 1.2.3 Connections between primary specialisms

Seven medical specialisms have little involvement among patients who receive care products for which another specialism is dominant.

- Pediatrics, rheumatology, allergology, geriatrics and psychiatry[1]. These specialisms are involved in fewer than 3% (by turnover) of the DTC care products of other primary specialisms. Conversely, their patients do see other medical specialists, particularly geriatrics and psychiatry patients.

- Cardiothoracic surgery and neurosurgery also barely see any patients who receive DTC care products in another specialism (3% to 4%). Both neurosurgery and cardiothoracic surgery are therefore not present in all hospitals. Cardiothoracic surgery and neurosurgery procedures are defined parts of a treatment for which the patient can travel to another hospital.

In four medical specialisms we find that independent treatment center obtain market shares of up to 10% on approximately one-third of the volume of DTC care products for those specialisms. These are ophthalmology, dermatology, plastic surgery and allergology. For other specialisms too, competition from independent treatment center can be important. Independent treatment centers have a market share of at least 10% in over 14% or so (by volume, 10% by turnover) of the market. If we set that limit at 5%, the figure is double that (28% volume, 16% turnover).

Surgery and general internal medicine are the most interrelated with other primary specialisms. Patients in almost all other medical specialisms also see a surgeon or internist for at least 3% of turnover in the same year.

### 1.2.4 Connections with clinic and emergency care

For a new entrant, the clinic and emergency care facilities probably represent the highest barriers to entry. These involve large investments and sufficient scale is required in order to make profitable use of these facilities.

- The four medical specialisms which are least associated with the clinic are allergology, ophthalmology, rheumatology and dermatology. Some of the treatments can therefore be carried out effectively in an outpatient unit or a ZBC. The ENT and plastic surgery specialisms also have relatively limited connections with the clinic.

[1] The mental health DTCs in psychiatry are not part of the analysis.

- Over one-third of the care turnover (35%) is provided by patients for whom a procedure has been recorded in the emergency unit in that year (27% by volume). Acute care is the most relevant to the specialisms of geriatrics and psychiatry. (That does not necessarily mean that a fully equipped emergency unit is required for those specialisms.) Emergency care is also important for patients in pediatrics, neurology, surgery, general internal medicine, urology, cardiology and gastroenterology & hepatology. Specialisms for which emergency care is less relevant are allergology, rheumatology, ophthalmology and dermatology. The specialisms of obstetrics & gynecology, ENT and allergology also receive relatively few patients through emergency care.

### 1.2.5 Clusters of DTC care products

We have carried out a cluster analysis of all care which we have not classified as probably complex. DTC care products which have been claimed less than 1,500 times and add-on medication have also been disregarded. In a cluster analysis, clusters are formed with the least possible difference within a cluster and the greatest possible difference between the clusters. In this way 80% of the DTC care products (by volume, 65% by turnover) have been classified in nineteen clusters. We have grouped those clusters in seven types:

I. Six clusters each supplied with 92% or more care by: ophthalmology, orthopedics, ENT, rheumatology, plastic surgery and dermatology. Half to three-quarters of the volume of DTC care products for those specialisms falls within the cluster, except for plastic surgery. The DTC care products for this type of cluster are supplied to patients who see relatively few other specialisms. This care is already provided to a relatively large extent by independent treatment centers. That may be possible for all these six clusters, i.e. 27% (by volume, 13% by turnover) of the care.

II. Obstetrics & gynecology (excluding oncological gynecology) and pediatrics. They are involved in almost all DTC care products in their cluster, while their patients hardly see any other specialisms; the fewest of all clusters. Two-thirds of their own volume of DTC care products falls within these clusters. This requires a significantly higher share of clinical admissions than in the case of type I and a higher share of emergency care for pediatrics.

III. A cluster for which surgery is dominant (84%). The care has relatively little connection with other specialisms. The cluster does have the highest importance of emergency care for a cluster (56%). Polyclinic visits due to injuries and various operations make up the core of this cluster. It is possible that part of this cluster can be offered outside the hospital. This concerns less than 1.4% (by volume, 1% by turnover) of all the DTC care products provided in 2014 which are already being provided for more than 5% by independent treatment centers.

IV. Six clusters: Five clusters with diagnostic specialisms of internal medicine, neurology, cardiology, pulmonary medicine and gastroenterology & hepatology. One cluster with urology as the dominant specialism. Approximately one in nine patients is also seen by surgery.

V. One cluster with gastroenterology & hepatology as the dominant specialism with a high proportion of day care, and diagnostic procedures with medium complexity.

VI. Two clusters: general internal medicine and surgery. In both clusters there is a relatively strong connection with the other field (surgery and general internal medicine). The share with a procedure in the OR is relatively high and half to one-third of the patients have been in the emergency unit. Of all nineteen clusters, these have by far the highest share with a clinical admission.

VII. Finally, there remains one cluster (3% by volume, 2% by turnover) for which no dominant specialism can be clearly designated. A relatively low proportion of patients come to the emergency unit (11%); almost one-third of the average.

### 1.2.6 Possible product markets

On the basis of the analysis of clusters and the description of the connections, we estimate that we can define six clear product markets. In addition there are twelve clusters of care which can possibly each form their own product market or can be further subdivided.

- Approximately 28% (by volume, 14% by turnover) of the DTC care products can possibly be provided without requiring a fully equipped hospital organization. These are the six clusters of DTC care products in type I, and part of the type III cluster. The dominant specialisms are: ophthalmology, orthopedics, ENT, dermatology, rheumatology, plastic surgery and surgery. In a large part of these product markets, independent treatment centers already have market shares above 5%.

- Approximately 51% (by volume, 49% by turnover) of the care occurs in ten clusters which are connected with care in the rest of the hospital. Whether there are actually separate product markets depends on whether these clusters have sufficient scale to operate the required facilities themselves, or whether these facilities can also be purchased externally.

- Part of the care remains in a broadly defined residual cluster of 3% (by volume, 2% by turnover) of the DTC care products.

- The remainder of the DTC care products have not been included in the clustering (20% by volume, 35% by turnover). These are care products with a very low volume or which have been previously classified as possibly complex care.

In the definition of product markets, due account must be taken of the qualitative aspects of collaboration. We found that connection is becoming increasingly important, both within and between hospitals for certain treatments.

## 1.3 Conclusion

The market for specialist medical care is highly fragmented when it is defined on the basis of possible demand substitution. For example, a patient with an inguinal hernia will not benefit from 99.6% of the remainder of specialist medical care. Product market definition from the demand perspective leads to many different product markets.

On the basis of supply substitution, the product markets for specialist medical care with comparable competition conditions are larger.

This mainly concerns supply substitution within specialisms. Supply substitution between specialisms is limited to 4% to 8% of turnover. We find that substitution in general internal medicine with gastroenterology & hepatology and rheumatology, and for surgery with neurosurgery and orthopedics.

The fact that there is scarcely any substitution of treatments between specialisms does not mean that every specialism constitutes its own product market. On the one hand, they may need to be subdivided, for example into basic care and complex care. On the other hand, a specialism-based definition is too narrow where there is a connection between specialisms.

We find that approximately 1/10 of the volume of care (1/5 of turnover) consists of complex care for which travel takes place. We have classified the remaining care in

seven specific product markets and a further twelve clusters which may describe other product markets.

With this analysis ACM can refine the assessment of mergers and possible significant market power.

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# 2 Introduction

ACM commissioned SiRM and Twynstra Gudde to investigate what proportion of hospital care involves complex care and what the connections are in care provision within a hospital.

This question is relevant to the definition of the product market by the competition authorities. This is part of merger assessments and investigations into significant market power, possible abuse of a dominant market position and cartels. Up until now the market for hospital care has usually been seen in terms of outpatient and clinical markets, without any further subdivision. In some cases top level care is viewed separately. Competition authorities are now beginning to draw a more detailed distinction between different products in the market for hospital care, for example in the United Kingdom, where in recent decisions the market has been viewed in terms of (primary or other) specialisms. This debate is now also taking place in Germany, France and the United States.

The degree of complexity of care plays an important role in defining the market. If, for example, the market for two hospitals which do not provide any complex care were investigated, the market shares would have to be corrected to take account of that part of the market in which they do not operate.

The context of hospital care is also important for competition supervision. In the case of care for which a hospital needs specific facilities, such as an IC or emergency unit, and/or for which multiple medical specialisms are required in order to provide that care, the barriers to entry are higher than in the case of care that can be supplied separately from the rest of the hospital.

Our investigation into the part of care that is complex and into the connections in hospital care consists of qualitative and quantitative analyses. The quantitative research has been based on the claimed care products (hereinafter: DTC care products) and underlying care activities in 2014, the most recent year for which a good database is available. For the qualitative part we have drawn on our own experience and various publications. The findings were discussed in three focus groups: with health insurers, hospital directors and medical specialists. We have used the results of the focus groups as input. The ultimate findings are those of SiRM and Twynstra Gudde.

The findings in the report are often shown in terms of the share of DTC care products in the total care provision. We use the following shares:

- the volume share concerns the share of the DTC care products claimed in 2014 (total of almost 14 million),

- the turnover share concerns the share in the €13.7 billion of turnover we have investigated and
- the number share concerns the specific share of DTC care products of the 4,250 defined care products.

In this report we first discuss the market definition in specialist medical care (section 3). We then analyze the distinction between complex and non-complex care (section 4) and the extent of connections among care within a hospital (section 5).

# 3 Market definition

In 2006 the Netherlands introduced a system based on regulated market forces in parts of healthcare. The main task of the new system was and remains the improvement of efficiency, greater customer and patient responsiveness and safeguarding a future-proof level of care expenditure and prices and hence accessibility of care.

Two new laws came into force in 2006: the Health Insurance Act (Zvw), which set out among other things the governance role of insurers, and the Healthcare Market Regulation Act (Wmg), setting out the conditions for regulated market forces in care and their supervision by the Dutch Healthcare Authority (NZa). Concentrations in healthcare are supervised by ACM on the basis of the Dutch Competition Act (Mw).

Since 2004 ACM has assessed mergers and collaboration in specialist medical care to identify possible restrictions of competition. On the basis of their own role, IGZ (the Dutch Healthcare Inspectorate) and NZaissue recommendations on intended concentrations.

Since the announcement of the introduction of market forces in the hospital sector, hospital mergers have been a recurrent phenomenon in the Netherlands. The Netherlands currently has 81 general hospitals that are part of 72 hospital organizations, 8 academic hospitals, 65 category institutions and approximately 231 independent treatment centers (table 1).[2]

[2] Stand van de zorgmarkten, NZa, 2015

Table 1: General hospitals, academic hospitals and independent treatment centers over the years

| Type of care provider | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| General Hospitals | | | | | | | | | | |
| *Entities (NZa)* | 88 | 87 | 87 | 85 | 84 | 84 | 84 | 84 | 84 | 81 |
| *Organizations (CBS)* | 82 | 81 | 79 | 78 | 76 | 75 | 75 | 73 | 72 | 72* |
| **Academic hospitals** | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| **Category-based institutions** | | 62 | 67 | 68 | 68 | 65 | 65 | 65 | 65 | 65 |
| **Independent treatment centers** | 94 | 149 | 189 | 220 | 241 | 258 | 288 | 274 | 260 | 231 |

Source: NZa, CTG/Zaio; * no data, assumed to be same as 2014

In the 2006-2015 period, 23 mergers were approved by ACM. One merger was rejected[3]. In the case of seven of the approved mergers, the hospitals became a single entity after the merger. The other 16 mergers are administrative mergers in which the hospitals publish their own annual report and are considered by the NZa to be separate hospitals, or mergers which had not yet been implemented as of 2015.

When assessing mergers, ACM defines the product markets and the associated geographic markets in which competition takes place. For that purpose ACM uses a product market definition which is generally based on generic, clustered clinical and non-clinical, specialist medical care. Recently, however, developments have taken place both in national and international regulation of concentrations, as well as in the structure and organization of the market itself, that have prompted ACM to take a new, critical look at the applied product market definition.

ACM commissioned SiRM and Twynstra Gudde to investigate whether the applied clustered product market definition was still the right approach. In the hospital sector ACM has worked since 2004 on the basis of the three clustered product markets[4]:

- clinical general hospital care;
- non-clinical general hospital care (including outpatient care);

[3] Case 14.0982.24/Stichting Albert Schweitzer Hospital – Stichting Rivas Zorggroep
[4] Unless one of the merged institutions is a specialist institution (e.g. an eye clinic or an orthopedic clinic)

- top-level care (top clinical and top referral care – also known as 'complex' care).

The background to the question of whether this classification is still sufficient lies in the increasing specialization, as a result of which there will be a greater distinction between the products offered by hospitals. ACM questions whether specialisms, patient groups or care profiles would be a better basis for a product market definition. With regard to a possible definition at specialism level, ACM is principally concerned with gaining insight into the interrelationships and interrelatedness between specialisms, including any differences between a general basic hospital, a top clinical hospital and an academic hospital.

ACM also wants more insight into the distinction between basic care and complex care, on the basis of a 'complexity axis'. In addition to DTC care products that are homogeneous complex or non-complex, there would also ideally be a way of classifying heterogeneous DTC care products in terms of the degree of complexity.

With greater insight into the structure of the supply of care, ACM can perhaps further refine the product market definition.

## 3.1 Market definition and specialist medical care.

Market definition is generally seen as a sensible tool for carrying out a competition analysis in a merger assessment or in the assessment of a competition case relating to abuse of a dominant position or other competition infringements. Market definition is also relevant when identifying significant market power on the basis of which the NZa can set conditions. That can also be done preventively, i.e. if no abuse of that significant market power has yet taken place.

Market definition is not always necessary. It is not an aim in itself; it is a means that may be necessary to enable the competition authority to make a proper assessment of the relevant product and geographic space within which the assessed case takes place. In other words, the aim of a relevant market definition is to define as accurately as possible the products among which and the geographic scope within which the competition takes place, the relevant competition forces which those undertakings experience from each other and how strong and effective those forces are in the disciplining of the undertakings.

The next step is the assessment of possible competition effects: what will happen to the competitive pressure between the parties as a result of an intended merger? In other words, to what extent are the merging parties each other's competitors? To what

extent can surrounding parties take over the role – now and in the future (entry)? To what extent are end-users, i.e. patients, but particularly also health insurers, able to discipline the merging parties with their choices, and with their purchasing policy and their control of behavior of their policyholders, should that prove necessary after the intended merger?

### 3.1.1 The definition of the product market

Product market definition starts with the question of whether 'the product', in this case the specialist medical care provided by the hospital, has good replacements from the patient's perspective (demand-side substitution) and from the supplier's perspective (supply substitution).

#### Demand substitution[5]

From the patient's perspective there is no or scarcely any real substitution potential[6]. Someone with hip disease will not benefit from a knee treatment, or from treatment by a clinical psychiatrist. But within a collection of accepted treatments for a particular disease, for example for prostate cancer, different treatment methods, offered by different hospitals, can compete with each other in terms of quality, effectiveness and price.

#### Supply substitution

From the supplier's perspective the question is whether other providers of specialist medical care could adjust their offering, within a clear timeframe of one year for example, in response to a price increase or a reduction in the quality of care from a provider, or whether new entrants can enter the market.

A familiar example concerns the relevant market definition used by the European Commission in the paper market, with regard to writing paper, but in which the European competition authorities considered that producers of high-quality photographic paper could rapidly adjust their production without sustained and prohibitive expense, so that these products also had to be included in the relevant product market[7].

The practice in specialist medical care is that supply substitution between specialisms arises only to a limited extent and that it operates primarily between specialisms.

Supply substitution between specialisms lasts a relatively long time. Some specialisms can take over treatments from another specialism. However, if that requires new

[5] See the CMA Merger assessment guidelines, 2010.
[6] A good discussion of the relevance of demand substitution can be found in the discussion of the relevant product markets in the Royal Bournemouth and Christchurch/Poole Hospital Foundation Trust case, CMA, 17 October 2013
[7] Notice 31997Y1209(01), Official Journal C 372 of 09/12/1997 p. 0005-1113, no. 22

techniques, it takes a fairly long time before scientific proof of effectiveness and safety has been gathered and before the technique has been disseminated. Examples of such substitution are invasive treatments of varicose veins by dermatologists where these were previously carried out by surgeons.

In the case of supply substitution within specialisms, it is also relevant whether a hospital that wishes to enter that market already has the specialism available in-house. That is because starting a new specialism in a hospital involves substantial investments: new equipment, specialist knowledge, nursing knowledge, capacity and experience, etc. In the first NHS trust merger case in 2013 [8]this was the subject of extensive investigation, including the use of specialist medical expertise.

In defining the relevant product market, the emphasis is on the question of whether 'the products' of general hospitals in general are still identical to such an extent that clustering these products is permitted. Or are there developments in the markets for specialist medical care which provide grounds to look somewhat more precisely, more specifically at these products to see whether a specialist medical 'product' that is offered in one hospital is indeed the same care, i.e. fulfills the same medical need, as that offered in an alternative hospital. Complexity of care plays an important role in answering this question.

### 3.1.2 "Classic" market definition difficult to apply in healthcare

Economists have long wrestled with the definition of relevant markets, i.e. the definition of relevant product markets and relevant geographic markets within which the competition takes place. This usually relies on ad hoc descriptions of product characteristics and the geographic distance between businesses. A method of defining the product market that has been generally accepted and better substantiated since the mid-1980 uses a hypothetical test, known internationally as the SSNIP test[9]. SSNIP stands for a hypothetical 'small, significant, non-transitory increase in price' (usually 5% over at least 12 months) which is used when determining the smallest market within which a hypothetical monopolist can carry out this price increase, without being called to order by consumers and competitors.

The test starts with a fairly narrow set of products. The hypothetical demand for those products is then determined: would a small but significant and permanent price increase in this product set by the company concerned lead to an increase in profit? If the answer to the question is negative, there are clearly sufficient alternatives for

[8] "The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust/Poole Hospital NHS Foundation Trust", Competition Commission, 2013.
[9] Introduced in 1982 in the American Merger Guidelines.

consumers and/or competitors can easily produce alternatives. Then the set is expanded with the addition of products and the question is repeated. Long enough until the answer to the question is positive. The set of products then determined forms the relevant product market. For this set of products end-users and competitors are unable, with their substitution reactions, to prevent the hypothetical monopolist from permanently raising his profit through a price rise. Therefore, there are insufficient fallback options for this set. The same test is repeated in order to define the product market also geographically.

Although this is the international standard for the definition of markets for competition purposes, a number of problems arise particularly in markets for specialist medical care which complicate the use of the SSNIP test.

- The test assumes a certain price sensitivity among consumers. Internationally, however, and hence also in the Netherlands, specialist medical care is mainly funded through health insurers. Patients are thus de facto barely price sensitive, or are so only up to the level of the deductible.

- The test assumes that patients can make a rational ax ante assessment with regard to the question of which hospital and which doctor provides the best care. But the reality is that most patients do not have the experience and insight or the right information to do that, or need healthcare to get the right diagnosis. Even retrospectively ascertaining whether the doctor and the hospital were the right choice is often impossible for the patient. Care products are described as 'credence goods'. The question therefore is whether the patient is able to make a good price/quality assessment – particularly concerning more complex care.

- The test assumes that the patient him or herself will make the decision. But that is generally not the case, particularly with regard to specialist medical care. In specialist medical care there are usually multiple actors involved in a decision: in addition to the patient himself or herself, the referring general practitioner, the medical specialist and the health insurer. The decision process is therefore much more complex than in "normal" markets.

The consequence is that the subject of market definition in the specialist medical care is difficult and controversial, even more than is the case in other markets. And the fact that traditional techniques for the definition of product markets and geographic markets are not suitable.

### 3.1.3 Complexity of care as a criterion for differentiated market definition in healthcare

Like a number of competition authorities, the position adopted by ACM since the first concentration cases were assessed in the Netherlands is that the type of care general hospitals offer has such great similarities and that the competition conditions concerning this care are so identical that the clustering of product markets into clinical and non-clinical general hospital care is justified. In later cases, based on considerations relating to demand and supply substitution and barriers to entry, a third segment has been added, the product markets for top-level care, i.e. top clinical and top referral care – also referred to as complex care.

In contrast to the extensive literature in the field of geographic market definition, relatively little theoretical and empirical research has been conducted in the field of market definition. Zwanziger et al. (1994) were among the first to argue in favor of a more differentiated market definition, based on the specialist background of the treating physicians. Zwanziger argues that the medical specialist is the determining factor for demand or supply substitution. When a hospital is considering adding a new treatment to the existing care they offer, that at least requires the hiring of specialists with a level of education that is necessary as a minimum in order to carry out the treatment. Zwanziger did not consider (at that time) the necessary material investments that are decisive for the market entry decision. By working on the basis of the specialisms that are necessary as a minimum for the complete offering of services of a general hospital, they identified 48 groups of Diagnosis Related Groups (DRGs). Within that a distinction was made on the complexity axis on the basis of primary, secondary and tertiary (most complex) care. In the Netherlands, researchers from iBMG[10] in particular argue for a more differentiated product market definition. Varkevisser (2009)[11] points out in his discussion of Zwanziger that the US labor market is more flexible than the labor market in the Netherlands. The Netherlands has lifetime admission agreements. This would call for a more differentiated product market definition due to higher barriers to entry.

It is clear, however, that an excessive differentiation is unworkable and also unnecessary. In the practice of competition regulation, it is possible to apply a certain degree of clustering of products to the extent that the products within clusters have reasonably similar substitution and entry conditions. Varkevisser et al. (2004), applied clustering to elective care in Dutch hospitals. Due account was taken of the complexity of the medical specialism, the volume of patients and the potential scale

[10] Varkevisser, M., S.A. van der Geest and F.T. Schut (2004), Concurrentie tussen Nederlandse ziekenhuizen: de deelmarkt voor reguliere klinische zorg, Studies in Economic Policy, no. 13,OCFEB/iBMG, Erasmus University Rotterdam

[11] Varkevisser, M., 2009, Patient Choice, Competition and Antitrust Enforcement in Dutch Hospital Markets

and scope advantages of production. That led to five different homogeneous product clusters which are relevant for competition regulation. These are: (1) specialisms which can be supplied by general hospitals and specialist medical centers, (2) complex medical care with high volume, (3) complex medical care with low volume, (4) regular medical care with high volume and (5) regular medical specialisms with low volume. They consider particularly the *elective/emergency distinction*, *complexity*, *volume*, *scale benefits* and *composition (or coherence*) of the care hospitals offer to be prima facie criteria in the differentiation of product markets. They all play a role in supply substitution and in the decision on entry and exit. Complexity of care and coherence are also central to the problem definition in this research.

## 3.2 Developments in specialist medical care in the Netherlands and impact on competition

Although ACM has distinguished the three known product markets from the outset, it has always stated orally and in writing that, whenever necessary, it would investigate a different product market differentiation. Until recently, however, there was no reason to do so. In cases involving concentrations in a specific product market, such as orthopedics and oncological care, ACM only considered that product market, divided into clinical and outpatient[12].

The classification used by ACM corresponds roughly to that normally used internationally. The underlying assumption is that general hospitals generally carry out the same diagnoses and treatments, and that the assessment of the consequences of a merger or acquisition for each individual specialism does not differ significantly from the assessment of the consequences for general hospital care, because the substitution potential and entry conditions were assumed not to defer significantly from those of the cluster.

In addition, the governance role of health insurers is important for the Netherlands. Insurers generally do not purchase at specialism level and until recently always stated they had sufficient means of control and influence to compensate for or correct any strengthened position of one or more specialisms as a result of a hospital merger in negotiations with the hospital.[13]

[12] Decision in case 7563/NPM Healthcare – Orthopedium, ACM 2013 and Decision in case 13.1463.22/Stichting het Nederlands Kanker Instituut – Antoni van Leeuwenhoekziekenhuis – Universitair Medisch Centrum Utrecht, ACM 2013.
[13] Spaarne hospital/Kennemer Gasthuis case.

The situation outlined above is changing. That is one of the reasons for investigating whether the current position in the markets for specialist medical care, as described here, may be pivoting in such a way that a further differentiation into product markets – depending on the present case – should be considered. What the precise assessments and criteria are and what consequences that has for product substitution, product market definition and geographic range of the distinct market(s) must be determined through empirical research. We discuss three subjects with possible impact on competition policy: the reasons for mergers, patients' travel behavior, the extent to which health insurers can direct their policyholders to particular providers.

### 3.2.1 Required scale as a reason for mergers

Over the last few years, however, there have been developments in the Dutch market for specialist medical care which justify reflection on the foregoing. As stated, most intended mergers in the last few years have been based on a wish shared by the parties to guarantee and improve the quality of care. Merging parties often state that this can be achieved better jointly. The assumption is that volume and scale will be necessary preconditions. That has the logical consequence that specialization, concentration of treatments and spreading of services are increasingly associated with concentrations. The question is thereby justified: do general hospitals still offer (largely) similar products and is a clustering of care into clinical, non-clinical and top level care still correct. And, once that has been released, what perspective for further differentiation (specialism, care profile) is then appropriate, and what is the connection between the different products offered when an assessment must be made of whether product substitution and/or entry on the differentiated level is possible.

### 3.2.2 Patients' travel behavior

There is also growing awareness that although travel readiness and travel patterns relate to complexity and urgency of the treatment, a comparison of DTC care products in itself provides insufficient answers to the question of how patients' travel behavior from the merged parties' catchment area should be explained. Is that because the surrounding hospitals actually provide a competitive counterweight to the merged parties, or is it because patients who travel from the catchment area require more complex care, care which they cannot obtain in the parties' catchment area. This problem is discussed in the most recent concentration decision[14] by ACM relating to the intended merger of the Albert Schweitzer Hospital and the Rivas care group.

[14] Case 14.0982.24/Stichting Albert Schweitzer Hospital - Stichting Rivas Zorggroep, 15 July 2015

### 3.2.3 Steering of policyholders by insurers

There is a further factor, which is that ACM observes a clear decrease in confidence among insurers that they can direct their customers. There is growing resistance to a limitation of options for policyholders and patients.[15] And insurers also report that in regions where concentrations have recently taken place, they experience a marked deterioration in their negotiating positions (decrease in fallback positions) and have to accept price rises above their national average.

Mergers between specialist medical care institutions in the Netherlands take place without exception between hospitals in the same region. This is in contrast to Germany, the US or South Africa, for example. In those countries national, sometimes also listed, international hospital groups have a large market share. In the Netherlands, no groups have hitherto been formed at national level.

A striking aspect is that the selective contracting of hospitals by health insurers and contracting based on care quality have hitherto remained fairly limited[16].

Dutch health insurers have only moved limited patient flows to their preferred hospital. Selective contracting is in principle an important means of motivating health insurers to practice efficient and patient-oriented care. By contracting selectively, the health insurer selects care providers for the policyholder. Selection takes place on the basis of price, quality and volume aspects (efficiency of use).

Selective contracting can result in some providers not being contracted, while other providers are used selectively (products are excluded) or volume and/or quality agreements are made with a selection of providers. Selective contracting enables insurers to exert pressure on providers on each of the competition parameters and to distinguish themselves in terms of contracting from other insurers.

In 2014 the Dutch market had 14 so-called budget policies with selective contracting and 600,000 budget policyholders – around 4.4% of the insured population[17]. Recent figures from Vektis show that this had grown in 2015 to around 7% and 17 policies. Research by Nivel[18] has shown since 2011 a rise in a number of policies (56 to 71 in 2015), with a particular rise in the number of policies with fully or partly contracted

[15] In the aforementioned Albert Schweitzer/Rivas case from 2015 ACM has made a detailed analysis of the disciplining effectiveness of the current purchasing tools used by health insurers, and notes: "Whereas health insurers in 2012 were still optimistic about growing trust among their policyholders with regard to their purchasing decisions, ACM now sees that health insurers are uncertain about the support for these decisions among policyholders." p. 42/60, point 149. Health insurers are experiencing growing regional 'social unrest' and 'citizen protest' with the threat of selective purchasing. This phenomenon could have major consequences for judgments made by ACM, including in future cases.
[16] Goede zorginkoop vergt gezonde machtsverhoudingen, iBMG 2016, Edith Loozen, Marco Varkevisser and Erik Schut
[17] Marktscan Careverzekeringsmarkt, NZa 2014.
[18] Het functioneren van de zorgverzekeringsmarkt, Nivel, 2015

care. In 2016 this number fell to 61 different policies[19]. The number of policies in which the health insurer does not conclude a contract with the provider, the reimbursement policy, decreased from 2006 to almost one-third in 2015, after which it rose again to almost 40% in 2016.

Health insurers actively committing to selective contracting are running a reputation risk. Dutch patients do not appear convinced of the clarity of the advice from their insurers.[20] Is that advice based on the interest of the patient or that of the insurer?[21] Dutch patients seem scarcely prepared to accept restrictions on their choices with regard to practitioners. Nor are politicians convinced of their utility and necessity[22].

## 3.3 International developments in the supervision of concentration in healthcare

Clustering of product markets into approximately three to four clusters is still the dominant approach internationally, while consideration is being given to a finer clustering, particularly in terms of medical specialism. In the United Kingdom this has already been applied twice in competition cases.

In the handling of case 3897/Hilversum hospital - Gooi-Noord hospital from 2005, an international benchmark was carried out on the applied product market classification in the United States, Germany and New Zealand. Empirical research was also carried out by Ecorys/NEI and stakeholder interviews were recorded in order to achieve the best possible product market definition. The aforementioned countries all operated on the basis of general hospital care, with a distinction in terms of clinical and non-clinical care, and it was noted that in the case law in the US a further differentiation in terms of complexity already occurred, in the sense that a distinction was drawn between 'primary, secondary and tertiary care'. That corresponds to the vision of Zwanziger et al., a number of years previously[23]. The classification of care

[19] https://www.nza.nl/publicaties/nieuws/Aantal-polissen-voor-de-basisverzekering-neemt-af-in-2016/
[20] Het functioneren van de zorgverzekeringsmarkt, Nivel, 2015 in which it was ascertained that one in five people in the Netherlands only has confidence that Dutch health insurer will put the interests of their customers first.
[21] Boonen, L.H.M.M., F.T. Schut (2011), Preferred providers and the credible commitment problem in health insurance: first experiences with the implementation of managed competition in the Dutch health care system, Health Economics, Policy and Law, 6(2): 219-235.
[22] At the end of 2014 the upper house of the Dutch parliament voted against a proposal from Minister Schippers of Health, Welfare and Sport to amend article 13 of the Health Insurance Act, which sought to expand the possibility for selective contracting (and voluntary restriction of the free choice of doctor).
[23] Zwanziger, J, G. Melnick, K.M. Eyre, 'Hospitals and antitrust: Defining Markets, setting standards', J. Health Policy and Law Vol 19. No 2, 1994.

into primary, secondary and tertiary took place on the basis of what we call later in this report 'care complexity'.[24]

### 3.3.1 United States

In American case law in particular there is an enduring debate about the geographic dimension of the relevant market. The basis in the definition of competition markets in the US since 1982, which was later adopted in the EU, is the SSNIP test discussed earlier. This test of both dimensions of the relevant market is based on the analysis of hypothetical price changes and their effect on market demand. As stated, this method is less suitable, however, for hospital markets because many patients are insured and therefore will not pay all or most of the bill themselves.

It is striking that the product dimension of the relevant hospital market in the US remains less explored. In a case in 1989[25] the court drew a distinction between primary, secondary and tertiary care: *"The district court found that the geographic market differed with respect to primary and secondary hospital care as a unit and tertiary hospital services."* Where primary, secondary and tertiary represent care of increasing complexity. This distinction was further developed in the aforementioned work of Zwanziger et al.

### 3.3.2 United Kingdom

The highest-profile practical development took place in United Kingdom. In two recent cases a differentiated product market definition based on medical specialisms has been used. For that they used 34 specialisms/subspecialisms: general surgery, urology, breast surgery, colorectal surgery: hepatobiliary and pancreatic surgery, upper gastrointestinal surgery, vascular surgery, trauma and orthopedics, ENT, ophthalmology, oral surgery, cardiothoracic surgery, anesthetics, pain treatment, general internal medicine, gastroenterology, endocrinology, clinical hematology, hepatology, diabetic medicine, clinical genetics, rehabilitation, palliative medicine, cardiology, dermatology, respiratory medicine, medical oncology, neurology, rheumatology, pediatrics, geriatric medicine, gynecology, clinical oncology and childbirth care.

[24] Central to their approach is the extent to which the treatment of two different health problems by the same team can be handled with the same equipment and the costs which a hospital has to incur in order to switch or to treat another condition in addition to the first condition. The position of Zwanziger at Al is that most treatments do not require highly specialized equipment and personnel. They therefore suggest using the practitioner as the core variable, with DRGs/DTCs being grouped in terms of the least specialized practitioner who can still carry out the treatment. That led to 48 product categories which were classified as primary, secondary and tertiary (highly complex) services. Hospitals were then classified on the basis of patient population into, for example, predominantly primary, primary and secondary, or primary, secondary and tertiary.

[25] United States of America v. Carilion Health Systems, No.89-2625, 4th Cir.1989

## Bournemouth/Poole

In 2013 the Office of Fair Trading submitted an initial intended merger between two NHS Foundation Trust hospitals to the Competition Commission (both now combined in the Competition and Markets Authority - CMA). This concerned a merger between two nearby hospitals (separated by distance of 13 km) in the south of England,[26] namely the Royal Bournemouth and Christchurch Hospitals and the Poole Hospital, referred to hereinafter as the Bournemouth/Poole case. In this first NHS foundation trust case the CMA identified more than 30 specialisms/subspecialisms. Within each specialism a distinction is drawn between clinical (including day care) and non-clinical care. And between elective and non-elective care. Finally, childbirth care was viewed as a separate category, since although it is strictly speaking a non-elective category of care, similar choice factors play a role to those in elective care.

There was also a separate analysis of the competition categories 'in' and 'around' the market; the latter, competition for contracting by local Clinical Commissioning Groups, did not produce any engaging analyses. The case took a fairly large amount of time, partly because the CMA pulled out all the stops to obtain a clear picture for the first time of the core issues in hospital mergers. But also because the parties involved were ill-prepared for such data requests.

It was only with regard to elective care that the CMA found a substantial lessening of competition likely. In the remainder it did not. This involved 19 clinical[27] and 34 non-clinical elective care specialisms in which a substantial lessening of competition as a result of the intended merger was considered likely[28]. Decreasing competition was also considered likely for clinical childbirth care. In total it concerned 20% to 30% of the clinical turnover of both hospitals. This was sufficient reason to prohibit the intended merger.

This is a striking case, because the product markets were assessed in a very differentiated way. Unfortunately this was a very specific case. Both hospitals were each other's nearest competitor; for both hospitals it was and remains the case that other hospitals in the region are too far away to be considered competitors. Moreover, both hospitals were situated on the coast, so the area for actual or potential

[26] Competition Commission (2013), The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust / Poole Hospital NHS Foundation Trust

[27] The 19 clinical care specialisms are: *general surgery, breast surgery, colorectal surgery, upper gastrointestinal surgery, pain treatment, general internal medicine, gastroenterology, endocrinology, clinical hematology, hepatology, diabetic medicine, rehabilitation service, palliative medicine, cardiology, dermatology, respiratory medicine, rheumatology, geriatric medicine and gynecology.*

[28] The 34 non-clinical, elective categories of care were: *general surgery, urology, breast surgery, colorectal surgery, hepatobiliary and pancreatic surgery, upper gastrointestinal surgery, vascular surgery, trauma and orthopedics, ENT, ophthalmology, oral surgery, cardiothoracic surgery, anesthetics, pain treatment, general internal medicine, gastroenterology, endocrinology, clinical hematology, hepatology, diabetic medicine, clinical genetics, rehabilitation service, palliative medicine, cardiology, dermatology, respiratory medicine, medical oncology, neurology, rheumatology, pediatrics, geriatric medicine, gynecology, clinical oncology and childbirth care.*

competition was halved. Therefore, there was also no analysis of the consequences for the geographic market definition of the differentiated product market definition.

### Ashford & St Peter/Surrey County

In a second, very recent case between two NHS Foundation Trusts assessed by the CMA, the intended merger between Ashford and St Peter's Hospitals and Royal Surrey County Hospital of 16 September 2015 – a case which was approved – the CMA in principle once again applied the same methodology as in the Bournemouth and Poole Hospital case from 2013. The hospitals concerned both lie to the west of London, in fairly densely populated areas with eight or nine other hospitals within travelling distance.

The advantage of the differentiated approach to product markets used again here is that the CMA can determine very precisely the subproducts where the overlap is so extensive that problems may be expected as a result of the presence or absence of competitive pressure[29]. And for those subareas a detailed competitive assessment is then carried out in which the concern is eliminated (as in the Ashford, St Peter's and Royal Surrey County Hospital case) or the problems are confirmed. One of the remaining four areas of elective care in the 2015 case with possible competition problems concerned, for example, non-clinical breast surgery. In that case all GP referrals by doctors in the catchment areas of the three hospitals concerned were assessed, including referrals to surrounding hospitals. From this the conclusion was drawn that the surrounding hospitals ensured sufficient competitive pressure to discipline the hospitals concerned in this contested subarea.

## 3.3.3 Germany

In Germany mergers and acquisitions are assessed by the Bundeskartellamt (BKA). The BKA defines the relevant product market for competition analyses for hospital care as a large cluster containing all care under the heading 'acute intramural hospital care' (akutstationäre Krankenhausdienstleistungen)[30] [31]. If the competitors are general hospitals, the BKA considers no further breakdown necessary. It is then stated in a decision that research at the level of specific medical specialisms (Fachgebiete) is unnecessary. In some cases a closer product market is analyzed, for example if one of the competitors is a category-based orthopedic or coronary center. Psychiatry,

[29] The starting point for the analysis was once again all specialisms concerned (58 overlapping specialisms this time – see table 7 p. 92). Within that a distinction was again drawn between elective and non-elective care, and between clinical, day treatment and non-clinical care. An assessment was also made of community care, private care and childbirth care.

[30] A. Schmid, M. Varkevisser, Health Policy 120 (2016) 16–25 'Hospital merger control in Germany, the Netherlands and England: Experiences and challenges'

[31] See for example the recent decision concerning Universitätsklinikum Heidelberg AöR and Kreiskrankenhaus Bergstraße gemeinnützige GmbH, Beschlussabteilung, B 3 - 86101- Fa – 129/12

rehabilitation and outpatient care are seen as separate product markets. The clustering applied by BKA results in fairly broadly defined product markets, and more detailed data are available.

There has also been criticism of the broad product market definition used by the BKA. Schmid and Varkevisser (2016) argue that the BKA is thereby opting for a higher risk of too lenient rather than too strict enforcement of German competition law. Hentschker et al.[32] carried out an empirical study into the effects of aggregation (clustering) of product markets in German practice of concentration assessment. They concluded that: the use of a general market definition such as 'acute intramural care' leads to the averaging out of impediments to competition that are visible when a concentration is assessed on the basis of specific diagnoses. They believe their results call for more empirical investigation into the definition of product markets for hospital care.

The latter now indeed appears to be happening. In a press release of 31 May 2016, the BKA states that a sector examination is taking place in the hospital sector into the competition conditions in this sector. Particularly the further increase in consolidation in the sector has prompted the BKA to gain a better view of the current market development, the intensity of competition in the market for clinical hospital care and the improvement of criteria for assessing intended concentrations in Germany. The intention is to also determine what factors influence choices which the consumer makes when selecting a hospital or service of a hospital. And how hospitals distinguish themselves from their competitors in this regard.

### 3.3.4 France

The French competition authority assessed approximately 11 mergers or acquisitions in the hospital sector between 2011 and 2015. These decisions briefly state that there are different product markets. However, for the specific decisions the regulator argues that a more detailed definition of the market would not change the conclusion and no more further product market definition would be carried out. Over the years, however, it has been stated that in principle a more precise definition of product markets is possible[33].

[32] Defining hospital markets – an application to the German hospital sector", Hentschker et al. Health Economics Review, 2014, 4:28.

[33] Decisions of the French competition authority (Autorité de la concurrence) from decision 13DCC164 of 2013 all refer back to that decision. That decision itself refers to a decision of the European Commission (COMP./M.5805) and to a decision of the French Minister for the Economy, Finance and Industry (at that time having authority to assess mergers and acquisitions) (C2006-105). This refers to decisions from 2002 and 2003 which included an assessment of the product markets (Lettre du ministre de l'économie, des finances et de l'industrie en date du 14 novembre 2002, au conseil de la société MédiPartenaires, relative à une concentration dans le secteur des établissements de soins en France. BOCCRF du 20 mai 2003).

According to the competition authority, day-to-day medical practice is based on a rough classification into 'groups with specialist activities', in which all care is divided into the disciplines of internal medicine, surgery, obstetrics and rehabilitation.

Many of these disciplines are further subdivided. In the case of surgery, among other things into gastrointestinal, respiratory, eye and cardiothoracic surgery, urology and orthopedics. These specialisms cannot substitute each other and not every hospital offers every specialism. A hospital which only offers orthopedic surgery will not be able to treat patients with appendicitis. In addition, the regulator indicates barriers to entry such as availability of bed capacity, availability of medical specialists and nurses, high investment barriers and licenses.

A narrower classification that also matches medical practice combines care activities. This provides a segmentation of the overall medical activities at the heart of the hospital in terms of medical, functional and economic criteria (including the use of infrastructure) for a particular group of treated patients. This segmentation is not developed in greater detail.

## 3.4 Discussion

The differentiated product definition in the British concentration assessment has enabled the British authorities to determine more precisely the areas in which the respective hospitals compete and what the possible effects of the intended merger are in those areas. It also provides a sharper insight into the question of which part of the turnover of the hospitals concerned can demonstrate competition effects and, in the Dutch case of price competition, provides the possibility of a more differentiated estimate of possible price effects.

It appears that there are sufficient grounds to examine the use of generic clustering of clinical and non-clinical general hospital care in more detail. That is indicated both by the results of international research and developments in international competition practice. There are also changes under way in the Dutch healthcare market which justify an investigation such as the present one. Examples are the increasing concentration, spread and specialization of specialist medical care – whether or not in thematic form (as in oncological care, or mother and child care). Other examples are parallel developments of super-specialization within specialisms, the increasing complexity of treatments, the influence of technology and the increase in specific (in some cases not alternatively usable) investments that hospitals must make. The non-consideration of these factors in the clustering of products of general hospitals could result in an excessively wide product market definition and therefore in an

underestimation of possible negative price and quality effects after the merger for certain categories of patients.[34]

## 3.5 Conclusion

There are grounds for conducting the market definition in more detail than has been usual hitherto.

A more detailed market definition could be carried out by looking at the distinction between complex and non-complex care. Competition in complex care occurs in a different product market than the competition in non-complex care.

Another perspective for product markets concerns medical specialisms. This is often referred to abroad as product market definition and has been applied twice in the United Kingdom.

The degree of connection between the medical specialisms and with required hospital facilities plays a part in determining the height of the barriers to entry. They will be lower for care that can be provided outside the hospital.

[34] As Capps et al. in Capps, C.S., D. Dranove, S. Greenstein, M. Satterthwaite, Antitrust Policy and hospital mergers-recommendations for a new approach, The Antitrust Bulletin (2002) have shown in the case of the clustered Elzinga Hogerty test, the 'marginal' 10% of travelling patients do not tell so much about the readiness to travel of the other 90% if we are aware that they may be entirely different patients with different care requirements. See also "Heterogene prijseffecten bij hospitalfusies", Roos A., Croes R., ESB 4715, 2015.

# 4 Degree of complexity

For the product market definition ACM also wishes to gain more insight into the distinction between 'complex' and 'non-complex' care products. The expectation is that complex care is supplied under different competition conditions and thus forms a different product market. One of those competition circumstances is the greater distance at which the competition takes place.

In this section we discuss the subject of complexity of specialist medical care on the basis of a qualitative and quantitative analysis. The quantitative analysis is based on the travel behavior of patients as a possible indicator of complexity. We analyze the travel behavior on the basis of the DTC information system (DIS) of the NZa, which contains all claims for specialist medical care under the Health Insurance Act. The analyses are based on claims for care which started in 2014.[35] We have compared the results based on travel behavior with other criteria of complexity. In the qualitative part we discuss the definition of complexity and various criteria for complex specialist medical care.

## 4.1 Definition of complexity used

In everyday language complex means 'complicated' or 'difficult'. The word is often used to refer to an overall whole comprising interrelated elements. The term also reflects the extent to which a process or system is understood. And that again may differ depending on the person: what is complex for an outsider may be relatively simple for an insider.

In specialist medical literature and practice there is no clear and shared definition of complexity[36]. There is, however, a reference to the multiple dimensions and layers of 'complexity in health care' (see below). That makes the subject matter of this investigation in itself already 'complex'.

Partly having regard to the aim of the investigation, we have adopted the distinction between 'care complexity' and 'case complexity'[37]. Complexity of specialist medical care is approached here from two different perspectives:

[35] In order to verify the stability of the results, we have also carried out the analyses on claim data from 2013. These results are included in Annex A – Results based on DIS 2013
[36] Complexity and health care, P. Kuipers et al., Clinical Education and Training Queensland, 2011
[37] Case and care complexity in the medically ill, P. de Jonge et al., Medical Clinics of North America, 2006

- complexity of the care product (care complexity) or care which by its nature is complex, for all patients.
- complexity of the patient (case complexity) in which the complexity is not in the diagnosis or treatment, but in the disease, any comorbidity, vulnerability or risk profile of the patient.

### 4.1.1 Care complexity

In an investigation [38]into care complexity a validated model has been developed in order to assess care complexity. The model consists of 10 indicators, partly objective and partly subjective, assessed (retrospectively). The indicators have been subdivided into four main groups.

| Objective indicators | Subjective indicators |
|---|---|
| Length of stay<br>Indicators concerning:<br>– Laboratory investigation<br>– Diagnosis<br>– Medication<br>– Consultations<br>– Nursing deployment | Assessment of doctor:<br>– There was complex care<br>– There was a complex organization for the care provision<br>Assessment of nurse:<br>– There was complex care<br>– There was a complex organization for the care provision |

The survey showed, as expected, a high correlation between the length of stay and the (combination of) indicators for laboratory investigation, diagnosis, medication, consultations and nursing deployment. There was also a strong relationship between the subjective assessments by doctors and nurses and the (combination of) indicators for laboratory investigation, diagnosis, medication, consultations and nursing deployment. There was a much less strong relationship between the subjective assessments by doctors and nurses and the length of stay. According to the authors the (combination of) indicators for laboratory research, diagnosis, medication, consultations and nursing deployment (designated as 'objective complexity') is the central element in this model, because it has a strong relationship with the other three factors. According to the authors, the length of stay can be seen as a readily available 'proxy' for the 'objective complexity'.

In practice the following factors will usually be referred to in order to indicate care complexity:

[38] Care complexity in the general hospital: results from a European study, P. de Jonge et al., Psychomatics, 2001

- a greater call on or high(er) demands on the (medical-technological) infrastructure for diagnosis and treatment (such as special imaging diagnostic equipment, the profile of the emergency unit, the equipment in an operating room, the level of the IC)
- the use of (scarcer) specific specialist medical or nursing expertise
- multidisciplinary collaboration, in the sense that multiple primary and other specialisms and paramedics have to work closely together
- specific requirements for the provision of care and its organization, in the form of licenses or standards.

### 4.1.2 Case complexity

The aforementioned survey study of complexity in healthcare also deals extensively with patient-related complexity (case complexity).

In the first place many disease-related factors can contribute to case complexity. These diseases are those which:

- affect multiple organ systems (for example cancer)
- require strict control of physiological parameters (such as kidney failure)
- are or may be life-threatening (for example certain heart problems)
- have serious and long-term consequences (such as deep depressions)
- cause serious invalidity (such as brain damage)
- cause significant pain or discomfort (such as arthritis)
- entail risks of side effects from the treatment
- are accompanied by psychosocial or psychiatric problems
- show a fluctuating or unpredictable course (such as multiple sclerosis)
- are associated with vulnerability (frailty).

In addition to disease-related factors, case complexity can also result from an elevated risk profile of the patient. For example through the simultaneous occurrence of multiple diseases (comorbidity or multimorbidity). Apart from the somatic and psychological condition of the patient, the study also points out the dimension of 'situational complexity'. This refers to the context of the patient, such as personal and environmental factors.

De Jonge et al. (2006) point out that patient-related complexity (case complexity) can lead to care complexity, for example as a result of the need for special diagnosis or treatment equipment, multidisciplinary collaboration or specialist nursing expertise. Hence there is a partly overlapping area between care complexity and case complexity.

### 4.1.3 Implications for the investigation

In this investigation the product market definition is central, particularly from the perspective of supply substitution. Therefore the basic principle has been adopted that the determination of the product market primarily concerns care complexity. That means it is necessary to determine which care products are complex by their nature. What remains are then care products that are not complex by their nature. It is conceivable that this category also includes 'heterogeneous' care products, in the sense that there are differences between hospitals if the same product is supplied and recorded. The differences could be attributed to the case complexity that is present. This matches the findings of the focus group of medical specialists, who stated that from their perspective complexity was seen particularly from the viewpoint of the patient.

Many of the characteristics of care complexity indicate concentration, either in order to make good use of the required facilities and infrastructure, or due to the combination of knowledge among the medical specialists.

## 4.2 Distinction between complex and non-complex hospital care in practice

As stated, the term 'complex care' has not been clearly defined. Even during the investigation phase, the term 'complex' as such is used as frequently as its significance is debated. That may be due to multiple factors, such as different visions within and between specialist medical professions or different interests (for example between hospitals and health insurers). During the focus groups it was even proposed to use a different term, without any agreement being reached on what term that should be. It was made clear, however, that there is a relationship between 'complex care' and 'concentrated care'. That matches the assumption that forms the starting point of the qualitative analysis to be discussed later, which is based on the travel behavior of patients. The assumption is that patients in general will travel further for complex or more complex care. It was recognized that there could also be other reasons for not going to the nearest hospital, such as reputation, treatment by staff, hospitality, waiting times etc.

In this section we cast light on the definition of complexity of care using a number of themes and aspects that in practice are generally associated with 'complex care', either due to care complexity or due to case complexity.

We found the following aspects that could indicate complexity:

- Travel distance
- Top referral care, top clinical care and trauma care
- Rarity
- Wbmv licenses
- Quality requirements and standards, including volume standards
- Medical-technological infrastructure
- Multidisciplinarity
- Substantive medical judgment

There is a relationship between these aspects, which can be summarized as follows. Complex care is often regulated care (Wbmv licenses, quality requirements and volume standards), occurs less frequently (rarity), makes higher demands on the medical-technological infrastructure and often requires multidisciplinary collaboration. Partly for these reasons, complex care is generally concentrated (travel distance) in top clinical hospitals and academic hospitals (top clinical and top referral care).

In order to test our analysis, we asked a number of health insurers which definition they use for the term 'complex specialist medical care', or if they have a list of specialist medical care products which they consider 'complex' and/or whether they include the complexity of care in determining their vision of an intended merger of hospitals.

When asked, these health insurers state that there is no fixed definition of complex care. By applying various criteria they each determine individually which care they believe can be considered 'complex'. These criteria concern particularly care complexity (infrastructure, expertise, extensive diagnosis, complexity of treatment). Criteria relating to case complexity are also cited. Connections are also made with the Special Medical Devices Act (Wbmv) and standards set by social associations. According to the insurers, complex care in the sense of care complexity is care which arises less frequently and which in principle is reserved for academic hospitals, top clinical hospitals and a number of category-based institutions.

Health insurers state that they purchase 'complex care' more selectively than non-complex care. This is evident, for example, from the application of standards. The concentration that results partly from that is embedded in a vision of the regional supply and of the profiles of hospitals, having regard to the importance of availability and accessibility of complex care for insured parties. Complexity of care is one of the criteria whereby health insurers assess a planned merger. In a merger the regional supply and the concentration and spread of complex and other care is considered.

We conclude that in practice there is no shared standard definition of complexity of specialist medical care. We do find, however, that the eight (related) aspects that we have referred to above are indicative of complex care. In this section we discuss those aspects separately below in a qualitative sense. In the following section we discuss the associated qualitative analysis.

### 4.2.1 Travel behavior

A common denominator of many aspects referred to with regard to complexity of care is that the care is concentrated and not offered by all hospitals[39]. Patients will therefore often travel much further for more complex care than to the nearest hospital. Conversely, therefore, part of the care for which patients travel on average much further is probably more complex care. This is also an important aspect in a competition analysis. After all, if it is necessary to travel further for a particular type of care, the geographically relevant market for that care is larger than for care which is provided in any hospital. Furthermore, it is likely that the competition conditions in the case of complex care are different than in the case of non-complex care, particularly due to the barriers to entry (including regulations and standards, infrastructure).

On the basis of the observed travel behavior, some care can be designated as complex, although it is not (false positive); conversely, there may be complex care for which no extra travel takes place (false negative):

[39]The assumption here is that the demand for care is distributed evenly across the Netherlands.

- Some of the patients will also travel for particular elected procedures due to (alleged) quality differences, or shorter waiting times, such as for the treatment varicose veins[40]. The travel time is then not an indication of complexity. We assume that the average additional travel time for that care is generally lower than in the case of complex care. That is because many patients opt for the nearest hospital, whereas that is not necessary for complex care that is concentrated. However, there may be DTC care products for which people travel further due to (alleged) differences in quality and access time. Those DTC care products can be identified partly by the fact that they are also offered by independent treatment centers.

- Possibly complex care is not found with travel behavior in the case of DTC care products which can be claimed both for a complex and for a non-complex patient. The complex patient may have to travel for a procedure, whereas a non-complex patient can go to the nearest hospital for that same procedure. The case complexity differs in this case. This concerns heterogeneous DTC care products. There is insufficient information for such a classification.

The other criteria discussed below are mostly based on regulation and standards for specific care. Not all care has been considered and classified in this way by the medical professional group or by regulators. For example, no standards have yet been set for part of the complex care. On the basis of observed travel behavior, more care will be designated as complex than with the other criteria.

The travel distance or travel time itself is not a good indicator of complexity, as this is influenced by density of hospitals in the area. A correction must therefore be made for this.

### Implications for the investigation

The basic principle is that the observed travel behavior for healthcare is an indication of complexity. However, there is no like-for-like pattern; people do not travel further for all complex care (particularly if case complexity or heterogeneous DTC care products are concerned) and not all care for which travel takes place is complex; travel also takes place due to (alleged) differences in quality and waiting time. The advantage of using travel behavior is that it involves observed patterns. Account is therefore taken of actual readiness to travel. This concerns travel behavior corrected to take account of local hospital density. In addition, a correction is also necessary for non-complex care for which travel takes place, for example to a ZBC.

[40] "Reisgedrag van patiënten", ESB, 2011.

### 4.2.2 Top referral and top clinical care and trauma centers

In practice, it is often assumed that 'top referral care' and 'top clinical care' are synonymous with 'complex care'. That also applies to acute care supplied provided by trauma centers. These definitions are closely linked, respectively, to academic hospitals and hospitals that are members of the STZ (the association of top clinical hospitals).

#### Top referral care

Top referral care is provided predominantly by academic hospitals. In the positioning memorandum on academic hospitals[41] top referral care is defined as follows:

*"The treatment of patients who require highly specialized care for which no further referral is possible ('last resort'). This concerns patients with a rare condition, a complex condition or treatment, a simple condition that becomes complex due to combinations of (chronic) diseases or where a common condition has taken an unusual course. This care has yet to be developed, is multidisciplinary, closely related to fundamental and translational scientific research and requires a special, complex infrastructure. It is therefore more than just super-specialist patient care."*

On the basis of the International Classification of Diseases (ICD) the academic hospitals have set up a web page (TRF portal) on the website of the NFU (Netherlands Federation of University Medical Centres) with an overview of top referral positions. In this portal it is possible to search by keyword, disease category, academic hospital or specialism. For each top referral position a summary description is provided as well as contact details of the specialist concerned and often links to other websites.

In order to improve transparency on the actual use of the resources for the top referral care, the NFU has started the ROBIJN program. As an initial step the academic hospitals have assessed the parts in which their care distinguishes itself from that in other hospitals. On the basis of statistical analyses, they have developed nine 'labels' to distinguish the specific top referral patients from those patients who receive regular care. These labels are:

1. Patients with high treatment intensity; these are patients in a phase in the disease process that requires much more intensive treatment than usual.
2. Patients for whom the care is closely interrelated with the scientific research and the development of care innovations in the respective academic hospital.
3. Patients who require a unique care offering due to the complexity or required infrastructure.

[41] Positioneringsnota UMCs, VWS en OCW, 2014

4. Patients who require multispecialist care, defined as care for which at least three primary specialisms have to work closely together.

5. Patients who require a complex procedure; operations that are carried out for less than one in 100,000 patients. These operations often require more preparation and operation time than for comparable routine procedures.

6. Patients with a rare diagnosis.

7. Patients who are referred by medical specialists. Patients who require care which is not offered in a general hospital can always be referred to an academic hospital. The academic hospitals guarantee that patients can always receive insured care in the Netherlands and they are responsible for its continuity.

8. Patients below the age of 50 who have more than three conditions simultaneously. In the different treatments account must always be taken of the effects of other conditions. This sometimes makes the treatment very complex.

9. Patients who require expensive, off-label medication. Expensive medicines are sometimes effective in conditions for which they were not originally developed. Innovative use of the medicines is not reimbursed by insurers.

The information above concerning top referral care is largely based on the definitions used by the academic hospitals and their association. That may raise the question of how objective this yardstick is. In practice, possibly prompted by various interests, in certain sections the question is asked: 'how unique is this care for an academic hospital'?

In these descriptions of top referral care both care complexity (for example 'special knowledge infrastructure') and case complexity (for example 'a simple condition that becomes complex due to combinations of chronic diseases') arise, with care complexity appearing dominant (special knowledge infrastructure, unique care infrastructure, multi-specialist care, few interventions, rare diagnoses).

Academic hospitals provide basic care, top clinical care and top referral care. It is not possible to state that care provided by an academic hospital is by definition 'complex care'. But it is possible to assume that, if there is complex care (particularly care complexity), there is a greater likelihood that this can be offered by an academic hospital (or a top clinical hospital, see below) than by a general hospital.

## Top clinical care

Top clinical care is provided predominantly by hospitals who are members of the Stichting Topklinische Ziekenhuizen (STZ). The STZ is setting up a Care Register, in order to show what top clinical care consists of.

According to STZ the new Care Register is a physical and digital assessment process with which the top clinical functions of an STZ hospital are underpinned and defined and with which distinctive capability is created. It replaces the STZ product catalogue used up to now, which included a very large number of top clinical/top referral/tertiary functions. The care register must be limited by means of a transparent methodology to actual special top clinical functions and functionalities, which in principle are offered exclusively in STZ hospitals. The STZ draws a distinction between three types of care:

- 'unique', care which is provided almost exclusively in academic hospitals and only highly exceptionally in a top clinical hospital.
- 'special', care which is provided in a top clinical treatment center, of which there are only a few in the whole of the country.
- 'complex', care which is provided in almost all STZ hospitals and only very exceptionally also in a general hospital.

Care which does not fall into these categories is 'basic care' according to the STZ.

In order to assess whether care provided in an STZ hospital falls into one of these categories, 12 criteria have been drawn up with the involvement of subject experts. In order to gain a place in the register, a care function must fulfill 12 criteria. For example, the function concerned must be a part of a good care pathway and the quality must be guaranteed. The respective care function must also be scientifically embedded. The care must also be multidisciplinary in order to be called top clinical. These criteria are not intended primarily to indicate complexity, but to allow good comparison between hospitals. The procedure is that an STZ hospital uses the methodology to assess digitally whether a function belongs to one of these categories, after which this assessment is validated and authorized by a committee. The intention is that from the summer of 2016 the care register methodology will be rolled out and that the Care Register will begin operating nationwide from 1 January 2017. Each STZ hospital is expected to contribute 10 to 15 care functions. A periodic reassessment will take place.

Just as in the academic hospitals, the STZ has its own definition and classification and the question of how objective everything is is just as likely to arise. Because the new

Care Register is not yet accessible, it is not possible to assess whether it indeed leads to a sharper (and more widely shared) definition of top clinical care.

There are differences between the 26 STZ hospitals with regard to scale and top clinical profile. Within the group of STZ hospitals, the importance of top clinical care for that hospital differs. In addition to top clinical care, larger STZ hospitals in particular have top referral functions and high ambitions in the field of science and education. In some areas they sometimes compete with academic hospitals.

STZ hospitals also provide basic care. Therefore it is not possible to state that the care which a top clinical hospital provides is by definition complex or more complex care. But it is possible to assume that, in the case of complex care, there is a greater likelihood that it can be provided by a top clinical hospital (or an academic hospital, see above) than by a general hospital.

### Trauma centers and emergency care

Outside the trauma centers designated by the Minister on the basis of the Wtzi , the organization of emergency care has for a number of years been a focal point and a subject of discussion among care providers, patients and health insurers.

In 2013 Zorgverzekeraars Nederland (the association of health insurers) published its Quality Vision on Emergency Care. ZN stated that the quality vision concerned 'complex' emergency care, although the term complexity was not clearly described. The vision led to a lot of debate, including on the question of whether CVA care is complex emergency care. The use of the indicators and standards proposed by ZN for six emergency indications (AMI, CVA, hip fractures, multi-trauma, RAAA and childbirth care) could lead to a further concentration in this care. When asked, ACM stated its view that concentration in many cases would also have consequences for non-emergency care and that restrictions of options would only be acceptable if there was a corresponding clear quality gain for the patient. That must also have support in the field, according to ACM. That can be evidenced, for example, by a joint quality vision of emergency care.

The National Health Care Institute then began an investigation into the support for the Quality Vision among parties such as FMS, NVZ, NFU and NPCF. The parties did not succeed, however, in reaching tripartite agreement in the specified period on indicator sets for five of the six required emergency indications (all apart from childbirth care). That means that the Institute then legally had the power to take over governance and to use its perseverance. The National Health Care Institute requested the Quality Advisory Committee (ACK) to advise it on the performance indicators and standards, including volume standards, for the six emergency indications. The ACK in turn established a Temporary Experts Committee on Emergency Care

(known as the Experts Group for short), which established an indicator set for each of the six emergency indications with which the quality of emergency care could be demonstrated.

Against this background, within the framework of this investigation, part of the emergency care can be seen as complex care, in the sense of care complexity. Multitrauma care, for example, is seen as complex emergency care, which is already highly concentrated in 11 trauma centers. The trauma centers are the eight academic hospitals and three STZ hospitals. There are also a number of STZ hospitals operating as a satellite for a trauma center.

PCI in AMI and RAAA (volume standard) can be seen as complex cardiological or vascular surgical care. CVA care cannot in principle be designated as complex care and due to the great importance of timely treatment is offered in many (but not all) hospitals. This could change if the emerging intra-arterial treatment becomes established for acute cerebral infarction. This is a complex treatment, on which there is an ongoing debate concerning cost-efficiency and cost-effectiveness. Finally, hip fractures and childbirth cannot be seen a prior as complex care, particularly in the sense of care complexity.

#### Implications for the investigation

Part of complex care is concentrated in academic hospitals and top clinical hospitals. That applies in any case to the top clinical and top referral care and the care provided by the trauma centers. The market is therefore different for this care than for basic care. Patients who do not happen to live near an academic hospital or STZ hospital will have to travel further for this type of care.

### 4.2.3 Rarity

Complex care is in practice often associated with care products that occur little or relatively little. Two common definitions for this are rare conditions and expert products.

#### Rare conditions

A rare condition is an illness from which fewer than one in 2,000 people suffer[42]. Rare conditions are life-threatening or chronically disabling diseases that arise so little that combined efforts are required to treat patients.

On 10 October 2013 the National Rare Diseases Plan (Nationaal Plan Zeldzame Ziekten - NPZZ) was launched in the Netherlands, as an extension of an agreement

[42] Nationaal Plan Zeldzame Ziekten, http://www.npzz.nl

within the European Union. The NPZZ provides a wide range of recommendations for the organization of healthcare, scientific research, training of care professionals, management and availability of knowledge of rare conditions and the governance and coordination of the implementation of the plan. A principal task for the implementation of the NPZZ is the development of a network of expertise centers. These centers combine knowledge and expertise in the field of rare conditions, develop protocols and guidelines, coordinate research and provide appropriate referrals of patients both within and outside the Netherlands. The centers have to fulfill the standards set by the European Union for such centers in order to be compatible with the European network for rare conditions (European Reference Networks).

The Minister of Health, Welfare and Sport has in two tranches designated expertise centers of both academic and top clinical hospitals. On the NSU site is a list of recognized expertise centers for rare conditions.

#### Expert products within the DTC system

In the DTC system so-called 'expert products' are distinguished. An expert product exists if fewer than five product profiles are present in the dataset selected by the decision model. On the basis of this definition there are currently almost 400 expert products. These products concern 'part of the more specialist care'. For expert products the price is determined on the basis of an expert opinion or on the basis of a substantively comparable DTC care product.

Expert products are not by definition synonymous with complex care. However, because this concerns DTC care products that (as yet) arise very little, it can be assumed that these are not offered in all hospitals and that in that sense there is concentrated care.

#### Implications for the investigation

It is to be expected that further travel will be necessary for DTC care products that are offered by few institutions. Not all these products will involve care complexity, however. In view of the above description, it can be assumed that treatments that are carried out in expertise centers for rare conditions are to be designated as complex care or components of complex care.

### 4.2.4 Wbmv licenses

The Special Medical Procedures Act (Wbmv) offers the Minister of Health, Welfare and Sport a number of instruments with which, where necessary, the supply of special medical procedures can be controlled, limited or even completely prohibited. The

objectives of the Wbmv are to guarantee the quality and efficiency of care with the special medical porocedures and to promote the appropriate use of these devices.

In practice the licensing system of the Wbmv is used most (article 2 of the Wbmv). Most current licensing obligations however are not new. They were already introduced in the 1980s, in a period when special facilities were regulated on the basis of article 18 of the then Hospital Facilities Act (Wzv), the forerunner of article 2 of the Wbmv.

The Wbmv was evaluated in 2012[43]. It was concluded that the function of the Wbmv remains important, as a supplement to self-regulation within the hospital sector. The objectives with regard to a device can be defined more clearly. In the evaluation research the field parties state that the Wbmv is an important means of regulating the concentration of complex care.

Currently the following special medical procedures are covered by the Wbmv[44]:

a. organ transplantation, including the transplantation of heart, kidney, pancreas, lung, liver or small intestines, or parts or cells of these organs;

b. implantation of artificial organs, insofar as they relate to the organs referred to in a, and intended as a replacement of the original organ or part thereof;

c. autologous and allogeneic transplantation of hematopoietic stem cells from bone marrow, peripheral blood or cord blood;

d. cell transplantation, including the insertion or application of human cells in patients in order to improve their state of health, other than:

    i. the insertion or application of human cells as part of organ transplantation as referred to in a;

    ii. autologous and allogeneic transplantation of hematopoietic stem cells from bone marrow, peripheral blood or cord blood as referred to in c;

    iii. the insertion or application of tissue in which the biological characteristics, physiological functions or structural characteristics of relevance to the intended clinical use results are unchanged; or

    iv. the use of human blood as such;

[43] Evaluation of the Wbmv, Significant, 2012
[44] Regulation of the Minister of Health, Welfare and Sport of 3 July 2014, reference 629167-122949-WJZ

e. exceptional interventions on the heart, including heart surgery and all forms of therapeutic intervention cardiology including the implantation of a defibrillator.

f. proton therapy and other forms of particle therapy;

g. special neurosurgery, including neurosurgery, to the extent that it concerns surgical treatment of conditions on the brain, the skull, the cranial base, cerebral nerves, spinal cord, nerve roots and the surrounding membranes, as well as the conditions which cause a functional disorder in the brain, spinal cord or cauda equina, and microsurgical treatment of the plexus brachialis;

h. clinical genetic investigation and heredity advice, including:

    i. advanced prenatal ultrasound investigation of structural fetal abnormalities;

    ii. removal of fetal material and prenatal biochemical, chromosomal and DNA investigation to diagnose congenital and inherited abnormalities;

    iii. removal and investigation of fetal DNA from maternal material to determine the sex of the fetus;

    iv. prenatal biochemical, chromosomal and DNA investigation to diagnose congenital and inherited abnormalities;

    v. genetic investigation prior to the implantation of an embryo;

    vi. postnatal biochemical, chromosomal and DNA investigation to diagnose congenital and inherited abnormalities, for the carrying of these conditions and disorders in sexual development and function.

    vii. heredity advice of a complex nature;

i. in-vitro fertilization, to the extent that it concerns the creation of human embryos outside the body;

j. neonatal intensive care with the exception of neonatal surgical care.

## Implications for the investigation

It is to be expected that DTC care products with a care activity associated with a Wbmv license will be deemed 'complex' on the basis of patients' travel behavior. They are in any case care products for which there are barriers to entry as a result of the license.

### 4.2.5 Quality requirements and volume and other standards

Over the past years quality standards have been developed for a number of conditions in Dutch hospital care. The emphasis is particularly on the minimum number of treatments that must be performed by a hospital in order to achieve quality and safety of the treatment. Different parties such as health insurers, scientific associations of specialists, patients' organization, research institutions and regulators have contributed to this. The underlying philosophy is that in many cases there is a relationship between a higher treatment volume and better quality and security of care.

For the following specialisms/subspecialisms, minimum quality standards (on some components)[45]have been drawn up including volume standard: oncology (Soncos standards), vascular surgery and cardiology.

In addition to the volume and other standards for surgical oncological procedures and vascular surgery, the Netherlands Surgery Association (NVvH) has also drawn up standards for other procedures[46], such as bariatric surgery.

The standards introduced in 2012 by Stichting Oncologische Samenwerking (Soncos) for oncological surgical procedures have led to a concentration of part of this care. The frequently occurring surgical oncological procedures (including for breast cancer, bowel cancer and rectal cancer) are performed in many hospitals. Less frequently occurring interventions (including esophageal cancer, stomach cancer, pancreatic cancer) have been greatly concentrated. Surgical procedures in the case of lung cancer have been further concentrated, but still take place in a few dozen hospitals.

The question is whether treatments for which standards have been set can also automatically be seen as 'complex' care products. Although both the Dutch Organization of Hospitals (NVZ) and the Federation of Medical Specialists (FMS) speak of 'highly complex care' or 'complex hospital treatments' with regard to concentration, they primarily relate it to quality and efficiency.

In practice, part of the specialist medical care for which volume and other standards apply are seen as complex in the sense of care complexity. This then concerns the so-called 'low-volume' treatments, such as esophageal cancer. The so-called 'high volume' treatments[47], as in the case of breast cancer, are not by definition seen as complex in the sense of care complexity. However, it is care for which a barrier to entry exists, because the provider has to meet volume and other standards and have a certain

[45] http://www.minimumkwaliteitsnormen.nl

[46] Normering Chirurgische Behandelingen 4.1, NVvH, June 2014

[47] Skin cancer was the most diagnosed form of cancer in the Netherlands in 2013 (15,010 new cases, excluding basal cell carcinoma). After skin cancer breast cancer occurred most (14,503 new cases), followed by colorectal cancer (13,370 new cases) and lung cancer (12,110 new cases). Prostate cancer was in fifth place in 2013 with 10,897 new cases. Together the five most frequently occurring types of cancer account for 65% of all new cancer cases (Source: IKNL / NKR, 2015).

quality level and infrastructure. That is why such care is not automatically offered in every hospital. As volume standards rise, as expected, further concentration will take place.

#### Implications for the investigation

In the framework of this investigation, low-volume surgical oncological procedures can be designated as complex care in the sense of care complexity. Other surgical oncological procedures cannot be designated *a priori* as complex care in the sense of care complexity (although it can sometimes be designated as case complexity), but they can in any case be designated as specialist medical care for which barriers to entry exist.

Other surgical cardiological procedures for which volume standards exist can be seen as complex or more complex care, which in any case is not offered in every hospital.

It is to be expected that care for which volume standards have been set will largely concern DTC care products which are designated as possibly 'complex' in the quantitative analysis on the basis of the patients' travel behavior. However, there may also be volume standards in the case of DTC care products which are not seen as possibly complex on the basis of travel behavior, for example for the 'operative removal of the lymph nodes in breast cancer'.

### 4.2.6 Medical-technological infrastructure

In general it is assumed that complex care makes high or higher demands on medical-technological infrastructure. This includes diagnostic equipment, equipment in operating rooms, the level of intensive care (IC). Below we examine the complexity of interventions and IC care, and the care in independent treatment centers which generally have less high-technology infrastructure.

#### Interventions and complexity

With regard to the location where a (surgical or other) procedure takes place, there is a distinction between:

- a treatment room (for example of an ophthalmologist or dermatologist)
- an intervention room for cardiological or radiological interventions
- an operating room.

In general here there is increasing complexity in the treatment, in the sense of the necessary equipment and facilities.

In the case of an operation it is less simple than is often thought to draw a clear distinction (in advance) between complex and less complex operative interventions and a valid risk classification for operations (care complexity) does not exist. The so-called ASA classification is used in preoperative screening in order to assess the risk profile of the patient and therefore concerns case complexity. The following classification is used:

- ASA 1: normally healthy, without regular use of medication.
- ASA 2: slight systemic disease, for which medication may or may not be required. No impediment to normal activities.
- ASA 3: serious systemic disease for which medication is required, which impedes normal activities, but is not totally disabling.
- ASA 4: very serious systemic condition which poses a chronic threat to life.
- ASA 5: terminally ill patient who is not expected to survive for longer than 24 hours with or without an operation.

It can be stated that in ASA 1 and 2 patients in general do not receive complex care in the sense of case complexity. That is also why such patients where necessary can also be treated in a ZBC, whereas independent treatment centers refuse patients with a higher actual or assumed ASA classification. The ASA classification is recorded in the patient's file, and not in the DTC information system (DIS). The ASA classification cannot therefore be used directly for the quantitative analysis of the DTC care products that primarily use information from the DIS.

## IC and complexity

In an IC intensive and specialist care is provided for IC patients who are defined by the NVIC as 'patients with one or more acutely threatened vital functions, in which continuous monitoring is necessary and the treatment of a potentially reversible condition may lead to the restoration of stable vital functions'[48]. The treatment of these patients requires highly trained personnel, advanced equipment and an appropriate organization. The sicker the patient is, the more demanding this is. ICs are therefore currently divided into three levels[49]:

1. a level 1 IC is a basic IC, aimed at monitoring, nursing and treating patients with a threatening or existing disorder of a vital organ function, possibly in combination with respiratory requirement, that is expected to last no longer than two to three days.

2. a level 2 IC is aimed at patients with serious illness, for which continuous availability and/or presence of specialist nursing and intensive care staff is required.

3. a level 3 IC is all or part of an IC with an academic and/or supraregional function and is aimed at patients with more complex, very serious illnesses, in whom vital functions are simultaneously disturbed and for whom continuous availability and/or presence of specialist nursing and intensive care staff is required. This usually concerns specific functions such as IC treatment of complex thoracic, neuro- and transplant surgery, or IC treatment of trauma patients or patients with complex and sometimes rare conditions.

The level of the IC often plays a leading role in the provision of care that a hospital can offer. The IC level determines to a large extent the possible complexity of patients in the other care functions and basic facilities such as traumatology in the emergency unit and midwifery[50].

Between 2010 and 2015 the scientific associations that are involved in intensive care worked on a new IC directive. The Dutch Association of the Anesthesiology, the Dutch Association of Intensive Care (NVIC) and the Dutch Association of Intensivists did not succeed in presenting a joint directive. The National Health Care Institute then took control and recently produced a quality standard for IC care, within which hospitals have scope to produce regional or customized solutions.

[48] Draft Intensive Care Directive. *Dutch Intensive Care Association*, 2013
[49] Richtlijn Intensive Care 2006, *Nederlandse Intensive Care Vereniging*, 2006. These three levels are discontinued in the new directive.
[50] Concentratie, specialisatie en samenwerking van ziekenhuiszorg. *Regieraad*, 2011

The number of planned IC admissions decreases in proportion to the number of unplanned admissions[51]. The decrease in the planned patient flow has to do with improvements in surgical and anesthesiological techniques. The rise in unplanned admissions mainly concerns non-surgical patients, usually older patients with multimorbidity. The reason for an IC admission, for example, lies more often in the complexity of the patient's condition (case complexity) than in the complexity of a previous procedure (care complexity). This trend is expected to continue.

It is seen in practice, however, that although IC care looks 'complex', it is in fact largely recorded and controlled care, which – particularly from the perspective of professionals – is not viewed *a priori* as care complexity.

From the product market perspective, therefore, a care product which includes an IC admission is not by definition complex care in the sense of care complexity. Almost all hospitals have an IC of at least level 1 and over half have an IC at level 2 or 3. There is, however, a relationship between having a 'heavier' IC (level 2 or 3) and the ability to offer complex or more complex care in the sense of care complexity. For example we find the ICs of level 3 particularly in the academic hospitals and (larger) top clinical hospitals.

### independent treatment centers and complexity

In general, care that is offered in independent treatment centers ( independent treatment centers) is to be designated as non-complex care. From a perspective of both care complexity and case complexity. In independent treatment centers, only patients with an ASA classification of 1 or 2 are treated. This concerns care which can be planned and for which the patient does not normally have to be admitted. This care makes less heavy demands on the medical-technological infrastructure.

According to the NZa[52] independent treatment centers focus in practice on non-clinical care with the possibility of rapid, high-volume treatment. The following monodisciplinary specialisms or conditions prove well suited to this according to the NZa: parts of surgery (inguinal hernia, varicose veins), orthopedics, ophthalmology and dermatology.

### Implications for the investigation

It is to be expected that 'complex' care will make more use of medical-technological infrastructure (such as diagnosis, treatment room, IC). Particularly with regard to the 'heavier' infrastructure. Concentration of complex care leads to a higher proportion of

[51] De brede betekenis van acute zorg, Twynstra Gudde & SiRM, 2014
[52] Monitor Zelfstandige Behandelcentra, NZa, 2012

use of medical technological infrastructure for DTC care products for which patients travel further.

Care provided by independent treatment centers makes lower demands on medical-technological infrastructure and not generally complex care either in the sense of care complexity or in a sense of care complexity. In the analyses we therefore take account of this by separately classifying DTC care products that are supplied to a relatively large extent by independent treatment centers and for which patients travel a lot in relative terms.

### 4.2.7 Multidisciplinarity

In practice a relationship is also established between complexity of care and the number of primary specialisms involved. The NFU refers to 'multispecialist care' if at least three primary specialisms have to work closely together. This presumably concerns in particular the complexity that results from the situation and condition of the patient (case complexity). The distinction between case and care complexity has been made several times. Case complexity is often connected with comorbidity or multimorbidity of the patient. Multiple conditions simultaneously require (collaboration between) different treating specialists, which is reflected in the multidisciplinarity of care.

Multimorbidity is not complex by definition. Different specialists can also treat the same patient without objection and without coordination in parallel with each other. In some of the cases coordination will be necessary, however, to ensure an optimum treatment result.

One way of studying this is by comparing whether the travel behavior of patients treated by multiple specialists differs from that of patients who are being treated in a single specialism.

#### Implications for the investigation

With regard to this indicator of complexity a number of comments need to be made at the outset. First of all, case complexity is a poor criterion for classification of DTC care products into complex or non-complex. Only some of the patients within a DTC care product will receive multidisciplinary treatment. In other words the degree of multidisciplinarity varies within a DTC care product. This may therefore affect patients' travel behavior only marginally. The question is also whether this group is able to travel a long distance for care with high-than-average care consumption.

Furthermore, it may also be that only part of the disciplines concerned have to take account of multidisciplinarity.

It is also possible that part of the treatment (for example an operation which is complex by nature) is provided in another hospital and is therefore seen by the practitioners concerned as multidisciplinary. From a competition perspective in that case it is not so much the multidisciplinarity that is relevant, but the fact that the treatment may be seen elsewhere as complex for other reasons (for example standards or the required infrastructure) and therefore concerns a different product market.

### 4.2.8 Substantive medical judgment

The complexity of the care provided within a DTC care product is to a certain extent available through the description of the DTC care product issued by the NZa. Three descriptions are provided: a description with medical terminology, an abbreviated version of it and a lay description. The description sometimes contains direct references to the complexity of the condition, for example "mild", "average" or "serious", but the described complaint, diagnosis or treatment may also say something about the degree of complexity.

The proportion of complex DTC care products will also differ between specialisms. Thus, for example, cardiothoracic surgery and neurosurgery will provide relatively more DTC care products for which patients have to travel.

Medical specialists point out that the description of the DTC care product is not always unambiguous. Substantive medical knowledge and experience are required in order to classify the DTC care products. They also state that the case complexity may differ so that a DTC care product in some cases is but in some cases is not designated as complex. In that case it is not the treatment itself that determines complexity, but the condition of the patient.

#### Implications for the investigation

The descriptions of DTC care products provide a starting point for estimating the degree of complexity. It will mainly concern care complexity.

Such a classification must be used cautiously, however, since medical specialists state that case complexity can be overlooked. Attention is also drawn to the fact that the description of a DTC care product is not always sufficiently focused and complete in order to assess the degree of complexity.

## 4.3 Scale for complexity

The distinction between complex and non-complex care can be illustrated with the use of what are referred to in practice as the eight – related – criteria. We have

operationalized these criteria on the basis of the DIS with all the DTC care products opened in 2014.

The analysis has been built up around travel behavior. We first analyze which DTC care products probably contain complex care on the basis of travel behavior. We then compare the results of the analysis of travel behavior with the other criteria for complexity.

### 4.3.1 Travel behavior

Travelling further than average for care is an indication of possible complexity.

#### Three categories of travel behavior

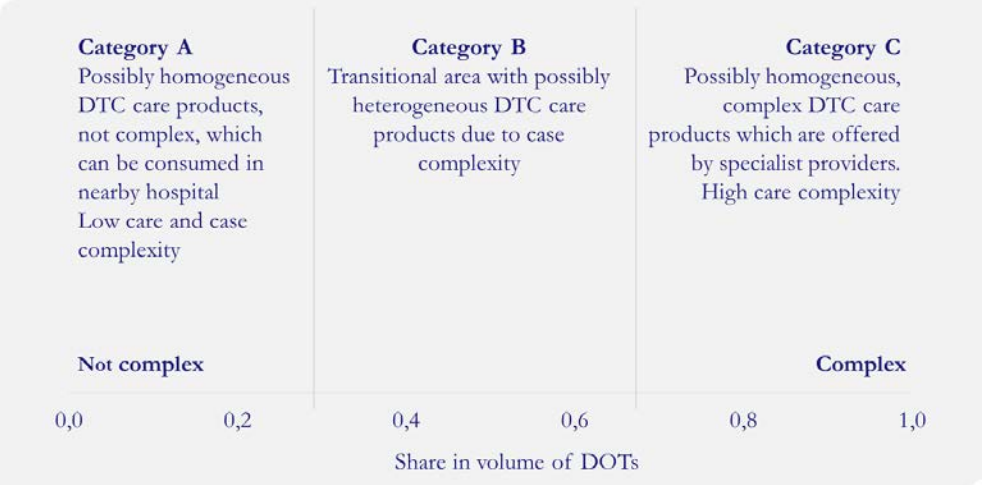
We estimate the complexity of care on the basis of the patients' travel behavior. The DTC care products have been arranged on the basis of how much extra travel has taken place on average in order to receive the care compared to how much the patient had to travel as a minimum to a hospital. We have classified this continuous distribution of care in three categories: A, B and C (figure 1).

A. Care that is provided by almost all hospitals. In general that is basic care. Patients travel relatively little for it. Part of this care is also offered in independent treatment centers.

B. Care that is not provided by all but is provided by many hospitals. It may also concern DTC care products which in one case do and in another case do not contain complex care, for example due to case complexity. We therefore refer to heterogeneous DTC care products for which some patients do and some patients do not have to travel.

C. Care for which patients have had to or wish to travel. Below, as expected, we find care with high care complexity that is often concentrated in a number of hospitals and care for which patients travel due to actual or alleged quality differences.

Figure 1: Classification of complexity into three categories



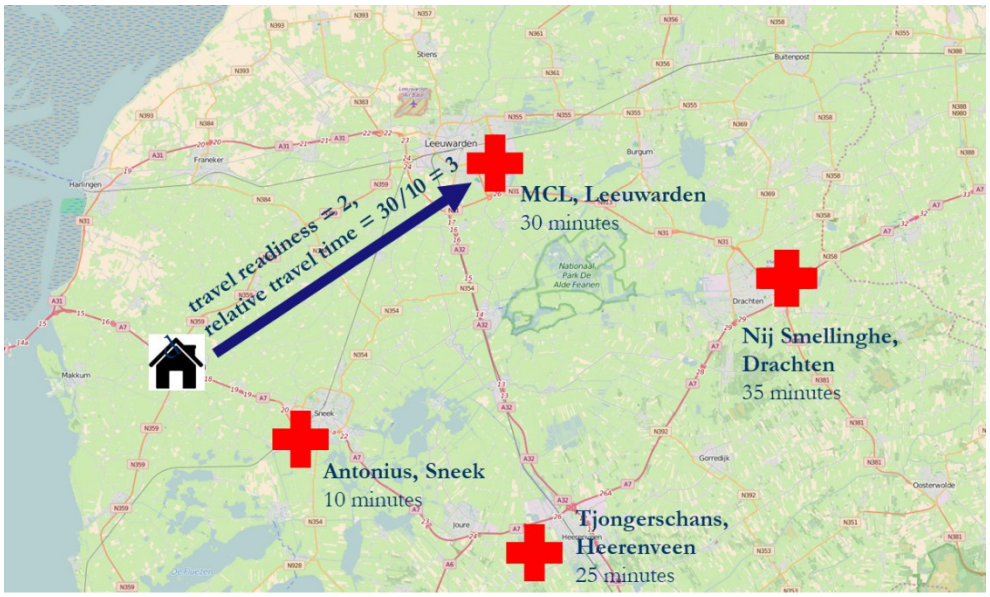

In order to determine how far patients have travelled for care, we have compared the location of the hospital at which the patient has been treated with other hospitals. Two criteria have been used for this purpose:

1. Proximity index: the number of hospitals that are located closer to the patient's postal code than the providing hospital. If the providing hospital is the closest hospital, the proximity index is 0.

2. Relative travel time: the number of times that the patient has travelled the travel time to the nearest hospital in order to attend the providing hospital. If the providing hospital is the closest hospital, the relative travel time is 1. This criterion is less sensitive for the travel behavior of patients having multiple hospitals in the vicinity. Travelling beyond a hospital located very close by can, however, greatly influence the index.

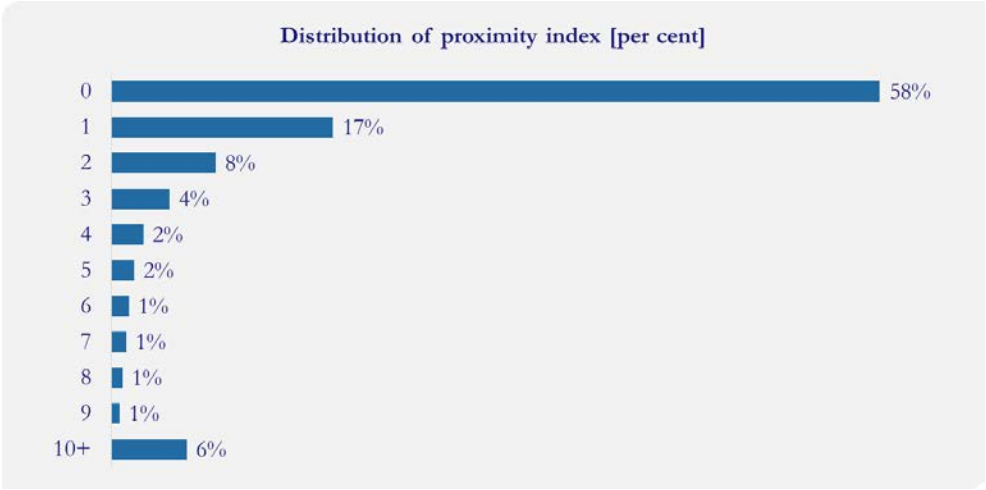
As an example we provide the proximity index and relative travel time for patients who live in Bolsward and attend the MCL in Leeuwarden for their care (figure 2). For these patients two hospitals are closer: The Antonius Hospital in Sneek and Tjongerschans in Heerenveen. The proximity index is therefore 2. With regard to the relative travel time we compare the 30 minutes which these patients travel with the 10 minutes which they would have had to travel to the nearest hospital (Antonius). The relative travel time is therefore 30/10 = 3.

Figure 2: Schematic representation of travel readiness and relative travel time




In this way we calculate the proximity index and relative travel time for each of the over 13 million claimed DTC care products in 2014. This shows that over 40% (by volume) of the DTC care products are supplied in a hospital that is *not* the closest and that more than 5% (by volume) of the DTC care products are supplied in a hospital while there are 10 or more hospitals that are closer (figure 3). Those are for example a heart-lung transplant, transplant of the pancreas in cases of serious failure of the kidney/liver/intestine/pancreas, epilepsy surgery in the case of a brain condition or one day treatment or more than four outpatient visits in the case of HIV/AIDS (in the case of child).

Figure 3: More than 40% (by volume) of the care is not provided by the nearest hospital.



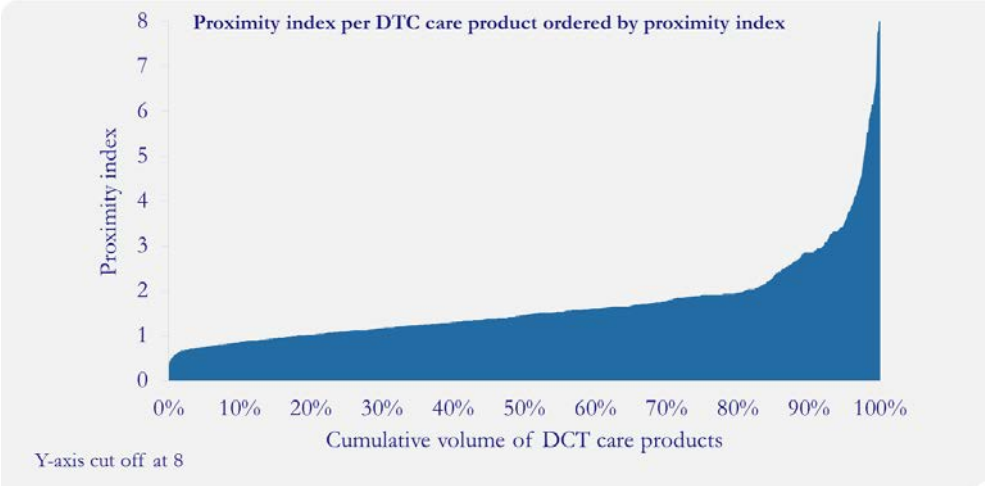

## DTC care products in order of travel behavior

In order to classify the DTC care products in categories A, B and C, we calculate for each DTC care product the average of the proximity index and of the relative travel time. We then arrange the DTC care products on the basis of this average. We carry out this analysis separately for the proximity index and the relative travel time. Here we discuss the results for the proximity index. Analyses of the relative travel time provide an almost similar result (see Annex D – Method, paragraph 7.4.3).

The averages are determined for the Netherlands as a whole. The Randstad region and the area around Eindhoven have higher population densities and more independent treatment centers and hospitals than elsewhere in the Netherlands. It therefore takes less time and effort there not to go to the nearest hospital. We assume that this happens more for complex care, as in the rest of the Netherlands. For less complex care some of the patients will still opt for the nearest hospital, whereas that is often not possible for complex care. We have confirmed this assumption by carrying out the analysis below twice: for the Randstad/Eindhoven regions and for the rest of the Netherlands. We found no difference with regard to the conclusions.

On the left-hand side on the x-axis in figure 4 we place the DTC care product with the lowest average proximity index and on the right the DTC care product with the second lowest average proximity index, and so on until the far right on the X axis the DTC care product with the highest average proximity index is shown. The average proximity index for the Netherlands as a whole across all DTC care products is 1.7.

Figure 4: The proximity index shows a linear rise for 83% of least complex care




As an illustration we describe a number of DTC care products.

- The DTC care product furthest on the right with more than four claims has been described by the NZa as: "159999015 - Operative fitting of a shunt in the uterus in supervision of pregnancy in a specialized center". This DTC care product has an average proximity index of 14.4 and an average relative travel time of 10.2. This DTC care product is offered in two hospitals.
- The DTC care product furthest on the left with more than €1 million of turnover is *'20107007 - Breast reconstruction operation in breast cancer'*. The average proximity index is 0.4. The relative travel time is 1.2.

The width of a bar in the illustration shows how large the volume (number of claims) of the specific DTC care product is. For example, the broad DTC care product on the right is 60% of the volume *'Investigation or treatment as outpatient or day treatment in the case of injury, excluding broken hip'*. This DTC care product recorded 330,165 claims in 2014 and on average for these patients 1.6 hospitals were closer than the providing hospital.

In order to put the determined values in perspective, we look at the travel time of patients with a hypothetical travel time for three specific, hypothetical DTC care products:

1. The DTC care product is supplied only at UMC Utrecht, the most centrally located academic hospital in the Netherlands. On average 21 hospitals are closer.

2. The DTC care product is only provided in the eight academic hospitals and all patients go to the closest academic hospital for this DTC care product. The average proximity index is then 5.4.

3. The DTC care product is supplied in the eight academic hospitals and in the 13 STZ hospitals with the heaviest care profile (Top STZ hospitals)[53] and all patients go for this DTC care product to the closest providing hospital. On average there are then 1.6 hospitals closer than the treating hospital.

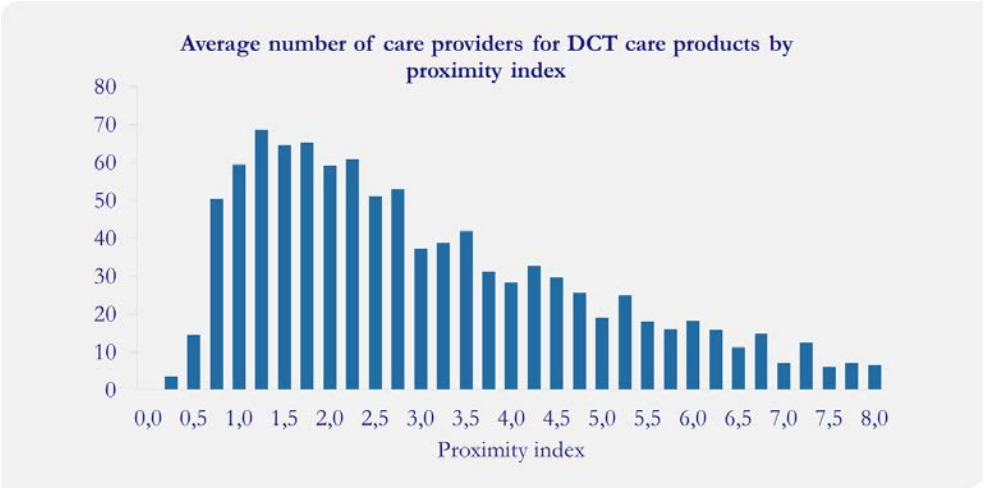
Two per cent of the volume of DTC care products have a proximity index higher than 5.4. This means that just 2% of the total volume of care is more concentrated than at the eight academic hospitals (figure 4).

The arrangement in figure 4 gives an insight into the travel behavior of one DTC care product compared to another. We see a break in the trend around 83% of the volume. The extent to which patients travel further rises faster with every subsequent DTC care product. We define category C on the right of this trend break. That is above a proximity index of 2.1. Similarly we find a comparable threshold for the relative travel time (see Annex D – Method, paragraph 7.4.3) at 2.5. As an additional precondition for the classification of a DTC care product in category C we therefore also state that this must also have an average relative travel time of over 2.5.

We also see the trend break at a proximity index of 2.1 in the number of hospitals providing DTC care products (figure 5). Above that level it decreases clearly, indicating complex, concentrated care for which travel is required.

[53] For the selection of the 13 TopSTZ hospitals we have looked at the share of three complex forms of care (complex high-volume, complex low-volume and Wbmv) within the total production of each of these hospitals. The 13 TopSTZ hospitals are: Catharina, Eindhoven; Isala, Zwolle; OLVG, Amsterdam; Medisch Spectrum Twente, Enschede; St. Antonius, Nieuwegein; MCL, Leeuwarden; Amphia, Breda; Rijnstate, Arnhem; Noordwest Ziekenhuisgroep, Alkmaar; St. Lucas Andreas, Amsterdam, St. Elisabeth, Tilburg; Maasstad Rotterdam, MCH, The Hague.

Figure 5: The number of care providers decreases above a proximity index of around 2.1.




## Independent treatment centers and categories of travel behavior

On the basis of the cut-off points for the proximity index (2.1) and relative travel time (2.5) we have classified 16% (by volume) of the DTC care products in category C. This care, however, also includes DTC care products for which a lot of travel takes place for reasons other than complexity[54]. These include shorter waiting times, the reputation of doctors and actual or alleged differences in (perceived) quality. We try to filter these DTC care products out of category C and thereby define category C*. C* consists of the care products in category C minus the DTC care products with both of the following characteristics:

- a market share of academic hospitals and 13 STZ hospitals with the heaviest care profile lower than 30% (the average on the left-hand side of figure 4) A higher share of academic hospitals and TopSTZ hospitals is, after all, a sign of higher complexity (see section4.2.2).

- a market share of independent treatment centers higher than 10% in which the assumption is that independent treatment centers are mainly chosen for reasons other than complexity[55]

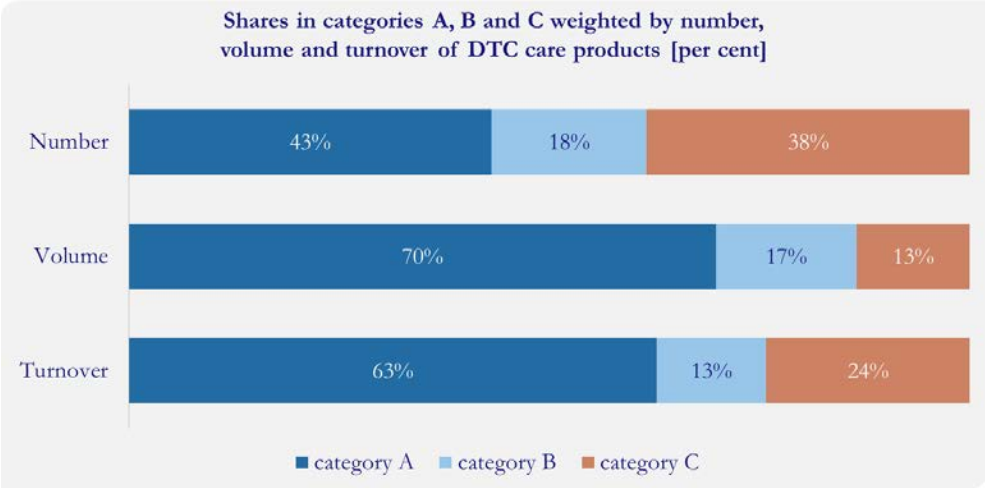
[54] A secondary factor is that the proximity index for care that is also provided by ZBCs is higher because in addition to hospitals patients also travel beyond ZBCs. Possibly because patients and/or their referring GP are is unaware that the required care is also supplied closer in a ZBC.

[55] There is no natural benchmark for the upper limit of the market share of ZBCs for care in category C. Here we opt for 10%, because we want to prevent complex care being removed incorrectly from category C. Empirically the reduction of the threshold also appears to have a limited impact, since the DTC care products in category C with a ZBC share above 0%, but below 10%, usually have a academic hospital/Top-STZ market share of more than 30%.

The DTC care products in category C* cover 13% of the volume, 24% of the turnover and 38% of the number of DTC care products (figure 6).

We filter the ZBC care in the same way from category B in order to construct category B*.

Figure 6: One-quarter of the turnover falls in category C* of DTC care products for which patients travel a lot in relative terms, most probably due to complexity




We divide the other DTC care products between categories A* and B*. Category A consists of the 67% of DTC care products (by volume) for which the least additional travel has taken place on average, according to both the proximity index (threshold value is 1.70) and the relative travel time (2.25). The DTC care products which fall in category C but not in category C*, or in category B but not in category B*, we add to category A. Together with the original DTC care products in category A we refer to this as category A*.

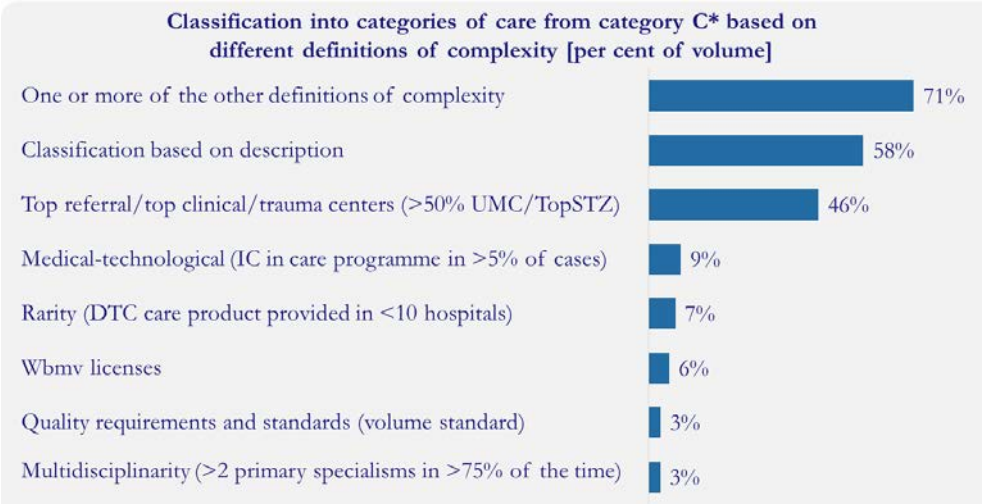
We also investigate whether category C* does indeed consist of complex DTC care products. This concerns in any case DTC care products for which patients travel further in practice. For these DTC care products competition between providers takes place over greater distances, possibly because only a few hospitals offer the care.

### Alignment with other indicators of complexity

As discussed in section 4.2, in practice there are different – related – aspects of complexity. To some extent these aspects are generally accepted. Where possible we determine, for each DTC care product, on which of the stated aspects this DTC care product is considered to be complex. We then compare that with the classification in category C* based on the proximity index and relative travel time.

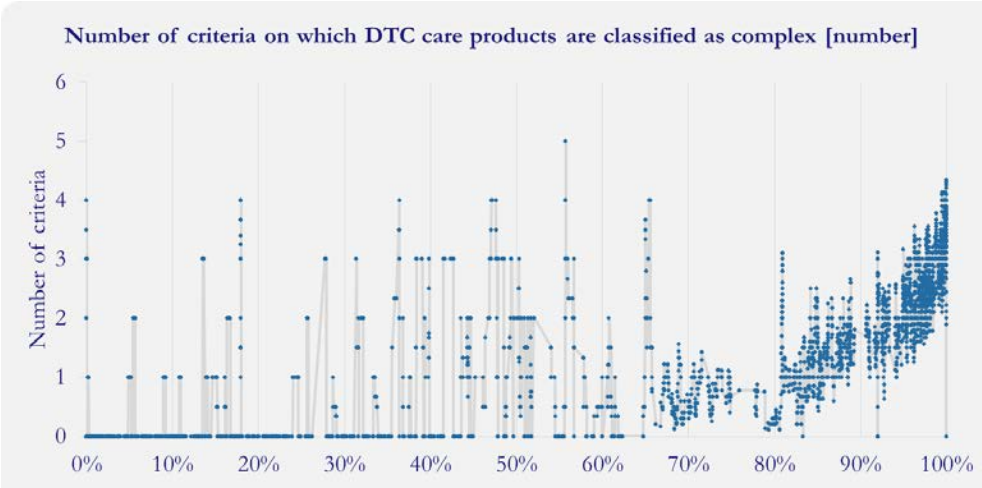
Just under three-quarters (71%) of the care in category C* is considered to be complex care on the basis of at least one of the other criteria.

Figure 7: The care in category C* is considered to be complex also on the basis of another indicator in almost three-quarters of the cases.




We see that for DTC care products above a proximity index of 2.1 (87% of the volume of DTC care products has a lower proximity index), the chance that a DTC care product will be considered complex on one of the other criteria is systematically higher than below it (figure 8). The criteria appear to be consistent with classification in category C* based on the proximity index.

Figure 8: The likelihood that a DTC care product will be classified as complex on a criterion other than the proximity index or relative travel time increases after approximately 80% of the DTC care products



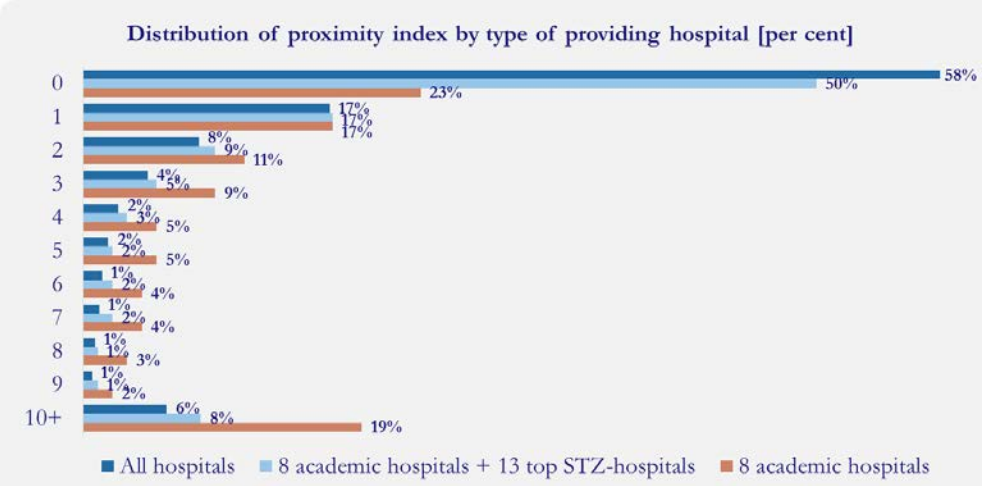
On the basis of travel behavior, we therefore categorize a higher proportion of the care as complex than on the basis of other criteria. Despite the filtering based on market shares of academic hospitals, TopSTZ hospitals and independent treatment centers, not all care in category C* is complex care according to one of the other criteria. Perhaps because such a criterion for complexity is not available for all complex care. On the other hand patients also choose to travel further for other reasons, as described above. Conversely, we also see DTC care products with a proximity index lower than 2.1 that are categorized as complex on the basis of other characteristics.

Below we compare the other characteristics of the DTC care products with their classification in category C*.

### 4.3.2 Top referral and top clinical care and trauma centers

Hospitals differ in the extent to which they provide complex care. Broadly speaking the following classification can be used. Academic hospitals provide top referral care and top clinical care. STZ hospitals provide top clinical care. We draw a distinction between the 13 of the STZ hospitals with the heaviest care profile and the other 14 which more resemble basic hospitals in terms of their profile. We therefore define academic hospitals and the 13 TopSTZ hospitals as institutions focused on complex care in which the bulk of the top referral and top clinical care is provided. Patients in these institutions travel further on average than the average patient; in addition to the basic care for patients in the immediate surrounding area, these hospitals have a larger operating area for complex care (figure 9). Examples of care with a proximity index greater than 10 are: recurrent provision of medication during an outpatient visit or day treatment in the case of metabolic diseases (of children), real-life phase and hormone treatment on an outpatient basis in gender dysphoria and provision of chemotherapy for non-metastasized tumors, during a hospital admission for cancer of the bone, cartilage or soft tissue.

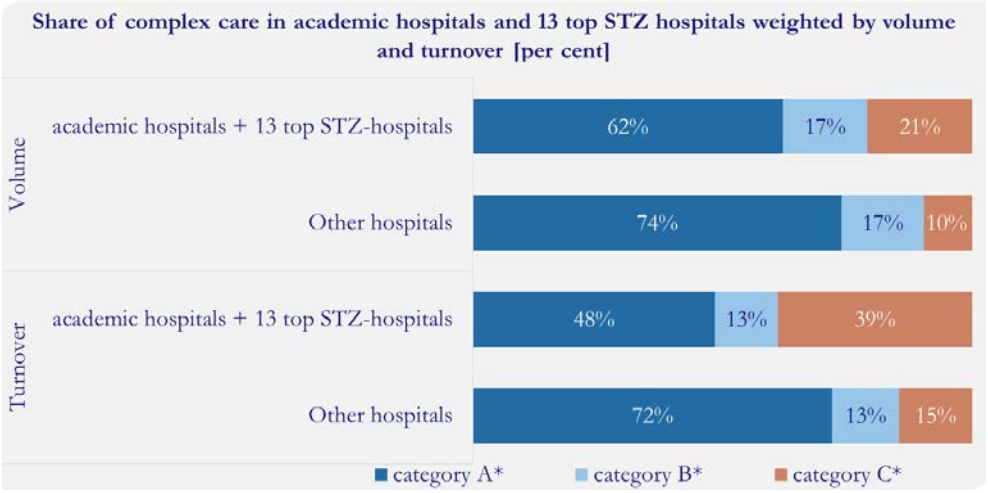
Figure 9: The proximity index across the entire allocation is higher for academic hospitals and 13 TopSTZ hospitals than for all institutions




Approximately 34% (by volume, 39% by turnover) of DTC care products are supplied by these institutions. The share of the volume of category C* DTC care products in academic hospitals and 13 TopSTZ hospitals is approximately twice that of the other institutions (figure 10). In the remaining hospitals 10% of the volume falls in category C*. The average turnover per DTC care product in category C* in the remaining hospitals is over 20% lower than in the 8 academic hospitals and 13 TopSTZ hospitals. This indicates that the more expensive complex care is more concentrated. Examples are operations on heart valves, bypass operations for lung and heart conditions. Examples of complex care that is less concentrated include various DTC care products with regard to the treatment of nerve pain and team treatments with multiple care providers over a lot of time in an outpatient clinic or relatively long admissions for conditions of the brain, organs or nervous system.

The acute care provided at the 11 trauma centers is classified in category C*. The trauma centers are the 8 academic hospitals and a number of STZ hospitals, all of which form part of the 13 STZ hospitals that we have included above in the group of providers of complex care.

Figure 10: Care in category C* has a larger share in academic hospitals and the 13 TopSTZ hospitals than in other hospitals

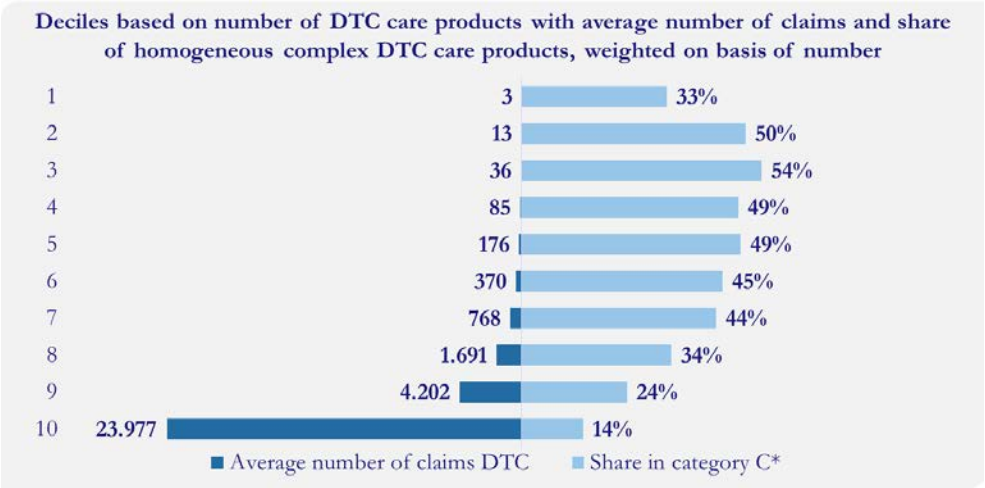



### 4.3.3 Rarity

Rare care means that the DTC care product will have a small volume. It then becomes less likely that all hospitals will offer this care. Care will therefore also be more concentrated for rare than for frequent conditions. In addition a concentration of care among a limited number of institutions can point to the high degree of specialization that is required in order to provide the care.

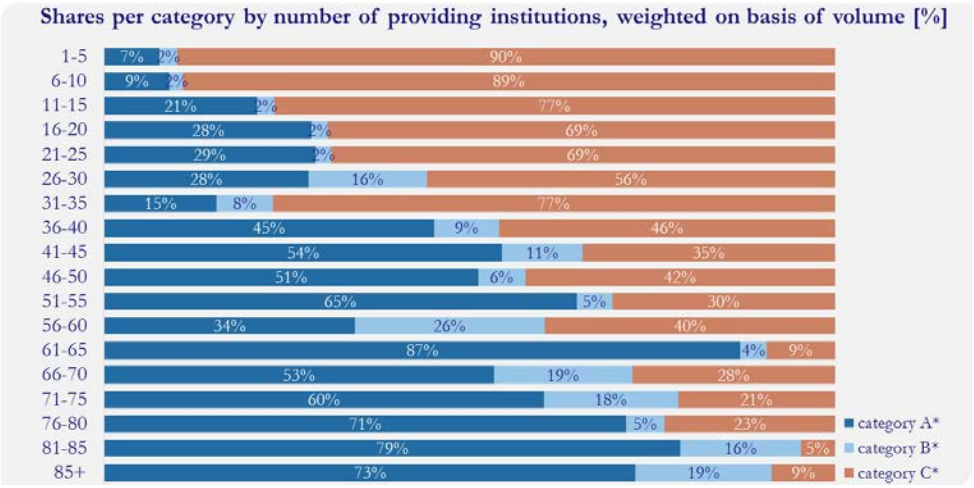
We therefore look at the correlation between the volume of the DTC care products and the share of DTC care products in category C*. To do that we divide the DTC care products into deciles, with each decile having the same total volume. The last decile, with the highest average volume per DTC care product, as expected contains the smallest share of DTC care products in category C* (11%). All deciles with fewer than 1,500 claims per DTC care product have a category C* share above 33% (figure 11)

Figure 11: The 10% of DTC care products with the highest volume have the smallest share of DTC care products in category C*




90% of the care which is provided by five or fewer hospitals or independent treatment centers falls in category C* (figure 12). Care that is provided by more than 80 hospitals falls predominantly in category A*.

Figure 12: DTC care products that are provided by few institutions fall more frequently in category C*




### 4.3.4 Wbmv licenses

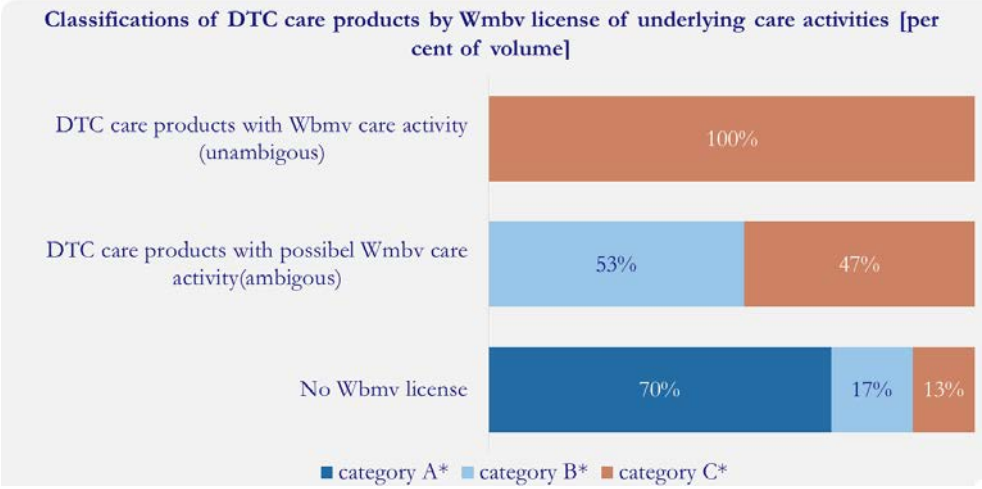
For the classification of DTC care products in terms of the need for a Wbmv license for the supply of care we use the classification from the care product table of the NZa. For each care product this table identifies which Wbmv license is required for the underlying care activities. For this investigation we distinguish the care products which are designated by the NZa as unambiguously and ambiguously designated

Wbmv care products. Unambiguous Wbmv care products are care products which can only be derived with a care activity for which a Wbmv license is required. The DTC care product therefore always includes Wbmv care. Ambiguous Wbmv care products can be derived from different care activities; partly care activities with a required Wbmv license and partly care activities for which no Wbmv license is required. The DTC care products therefore do not need to include any Wbmv care activity.

Approximately 1% of the volume consists of DTC care products with Wbmv activities. That corresponds to 6% by turnover and 3% of the number of DTC care products.

Unambiguous Wbmv care products always fall in category C* (figure 13). Ambiguous Wbmv care products, by contrast, fall in category C* and also in category B* with possible heterogeneous complex care. That is inherent in the classification method in DTC care products whereby the same DTC care product can be derived whether or not there has been a Wbmv procedure.

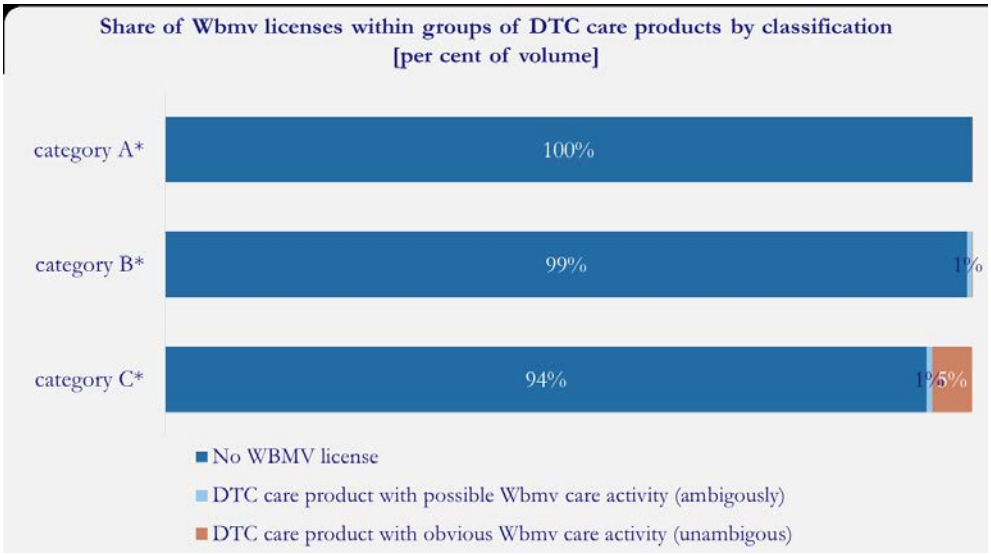
Figure 13: Care products with an underlying Wbmv license (unambiguous) are always classified in category C*.




Five per cent of the volume of category C* DTC care products consists products with an unambiguous Wbmv license (

figure 14). For DTC care products in categories B* and A* fewer than 1% of the volume require a Wbmv license.

Figure 14: Care products with a Wbmv license make up 5% of the volume of care in category C*.

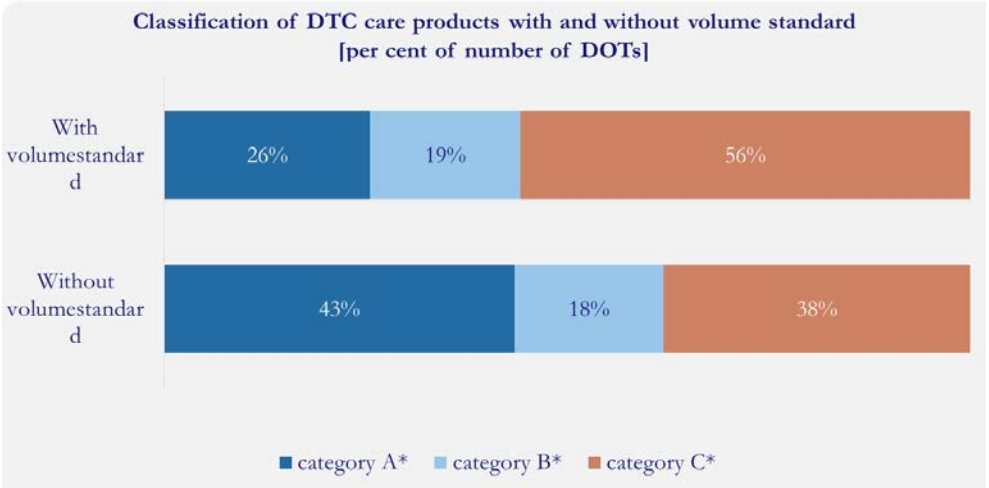



### 4.3.5 Quality requirements and standards

For 86 DTC care products we have been able to ascertain that a treatment with a minimum standard forms part of it. This concerns 2% of the number of DTC care products (corresponding to 1% of the volume and 7% of the turnover).

Of the DTC care products with a volume standard more than half (of the number) are classified in category C*. For the DTC care products without a volume standard that is almost 40% (of the number) (figure 15).

Figure 15: Over half of the number of DTC care products for which a volume standard has been determined fall in category C*.




In terms of volume that is 41% and 13% respectively. As discussed earlier, there are also volume standards for care that is offered by many hospitals and which is not considered to be very complex, such as operations for breast or bowel cancer.

### 4.3.6 Medical technology

Facilities used

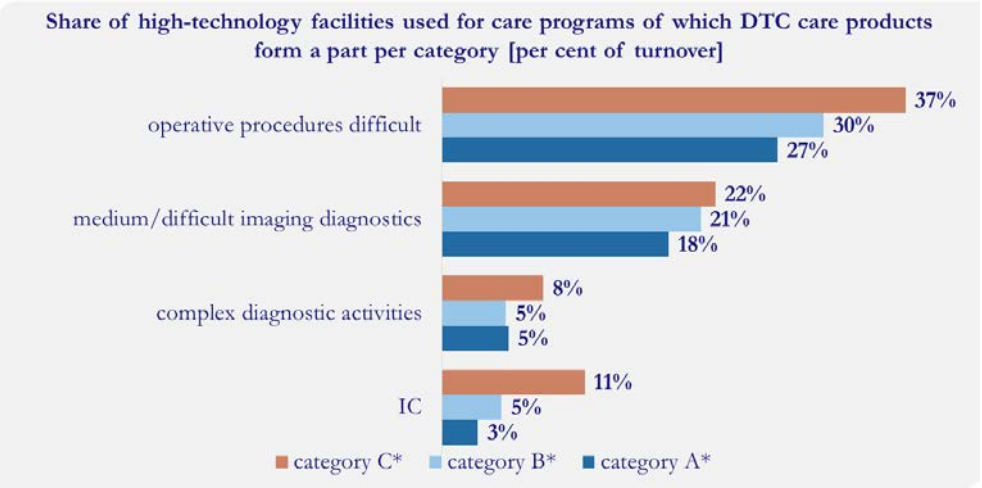
The use of facilities is recorded during the procedures. For the care profile category (CPC) 'imaging diagnostics', 'diagnostic activities' and 'operative procedures' it is not possible to deduce directly which facilities are required. The CPC 'imaging diagnostics' includes, for example, both the ultrasound scan during pregnancy and a kidney biopsy that has to take place in a radiological intervention room. For that reason we have assessed the care activities in each of these CPCs individually and classified each in three subcategories: simple, medium and difficult. The exception is imaging diagnostics in which the last two categories are combined.

- In imaging diagnostics a distinction has been drawn between the need for advanced equipment and the use of an antiseptic room:
    1. Simple**:** activity does not take place in an antiseptic room and no advanced equipment is used.
    2. Medium and difficult**:** activity takes place in an antiseptic room and/or advanced equipment is necessary.
- For the diagnostic activities the classification is based on how specialized the room is in which the care activity has to take place.
    1. Simple**:** diagnostic activities are not tied to a specially equipped environment.
    2. Medium**:** diagnostic activities require the use of sterile tools or involve an endoscopy.
    3. Difficult**:** diagnostic activities require a special radiological intervention room or an operating room.
- Operative procedures are also scored on the basis of the amount of space required:
    1. Simple: procedures take place in the treatment room.
    2. Medium**:** procedures are carried out in an appropriately equipped treatment room or outpatient operating room (OOR), such as for radiology and cardiology.
    3. Difficult**:** procedures requiring an operating room.

With this classification it has been determined for each DTC care product what level of facilities has been used by the patient in the care process of which the DTC care

product formed part. DTC care products in category C* are more often part of a care process in which high-technology facilities are also used (figure 16). Here too we expect to have no one-on-one connection. After all, part of the difficult facilities are also used for less complex care.

Figure 16: DTC care products in category C* are more often part of a care program using complex facilities



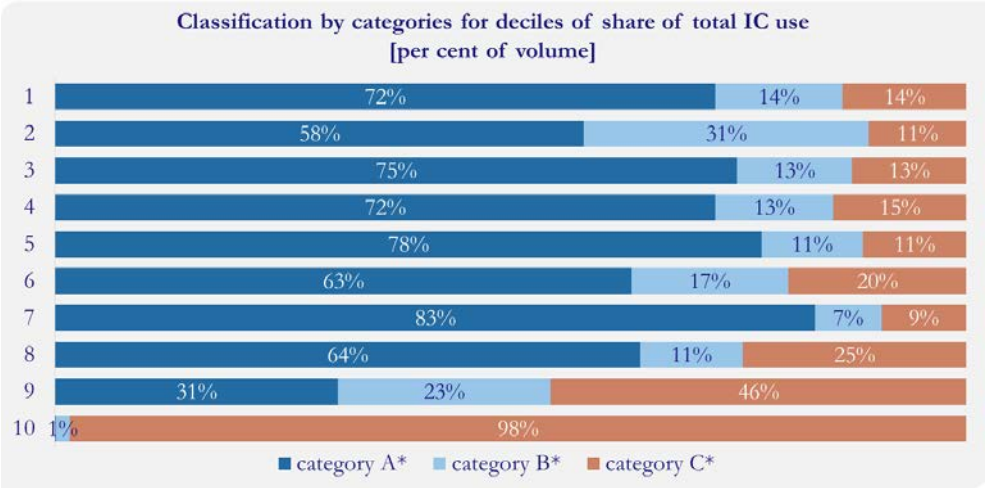

## Intensive Care

Use of Intensive Care in a care program is often an indication of complexity.

Approximately 1% of the DTC care products (by volume) are part of a care program in which an IC procedure has taken place. That corresponds to 5% of the turnover.

The DTC care products in the decile with the highest share of IC care (based on volume) are almost all (98%) classified in category C*. Even the second-to-last decile has substantially more DTC care products in category C* (46%) (figure17).

Figure17: The decile of DTC care products with the most use of IC falls almost entirely in category C*




Approximately 3% of the volume of DTC care products in category C* consists of DTC care products in a care program in which IC care occurs. That volume accounts for 11% of the turnover in this category.

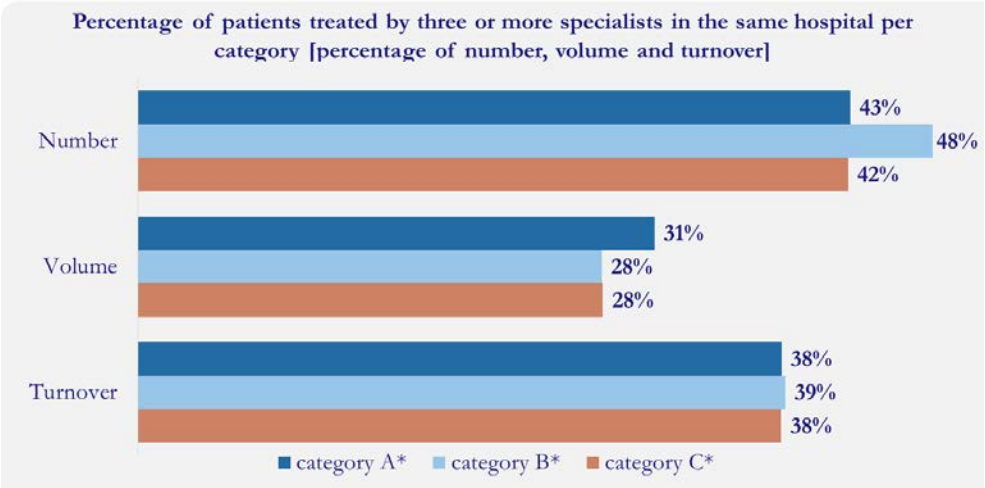
### 4.3.7 Multidisciplinarity

For each DTC care product we determine which different medical specialists have been involved in the care of the patient in the hospital. This may have been for different care requirements. Here we include care activities from care profile categories of day nursing, clinic, operative procedures, other therapeutic activities, rehabilitation, blood products, IC care activities, IC treatment day, add-on medication, orphan drugs and coagulation factors.

For each category of DTC care products an assessment was made of the share involving more than three primary specialisms. In category C* on the basis of the number of DTC care products and volume this share turns out to be lower than in category A* or B* (figure 18). Possible explanations for this are:

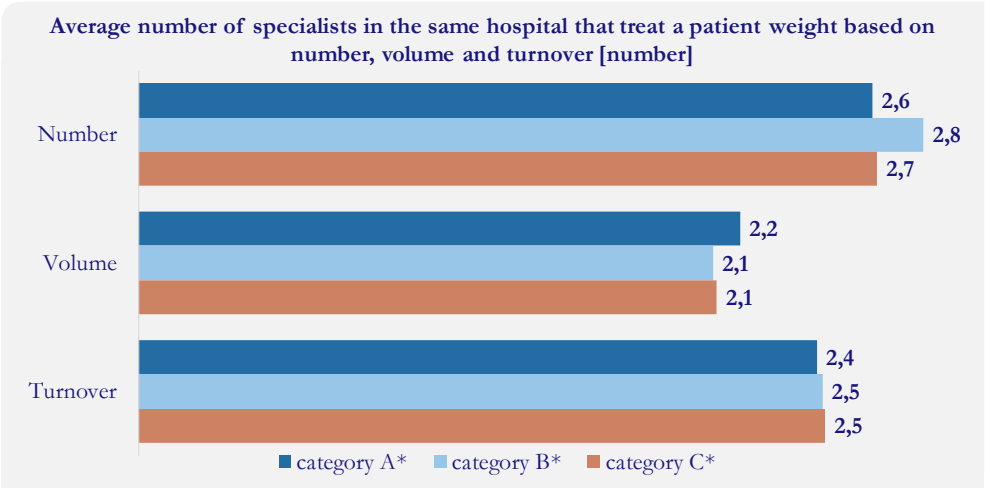
- Concentration of more complex care in tertiary centers. In our analysis that care appears to be monodisciplinary because we look at the connections within a hospital and not at the connections between hospitals.
- The need for care close to home for patients treated by multiple specialists, particularly where multi-morbidity among vulnerable elderly people are involved.

Figure 18: Patients for DTC care products in category C* see more than two specialists in the same hospital less often than category A* or B*




As an alternative we look at the average number of specialisms that patients see in categories A*, B* and C*. Here too we see only small differences between the categories and again a lower degree of multidisciplinarity in category C* (figure 19). The same explanations probably apply.

Figure 19 Differences in the number of specialists (in the same hospital) who treat a patient are not great between categories A*, B* and C*




### 4.3.8 Substantive medical judgment

Share of each medical specialism

For six specialisms approximately two-thirds or more of the DTC care products (by volume) falls in category C* (figure 20). These six specialisms may each form a

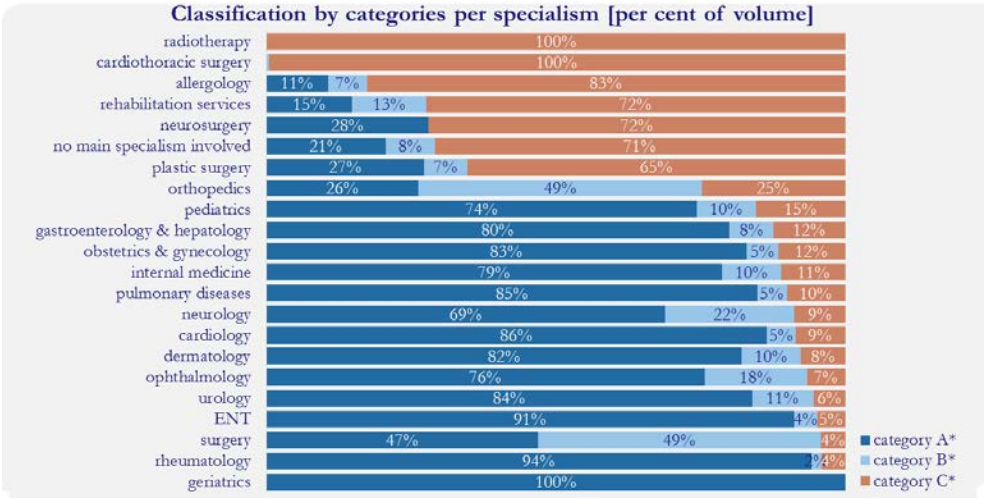
separate market from the other specialist medical care on which basic hospitals (to date) have competed little:

- These are three specialisms that are organized separately due to the required scale and facilities: radiotherapy, cardiothoracic surgery and neurosurgery. They mainly provide complex care and mainly treat patients who have been referred by another primary specialism. More than half of the DTC care products (by volume) of these three specialisms are supplied in the academic hospitals or 13 TopSTZ hospitals.

- The (clinical) medical specialist rehabilitation care is organized in separate institutions outside the hospitals in which patients often stay longer and in which a separate infrastructure is available for this rehabilitation care. This concentration does not therefore follow by definition due to the complexity of the treatment.

- There are not many allergologists and they partly fulfill a tertiary function and in that sense therefore provide complex care. It is possible that there also a residual part of ZBC care provided by allergologists in this category.

Figure 20: For six specialisms a high proportion of DTC care products fall in category C*




For plastic surgery the high proportion of category C* DTC care products (65%), even after the exclusion of DTC care products with high market shares of independent treatment centers, may also reflect a readiness to travel due to the patients' choice of a particular provider[56]. This is also evident from the share of DTC

[56] Mainly due to the DTC '1 or 2 outpatient visits in connection with plastic surgery'. The independent treatment centers percentage is 9%, but the academic hospital/top STZ percentage is 40%.

care product plastic surgery that is supplied by academic hospitals and 13 TopSTZ hospitals. At 35%, however, that is somewhat higher than the national average, but relatively low in view of the average share of 65% in category C*.

At the other end of the spectrum hardly any travel takes place for DTC care products for which geriatrics is the dominant primary specialism. They all fall in category A*. The care may, however, be complex in the sense of case complexity. Geriatrics focuses on vulnerable elderly people who often have multiple conditions. This is an example of where the term 'complexity' cannot be linked one-on-one to a larger geographic market. Proximity is important precisely for this target group. In addition the care is often provided in coordination with local primary providers such as general practitioners and district nurses.

### Classification based on description

A judgment on the complexity of the supplied care based on the description of a DTC care product requires substantive medical knowledge. Five practitioners have all scored included DTC care products, excluding add-on medication, in the same categories as those used in this investigation:

A. Category A (probably homogeneous non-complex care) which should be able to be provided in all cases in every basic hospital in the Netherlands.

B. Category B (probably heterogeneous complex) consists of DTC care products for which the care may be both complex and non-complex due to either an unclear description or possible underlying case complexity.

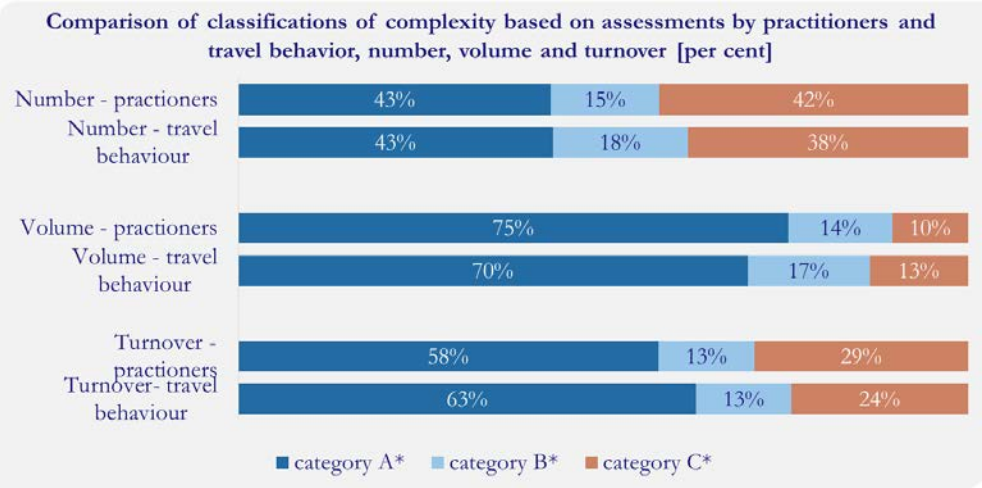
C. Category C (probably homogeneous complex DTC care products) had to include a particular degree of extra specialization or a high degree of advanced equipment at the time of the assessment to make concentration obvious.

The assessment by practitioners is a qualitative approach and is to a certain extent subjective. This classification was carried out by five recently qualified basic practitioners.

The initial assessment was carried out by three practitioners. The DTC care products on which no agreement was reached were then scored once again by two other practitioners. Finally we classify DTC care products in category A, B or C if at least 60% of the practitioners classify the DTC care product in that category. DTC care products with less than 60% agreement and add-ons are not included in the comparisons between complexity based on the practitioners' assessment and on the basis of travel behavior. That makes a total of 540 DTC care products, or 8% of the volume.

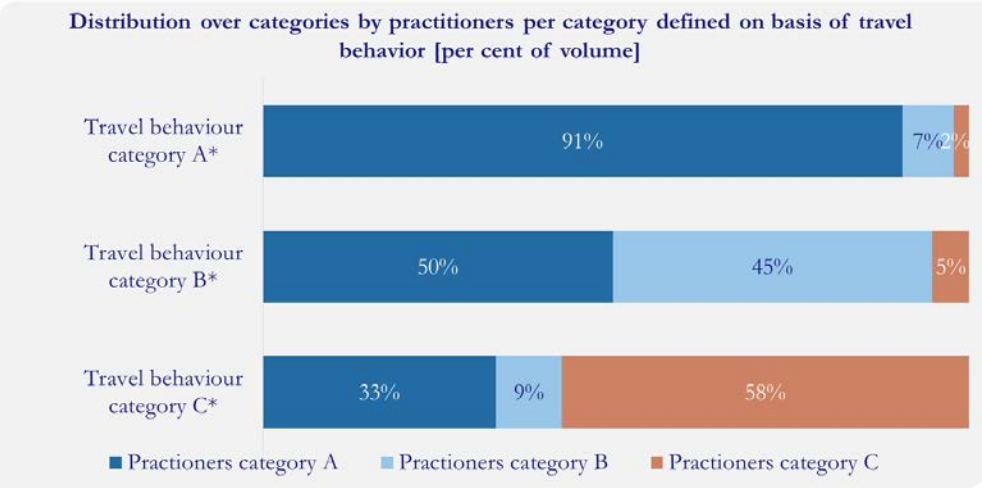
This results in a category C share of 10% (by volume) of the care. This concerns 42% of the more than 3,700 DTC care products on which there was 60% agreement. That corresponds to 29% of the turnover (figure 21). As described above, these shares based on travel behavior are 13%, 38% and 24% respectively.

Figure 21: Classification of DTC care products by practitioners in category A, B and C on the basis of descriptions leads to shares of category C* comparable to those on the basis of travel behavior




The practitioners also classify almost all claimed DTC care products for which the average patient travels little in category A(*) (figure 22). Over half of the DTC care products (58% by volume) which fall in category C* on the basis of travel behavior are classified by the practitioners as homogeneous complex care.

Figure 22: Practitioners classify more than half of the volume of DTC care products in the same way as on the basis of travel behavior



## 4.4 Conclusion concerning complexity of hospital care

Which care, determined per DTC care product, is complex and which is not is in itself a complex question. That is because there is no unequivocal, shared notion of complexity in healthcare. The terms case complexity (determined by the care intensity of a specific patient) and care complexity (determined by the treatment) often overlap.

### 4.4.1 Travel behavior as a criterion for complexity

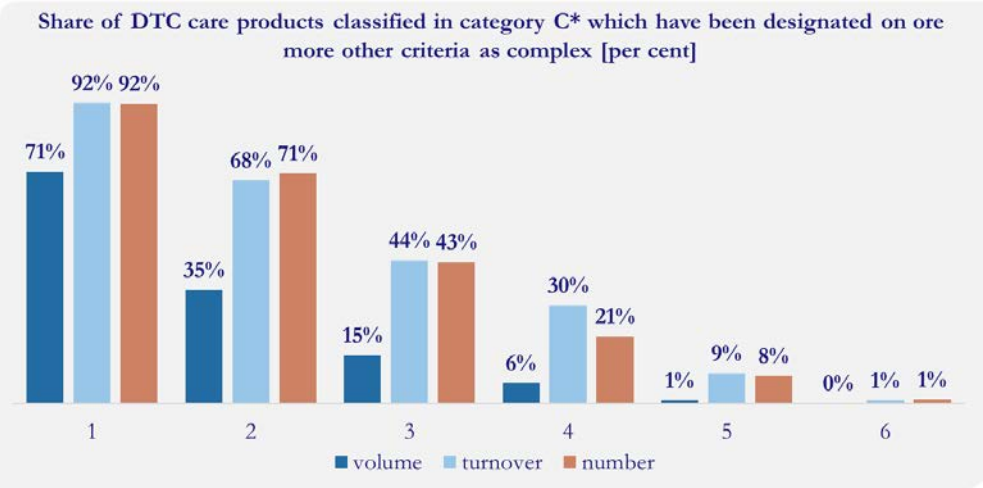
One of the characteristics of complex care, particularly with regard to care complexity, is that care is not offered by all hospitals. We use this in an overarching criterion: observed travel behavior. Overall, we find that patients consume less than 60% (by volume) of the DTC care products in the nearest hospital. In the case of over 5% (by volume) of the DTC care products, more than 10 hospitals are closer than the hospital which the patient has attended.

For 13% of the volume of claimed DTC care products (24% of the turnover, 38% of the number) the proximity index was higher than 2.1. This means that for those DTC care products on average more than 2.1 hospitals were closer than the supplying hospital. There are various indications that above this proximity index the degree of complexity is significantly higher than below it. This analysis has been cleaned up to take account of DTC care products for which travel to independent treatment centers and hospitals presumably took place for actual or alleged quality differences.

### 4.4.2 Other criteria for complexity

In addition to travel behavior, for each DTC care product we have defined a further seven (related) criteria of complexity. A large part of the volume of DTC care products (71%) which we classify on the basis of travel behavior in category C* with possible complex care, was also classified as complex care on at least one of the other seven criteria. For the number of DTC care products and the associated turnover, that is more than 90% (figure 23).

Figure 23: A large proportion of the DTC care products classified as possibly complex care on the basis of travel behavior are also complex on multiple criteria




These criteria are: top referral and top clinical care, rarity, licenses under the Specialist Medical Procedures Act (Wbmv), minimum standards, use of medical technology, multidisciplinarity and judgment of medical practitioners. As stated previously, there is a relationship between these criteria, and they are partly overlapping: complex care is often regulated care (Wbmv licenses, volume standards), occurs less frequently (rarity), makes higher demands on the medical-technological infrastructure and often requires multidisciplinary collaboration. Partly for these reasons, complex care is concentrated (travel distance) in generally top clinical and academic hospitals.

### 4.4.3 Share of complex care

It is difficult to determine precisely for each DTC care product whether it describes complex care, and whether that then applies to all patients for which that DTC care product has been claimed.

Based on our analysis for 2014, we estimate the following key figures for complex care for which travel takes place:

- approximately one-third of the 4,250 Diagnosis Treatment Combination (DTC) care products
- approximately one-tenth of the volume of the 13.6 million DTC care products
- approximately one-fifth of the analyzed turnover of almost €14 billion

# 5 Connections between care within hospitals

ACM wishes to have greater insight into the interrelatedness between specialisms. ACM questions what is necessary in order to provide a particular form of care if a hospital wants to start providing it, and what consequences no longer providing care have for other (support) specialisms.

This question is relevant to competition analysis. After all, care that can be provided independently of the rest of the hospital probably has lower barriers to entry than care for which a fully equipped hospital is required. The competition conditions are different.

For this question too we also carry out a qualitative and a quantitative analysis. The quantitative analysis consists in part of a cluster analysis. This cluster analysis shows logically coherent groups of products in hospitals which each form their own product market. In the clustering the interrelatedness of medical specialisms and the use of hospital facilities plays an important role.

## 5.1 Definition of interrelatedness used

The term interrelatedness concerns relations between elements that cannot readily be separated or disconnected. Interrelatedness involves a long-term dependence (whether mutual or otherwise) or a connection that cannot be broken without significant consequences.

For this investigation we focus on connections, also interrelatedness, within the hospital. Which parts of the hospital are so closely interrelated that they cannot be offered separately? This question can also be approached the other way round; which parts of the specialist medical care can be offered outside the hospital?

In addition to connections within the hospital, we also discuss the connections in care between hospitals and of hospitals and with other care providers. That describes important trends that also will have an impact on connections within hospitals.

## 5.2 Connections in specialist medical care within hospitals

Interrelatedness within a hospital arises in specialist medical care at a number of levels:

- Multidisciplinary collaboration between primary and other specialisms.
- Independence of specialisms in independent treatment centers
- Connections between primary and support specialisms.
- Required medical technology and infrastructure.
- Economic and strategic connections.

### 5.2.1 Multidisciplinary collaboration between primary and other specialisms

In a growing number of cases collaboration takes place within hospitals between primary and other specialisms in the treatment of patients, for reasons of knowledge sharing and quality improvement. This development is fuelled partly by the increasing comorbidity and multimorbidity (leading to increasing case complexity) and by the subspecialization and superspecialization within specialisms. This collaboration manifests itself among other things in structured multidisciplinary consultation (MBO) that is also required by the IGZ. We also see the emergence of multidisciplinary patient-oriented centers, such as a coronary and vascular centers, a center for mobility problems or a mother-and-child center. Multidisciplinary collaboration is synonymous with interrelatedness.

### 5.2.2 Independence of specialisms in independent treatment centers.

The counterpart of increasing interrelatedness between specialisms in a hospital is the emergence of independent treatment centers, in some cases even as a joint initiative of hospitals and medical specialists. There are around 300 independent treatment centers with eligibility under the WTZi Act (Care Institutions (Eligibility) Act), of which approximately 150 supply turnover information independently to the DIS[57]. From 2007 to 2010 inclusive the total share of independent treatment centers in the market for specialist medical care rose from 1% to 2.3%. The independent treatment centers are mainly based in the Randstad region. independent treatment centers focus particularly on high-volume non-clinical care that can be planned. independent treatment centers record most turnover in the specialisms of orthopedics and ophthalmology, followed by the specialisms of dermatology and surgery. For six specialisms the market share of independent treatment centers in the market for specialist medical care is higher than 2%: plastic surgery, anesthesiology, allergology, dermatology and ophthalmology. In relative terms the largest of these are allergology,

[57] Monitor zelfstandige behandelcentra, NZa, 2012

dermatology and ophthalmology, with more than 10% market share in some years. The share of independent treatment centers in the other specialisms is relatively limited.

The uncertainties for independent treatment centers are increasing according to the NZa. This has to do with changes in laws and regulations and policy, with an associated reluctance among banks and other investors to provide finance, the sometimes difficult collaboration with hospitals and the contracting process with health insurers. Health insurers are taking a more critical stance in their contracting of independent treatment centers than in the early years.

### 5.2.3 Primary specialisms and support specialisms

Primary specialisms are specialisms for which the patient is referred by a general practitioner or other specialist. There are around 23 such primary specialisms. Academic hospitals generally have most primary specialisms, followed by top clinical hospitals and general hospitals. Over 80% of the national hospital turnover is generated in a hospital with between 19 and 25 primary specialisms[58].

In addition to primary specialisms, medical support specialisms are distinguished, such as anesthesiology, radiology, medical microbiology, clinical chemistry etc. By definition there are connections between primary specialisms and support specialisms. In some cases the relationship is a broad one, in the sense that many or almost all primary specialisms use a support specialism, such as clinical chemistry (laboratory investigation). In some cases that interrelatedness is narrower, as in the case of anesthesiology. Without an anesthesiologist the surgeon cannot operate, but by no means all fields use the anesthesiologist.

Two developments are occurring in the support specialisms. In the first place certain support specialisms have partially gained a 'primary character' in the past few years. Examples are the combating of pain by anesthesiologists or intervention radiology. In the second place we see increased scale and regional to supraregional concentration of laboratories, for example. In the broader sense the activities of support specialisms engaged in diagnostics can be offered independently of other hospital facilities. Examples are the independent diagnostic centers or the assessment of radiographs of Dutch patients by radiologists in India.

### 5.2.4 Medical technology and infrastructure

Medical technology, combined with ICT, is one of the main drivers for the development of specialist medical care. Investments in medical equipment for

[58] Marktscan Medisch Specialistische Zorg 2014, NZa, 2014

diagnostics and treatment are among the major investments in a hospital. In order to make such investments profitable, a certain volume is required. This often requires efficient use by multiple specialisms, for example in robotic surgery. If a particular specialism is no longer offered, that may have consequences for the efficient use of the equipment in question. This has an impact on the results of the hospital, which in turn can influence the competitive position.

The required medical infrastructure and its use differs depending on the specialism. For example (almost) all surgical fields use the operating complex, albeit to differing intensities. Some interventions can also take place outside an OR complex, such as an OOR (outpatient operating room) or, as in the case of oral surgery or ophthalmology, in an in-house treatment room.

Access to an IC is a precondition for many specialisms to provide certain care, but the use of the IC varies depending on the specialism, as is also shown by the quantitative analysis.

The term 'stand-alone specialism' is used if the specialism (or parts of it) can be provided with relatively low investments outside the infrastructure of a hospital. As stated above, we see this particularly in the care which independent treatment centers provide in, for example, parts of elective surgery and orthopedics, ophthalmology and dermatology.

### 5.2.5 Economic and strategic connections

Economic

ACM questions among other things what the consequences are if a hospital no longer offers a certain specialism. It may be that a particular specialism is crucial for other care. That also applies to certain facilities. If they are essential, entry to the market for parties which do not have them is not possible.

Twynstra Gudde and SiRM dealt with a similar question in the investigation entitled 'De brede betekenis van acute zorg' ('the broad definition of acute care') which we carried out on behalf of the NVZ in 2013. The investigation concerned among other things the significance (including economic) of an emergency unit for a hospital. The investigation showed that around 16% of the total number of DTCs[59] of a hospital are related to an emergency visit. Those visits (and the follow-up treatment) relate to around 40% of the economic value (in terms of costs) of all DTCs in a hospital. Of

[59] These analyses were carried out on data from before 2012 and the 'old DTCs' were still in use instead of the DTC care products introduced subsequently.

the emergency DTCs ultimately 78% lead to an initial outpatient visit, 7% to a day admission and 35% to a clinical admission. Some patients will make use of several of these facilities. Approximately half of the total number of admissions and days of stays in hospital involve patients who in the first instance came into the hospital via the emergency unit. In addition, the average length of stay in hospital of a patient with an emergency DTC is longer. The emergency unit is therefore particularly important for the supply to the clinic. The emergency-related DTCs are also of significance (whether substantial or otherwise) for the OR, diagnostics and the laboratory. The emergency unit (and IC units) also have an important internal function for a hospital and are furthermore relevant to the attractiveness in the labor market. Any closure of an emergency unit therefore has a major impact on a hospital.

### Strategic

In their strategy formation hospitals currently devote a great deal of attention to their profile and portfolio. 'Focal points' or 'areas of attention' are increasingly being identified, with which a hospital seeks to distinguish itself or will invest additional sums. Because the resources are scarce and scope for growth is limited, strategic allocation decisions affect the interrelatedness of specialisms. Investing in one specialism can mean that another specialism grows less or even has to contract. The strategy of a hospital therefore influences the interrelatedness of specialisms and vice versa.

A number of hospitals opt for so-called 'themes' in their strategy and organization. A theme is then defined as a cluster of patient groups/conditions, for example oncological care, mother and child care, mobility etc. Within a theme, departments/specialisms work closely together, both in terms of care content and organizationally. A theme is therefore a specific form of deliberate interrelatedness between specialisms.

The publication 'Krachtig Kiezen' (2014) (Çhoosing Powerfully') of the NVZ (the association of hospitals) states that there is ultimately a 'range of manifestations' since hospitals will make different strategic choices in terms of positioning, business model and portfolio. The publication foresees two parallel streams: unbundling and (innovative) bundling. Unbundling means that part of the specialist medical care is placed in an in-house business model, such as diagnostic centers, treatment centers and diagnosis and advice centers for thematic conditions (for example heart problems). Such centers will focus particularly on patients with simple conditions and a lower risk profile and on treatments that are more monodisciplinary or condition-oriented. For patients with a higher risk profile and multiple problems, the NVZ publication foresees the emergence of integrated diagnosis and treatment centers. This is the future-oriented manifestation or continued development of a 'hospital' as a

place where multiple specialisms are brought together and where there is consequently a relatively wide offering of specialist medical care. In these centers multidisciplinary collaboration is the standard and customized work (personalized healthcare) comes to the fore. This future vision therefore means that for part of the specialist medical care the interrelatedness will increase, whereas for another part it will decrease.

### 5.2.6 Implications for the investigation

With regard to the connections within hospitals, the picture is twofold. On the one hand we see increasing interrelatedness as a result of multidisciplinary collaboration, partly due to comorbidity in patients and collaboration in patient-oriented themes. On the other hand there is autonomization of parts of the care in independent treatment centers and 'unbundling' of specialist medical care in separate business models, such as in diagnostic centers. In general the movement of autonomization and 'unbundling' involves care with a relatively low care and case complexity. This concerns in particular parts of primary specialisms that predominantly make little or no use of other primary specialisms and also have a relatively limited call on the medical infrastructure of a hospital. Attempts have been made to gain greater visibility on this on the basis of a cluster analysis.

## 5.3 Interrelatedness between hospitals

From the perspective of connections in hospitals with other hospitals and other care providers, the following subjects and developments are relevant:

Interrelatedness between hospitals

- network organizations
- cross-hospital partnerships

interrelatedness between hospitals and other care providers

- chain collaboration
- integrated childbirth care

### 5.3.1 Connections between hospitals

Network organizations

As in many other sectors, hospitals are developing into network organizations. Within a network providers can choose their own profile, with the network as a whole

covering the breadth and depth of the care. Regional acute care networks have traditionally existed in acute care and regional networks are also used in oncology. In some policy recommendations[60] a network is seen as the central concept for the future organization of specialist medical care.

The introduction of volume and other standards for particular treatments has given fresh impetus to the emergence or expansion of specialist medical networks. For example, regional agreements are entered into concerning treatments between hospitals in which one hospital carries out the preliminary process (diagnosis and advice), the other hospital carries out the (surgical) intervention and the first hospital again provides the aftercare.

Viewed on the basis of practice (and from the patient's perspective) a care product is thus sometimes provided by different 'care producers'. The development of concentration of complex or more complex care leads to an increase in such situations. It may be the case that both hospitals claim their part separately, or that services are provided between them. Mutual service provision (MSP) is the provision of care as part of a DTC care product at the request of an institution or medical specialist without any transfer of the main practitioner role. The providing party then charges the resulting costs to the main practitioner. Care supplied by means of MSP is then invoiced by the main practitioner as part of the DTC care product to the health insurer or patient. From the product market perspective, insight into the claim method is therefore relevant in order to gain a picture of the relationship between parties in a network. The care products designated in the quantitative analysis as complex include, for example, the separately claimed DTC care products for complex operations, which are part of a care process that in the patient's and professional's perception is a broader 'care product' because it also encompasses the preliminary and follow-up processes.

Within a network there is by definition interrelatedness. If a member of a network were no longer to offer certain care, that would have direct consequences for network offering.

### Cross-hospital partnerships

Cross-hospital partnerships (or regional partnerships) are a form of interrelatedness between medical specialists who practice the same specialism or main specialism at more than one hospital. Up to 2015 there was growth in the number of regional partnerships. A large number of the hospitals were thus involved and nationally there were estimated to be more than 100 regional partnerships. These were formed on the

[60] Medisch specialistische zorg in 20/20, RVZ, 2011

one hand to improve the quality (knowledge sharing, meeting volume standards, allowing sub-specialization) or efficiency (working more efficiently, better service load). In addition, strategic factors could play a role, such as the position with regard to hospital managements. After the formation of a regional partnership, health insurers still negotiate 'at the front end' with different hospitals, but 'at the back end' the respective care is supplied by the same partnership.

The introduction of integrated funding from 1 January 2015 has led to the establishment of specialist medical companies (SMCs) in order to secure the fiscal entrepreneurship of medical specialists. SMCs are (legal) joint ventures, mostly in co-operative form, of all or almost all the independent medical specialists in a hospital. In order to be considered a 'company' from a fiscal point of view, an SMC must incur certain entrepreneurial risks, through the hiring of personnel and making investments. An SMC has a contractual 'business-to-business' relationship with a hospital, which in turn has the contractual relationship with the health insurers. Within an SMC there is therefore a financial-business interrelatedness between specialisms. If a specialism is no longer offered, that will have an effect (ceteris paribus) on (the turnover and results) of the SMC.

The formation of SMCs has had consequences for the regional partnerships, since for each hospital they have become part of the SMC associated with the respective hospital. Some have formed a separate SMC, which has a contractual relationship with multiple hospitals. An investigation by the NZa[61] did not reveal any SMCs with multiple specialisms working as an entire SMC for multiple hospitals. In other words, there are (as yet) no MSBs that could be seen as a kind of competitor to hospitals.

### 5.3.2 Interrelatedness of hospitals with other care providers

Hospitals are also interrelated with other care providers, for example with primary care for collaboration and childbirth care.

#### Collaboration

Where multidisciplinary collaboration takes place particularly within the specialist medical care, the collaboration mainly concerns the relationship between hospitals and primary care, around frequently occurring chronic diseases such as asthma, diabetes, COPD, dementia. One of the effects of the collaboration is that part of the care shifts from the medical specialist to the general practitioner. This fits in with the trend of substitution of secondary care for primary care.

[61] Monitor Integrale Bekostiging Medisch Specialistische Zorg 2015, NZa

If a specialism involved in collaboration is no longer offered in a hospital, this will therefore have an effect on that regional collaboration as a whole. Of course, for that part involving specialist medical care that cannot be substituted.

Integrated funding of childbirth care

Midwifery care is provided in the Netherlands through collaboration in 79 regions. Minister Schippers is making it possible from 1 January 2017 for all these regions to opt voluntarily for so-called integrated childbirth care. This new form of funding becomes possible as a fully-fledged voluntary option alongside the existing funding. Regions can then enter into agreements themselves on forms of collaboration among gynecologists and midwives and the allocation of the funding. Regions that do not want to do so can carry on using the current funding system.

### 5.3.3 Implications for the investigation

In the organization of the care we see increasing interrelatedness among hospitals and between hospitals and other care providers. Developments such as network organizations (for example the regional oncological networks), integrated funding (childbirth care) and collaboration are resulting in a 'care product' which in those fields is increasingly a form of 'coproduction' or 'serial production'.

On the one hand this leads to barriers to entry because a provider must be included in the relevant networks. On the other hand the collaboration in networks leads to the right degree of concentration; that part of the care that is complex is more concentrated than the part that is not complex. The competition law consequences of this depend on the extent to which new providers gain access to essential facilities in such a network.

## 5.4 Differences in interrelatedness between types of hospital

ACM also questioned whether the interrelatedness between specialisms was different in a general hospital, a top clinical hospital or an academic hospital.

In fact in the Netherlands we do not really have an unequivocal term such as 'basic hospital'. We generally speak of general hospitals, top clinical hospitals and academic hospitals. All these hospitals offer basic specialist medical care. In addition to basic care, the top clinical hospitals also offer top clinical care and the academic hospitals offer top clinical and top referral care in addition to basic care. It is therefore difficult to say whether the interrelatedness as described in this section differs depending on the type of hospital.

If there already is a relationship, this will presumably be more in the care profile and the associated medical-technological infrastructure than in the type of hospital. In the assessment of interrelatedness, it will therefore be necessary to look primarily at the portfolio and case mix of a hospital. The portfolio concerns the number and size (numbers and turnover of DTC care products) of the specialisms, the breakdown between acute care and care that can be planned, the share of complex care in terms of care complexity and the relative use of the medical infrastructure. The case mix primarily concerns the share of complex patients (case complexity).

Care that can predominantly be planned, that has relatively low care and case complexity and makes relatively little use of the medical infrastructure is in principle the least interrelated with the rest of a hospital. Here we try to gain a greater picture with the cluster analysis.

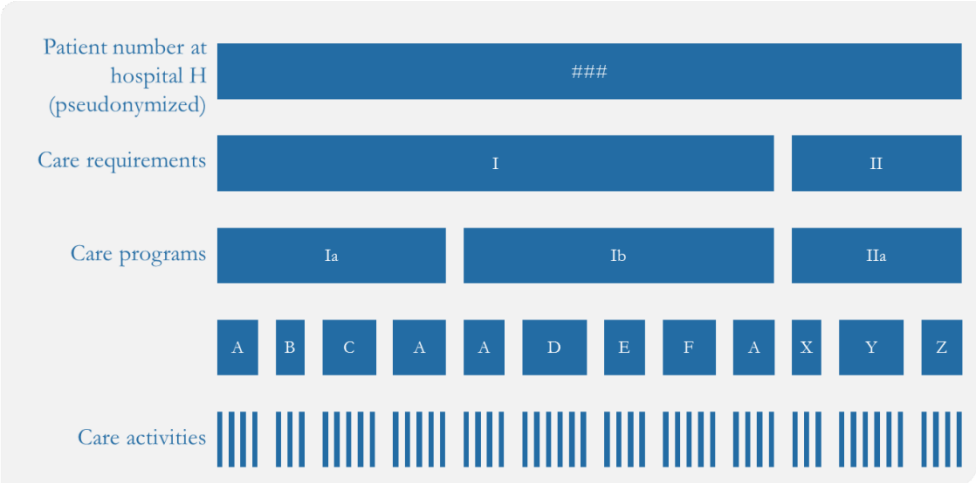
## 5.5 Scale for degree of connection

In this section we discuss the quantitative analysis of the degree of connection within a hospital. In so doing we adhere to the qualitative analysis in section 5.2 and investigate:

- collaboration between primary specialisms
- use of support specialisms
- use of medical technology and infrastructure, based on the use of diagnostics, imaging, treatment space and IC
- economic connection based on the use of the emergency unit, outpatient clinic and clinic

Connections in activities and facilities in the hospital relate to more than just care provided within a DTC care product. We take account of all care activities that have been necessary in order to treat a patient. That probably leads to an overestimate of interrelatedness. After all, the patient may also have visited the hospital for two or more completely different care requirements. See figure 24 for a schematic overview of the relationship between care activities, DTC care products, care programs, care requirements and individuals.

Figure 24: Schematic representation of definition of links in care activities to DTC care products per person




The analysis consists of six steps:

1. For each patient we assess which care has been received. The analysis differs for care provided by primary specialisms/facilities, support specialisms and through facilities:

    a. For primary specialisms we look at the care activities from specific care profile categories (see Annex D for details) which have been recorded in the same hospital and by which specialism those care activities have been carried out.[62] This is the bottom row of figure 24.

    b. For support specialisms we include care activities from all care profile categories and also look at which other care products (OCPs) they have provided.

    c. For facilities, with the exception of IC, we also look at the care activities, but then only at activities which belong in the specific facility, for example care profile category 7 for imaging diagnostics (see Annex D for details).

[62]This overestimate does not appear in an analysis for a specific care requirement. In practice, however, that did not prove workable. For each care program we have analyzed all the care activities recorded in the care program. The assumption that a care program describes all care activities for the treatment of a specific care requirement of the patient may lead to an underestimate of the interrelatedness among specialisms and with facilities. That is because a new care program is opened if a specialist other than the treating specialist opens a sub-program in order to treat the same care requirement. In this way we take account of the connection within a DTC care product, but not between DTC care products. Hospitals optionally also record a data field in order to link different care programs to an overarching care program (linking of care program Ia and Ib in (figure 24). All the care for a specific care requirement could then be linked. However, it is found that this field is poorly completed. According to our estimate the degree of interrelatedness on the basis of this analysis was too greatly underestimated to be included in this report.

2. We translate the prevalence of activities per patient (result of step 1) into the level of a claimed DTC care product.[63] We link all activities and consulted specialisms/departments for a patient to each DTC care product claimed for that patient. All care activities on the bottom row are linked to all subprograms/DTC care products of the second row from bottom in figure 24.

3. For each DTC care product we average the scored dimensions (result of step 2). For each DTC care product this leads for example to the following: for each primary specialism the share (by volume or turnover) of the DTC care product in which that primary specialism was involved, the share of IC admissions and the share for which an OR was used. For each DTC care product we thus calculate which share each primary specialism, support specialism and facility was involved on average in the supply of care to the patients for that DTC care product. These averages give an insight into the importance of the specialism and the facility for the specific DTC care product. For all 'A' DTC care products for all patients, as shown in figure 24, we count each type of care activity and divide it by the number of times that, for example, DTC care product A was opened in 2014.

4. For each DTC care product we then determine the dominant primary specialism. This is the primary specialism with the highest involvement. For each dominant primary specialism we calculate the involvement (by volume) of the other specialisms, the facilities and the care types, expressed as a share of the DTC care products in which the other specialisms, facilities and care types were involved.

5. For each DTC care product we determine whether, if we score that two specialisms have been involved in the care program (result of step 2), it is a case of interrelatedness or substitution. After all, if specialism A carries out half of all DTC care products X and specialism B the other half, that produces the same score as the situation in which for each DTC care product X both specialist A and B are involved. It is a question of substitution versus connection. We measure the degree of substitution by scoring for each DTC care product whether it has been supplied by one specialism *and* not by another.

[63] Not all care activities are claimed through a DTC care product. For example, oral surgeons claim individual care activities rather than DTC care products. These individual care activities are not included in the analysis.

6. For each DTC care product we deduct the degree of substitution (result of step 5) from the degree to which a combination of specialisms arises (result of step 2). That then provides us with the degree of interrelatedness for each DTC care product.

Below we discuss the connections in specialist medical care, based on an analysis of the shares of turnover (hospital and fee component). We assume that, in general, the average price of a DTC care product reflects the average costs of a hospital. In that way we look at the connections in terms of activities of the hospital. The tables set out below with turnover shares are shown for volume shares in in **Fout! Verwijzingsbron niet gevonden.**.

### 5.5.1 Multidisciplinary collaboration between primary and other specialisms

We determine interrelatedness between specialisms on the basis of the provider of the care activities of a patient in a hospital. We include care activities from the care profile categories of day nursing, clinic, operative procedures, other therapeutic activities, rehabilitation, IC care activities, IC treatment day, add-on medication, orphan drugs and coagulation factors. These care activities describe parallel activities by other primary specialisms.

The dominant primary specialism of a DTC care product is not necessarily involved in all cases in the DTC care product, but is most often. If other specialisms are involved, that can indicate:

- Substitution if the primary specialisms provide the same care without the other primary specialism being necessary.
- Connection in the sense that they are both involved in the treatment.

#### Substitution between primary specialisms

We have investigated the 15 most frequently occurring substitutions between primary specialisms. For each primary specialism an assessment was made of the share of the DTC care products where that specialism is dominant for which the patient also sees another primary specialism.

The degree of substitution in terms of turnover of DTC care products which were claimed by two primary specialisms amounted to 17%. As a lower limit for the analysis we chose 2% (table 2). For illustration purposes we discuss a number of examples:

- Of the DTC care products for which orthopedics is the dominant specialism (the orthopedics row) 4% (of turnover) is supplied by surgery. Conversely 6% (by turnover) of DTC care products for which surgery is the dominant specialism is supplied by orthopedics.

- 17% (by turnover) of the DTC care products for which gastroenterology & hepatology is the dominant specialism were provided by general internal medicine. Here we recognize the existence of gastroenterology & hepatology as a subspecialism of general internal medicine.

- 2% (by turnover) of the DTC care products for which urology is the dominant specialism were provided by surgery. This may relate to oncological operations.

We find that surgery and internal medicine substitute most for and are most substituted by another primary specialism.

- In surgery that is for DTC care products in which the dominant primary specialisms are: gastroenterology & hepatology, dermatology, orthopedics, internal medicine, urology and neurosurgery. Practitioners stated that connections with gastroenterology & hepatology and internal medicine can arise because surgeons are also called in for abdominal complaints and carry out endoscopies. Surgeons also have trauma services in which they see patients in the emergency unit who may be seen during other services by orthopedics or in other hospitals. A number of DTC care products such as CTS operations are carried out by both surgeons and neurosurgeons.

- General internal medicine is most substituted by and substitutes DTC care products for which the following primary specialisms are dominant: gastroenterology & hepatology, rheumatology, geriatrics, pulmonary diseases and urology. These are all recognizable primary specialisms for substitution of and by general internal medicine.

- We also see a certain degree of substitution between orthopedics and neurosurgery, which may have to do with back operations, and between neurosurgery and pulmonary diseases.

For all other combinations fewer than 2% (by turnover) of the DTC care products are substituted in the database.

Table 2: Share of DTC care products for each dominant primary specialism (row) that has been substituted for another primary specialism (column) [per cent of turnover of DTC care products for dominant specialism (above 2%)]

| | allergology | cardiothoracic surgery | cardiology | surgery | dermatology | gastroenterology & hepatology | geriatrics | internal medicine | ENT | pediatrics | pulmonary diseases | neurosurgery | neurology | obstetrics & gynecology | ophthalmology | orthopedics | plastic surgery | psychiatry | radiotherapy | rheumatology | rehabilitation | urology |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| allergology | | | | | | | | | | | | | | | | | | | | | | |
| cardiothoracic surgery | | | | | | | | | | | | | | | | | | | | | | |
| cardiology | | | | | | | | | | | | | | | | | | | | | | |
| surgery | | | | | | | | | | | | | | | | 6% | | | | | | |
| dermatology | | | | 6% | | | | | | | | | | | | | | | | | | |
| gastroenterology & hepatology | | | | 8% | | | | 17% | | | | | | | | | | | | | | |
| geriatrics | | | | | | | | 4% | | | | | | | | | | | | | | |
| internal medicine | | | | 3% | | 2% | | | | | | | | | | | | | | | | |
| ENT | | | | | | | | | | | | | | | | | | | | | | |
| pediatrics | | | | | | | | | | | | | | | | | | | | | | |
| pulmonary diseases | | | | | | | | 3% | | | | | | | | | | | | | | |
| neurosurgery | | | | 2% | | | | | | | | | | | | 8% | | | | | | |
| neurology | | | | | | | | | | | 2% | | | | | | | | | | | |
| obstetrics & gynecology | | | | | | | | | | | | | | | | | | | | | | |
| ophthalmology | | | | | | | | | | | | | | | | | | | | | | |
| orthopedics | | | | 4% | | | | | | | | | | | | | | | | | | |
| plastic surgery | | | | | | | | | | | | | | | | | | | | | | |
| psychiatry | | | | | | | | | | | | | | | | | | | | | | |
| radiotherapy | | | | | | | | | | | | | | | | | | | | | | |
| rheumatology | | | | | | | | 8% | | | | | | | | | | | | | | |
| rehabilitation | | | | | | | | | | | | | | | | | | | | | | |
| urology | | | | 2% | | | | 2% | | | | | | | | | | | | | | |

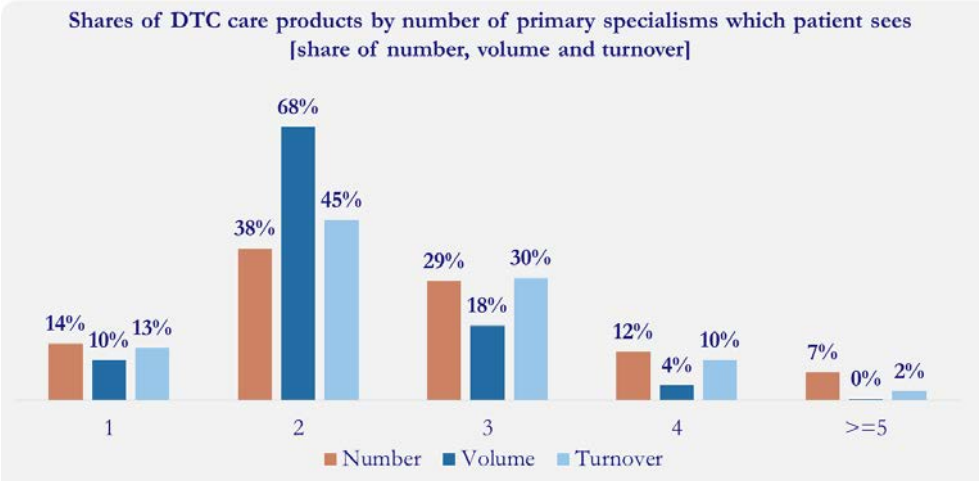
The top 5 substitution combinations are the same for the analysis of volume shares and turnover shares. These are as follows in order of turnover share that is substituted: gastroenterology & hepatology for general internal medicine (17%), gastroenterology & hepatology for surgery (8%), neurosurgery for surgery (8%), surgery for orthopedics (6%).

Supply substitution between specialisms concerns in total approximately 3.8% (by turnover, 5.7% by volume) with the applied cut-off limit of 2% substitution between specialisms (without that limit it is 7.6% and 9.9% respectively). Supply substitution between specialisms is therefore limited. The product market definition based on supply substitution will be dominated by supply substitution within specialisms.

### Connections in primary specialisms

Part of the care is provided together with other primary specialisms (figure 25). An approach to that is the number of primary specialisms that a patient sees during the year. Taken across the whole volume of DTC care products, approximately 10% of the patients are seen by a single primary specialism, in 68% of the care by two and in the remainder by three or more. In shares of turnover approximately 13% is monodisciplinary, 45% bidisciplinary and 42% of the care turnover involves three or more primary specialisms.

Figure 25: Most DTC care products are provided for patients who see two primary specialisms during the year




We express the connections between primary specialisms A and B in the share of DTC care products (turnover) for which primary specialism A is dominant and for which primary specialism B is involved in the care, or also carries out a procedure for that patient (table 3).

Table 3: Share of DTC care products per dominant primary specialism (row) in which another primary specialism is involved (column) [per cent of turnover of DTC care products for dominant specialism (above 3%)]

| | ophthalmology | ear, nose and throat surgery | surgery | plastic surgery | orthopedics | urology | obstetrics & gynecology | neurosurgery | dermatology | internal medicine | pediatrics | gastroenterology & hepatology | cardiology | pulmonary diseases | rheumatology | allergology | rehabilitation | cardiothoracic surgery | psychiatry | neurology | geriatrics | radiotherapy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ophthalmology | 100% | | 4% | | | | | | 3% | 4% | | | 4% | | | | | | | | | |
| ear, nose and throat surgery | | 96% | 4% | | | | | | | 4% | | | | 3% | | | | | | | | |
| surgery | | | 88% | | 4% | | | | | 16% | | 10% | 5% | | | | 3% | | | | | |
| plastic surgery | | | 12% | 100% | | | | | 7% | 6% | | | | | | | 3% | | | | | |
| orthopedics | | | 5% | | 87% | | | | | | | | 3% | | | | | | | | | |
| urology | | | 8% | | | 94% | | | 3% | 12% | | 4% | 6% | | | | | | | | | |
| obstetrics & gynecology | | | 4% | | | | 97% | | | 3% | | | | | | | | | | | | |
| neurosurgery | | | 4% | | 5% | | | 85% | | 8% | | | | | | | 8% | | | 15% | | 3% |
| dermatology | | | 7% | 4% | | | | | 93% | 4% | | | 4% | | | | | | | | | |
| internal medicine | | | 22% | | | 5% | | | 6% | 94% | | 8% | 10% | 5% | | | 3% | | | 5% | | 5% |
| pediatrics | | | 9% | | | | | | | | 97% | | | | | | 4% | | | | | |
| gastroenterology & hepatology | | | 17% | | | | | | | 16% | | 78% | 6% | | | | | | | | | |
| cardiology | | | 7% | | | | | | 3% | 10% | | 3% | 100% | 5% | | | | 4% | | 3% | | |
| pulmonary diseases | | | 11% | | | | | | 4% | 13% | | 5% | 11% | 94% | | | | | | 4% | | 3% |
| rheumatology | | | 5% | | 4% | | | | 4% | 5% | | | 4% | | 92% | | | | | | | |
| allergology | | | | | | | | | | | | | | | | 100% | | | | | | |
| rehabilitation | | | | | | | | | | | | | | | | | 100% | | | | | |
| cardiothoracic surgery | | | 7% | | | | | | | 20% | | | 40% | 4% | | | 9% | 100% | | | | |
| psychiatry | | | 26% | | 6% | 5% | 6% | | 3% | 39% | | 12% | 15% | 10% | | | 6% | 3% | 100% | 11% | | |
| neurology | | | 10% | | 4% | | | 4% | | 10% | | 3% | 9% | 4% | | | 10% | | | 96% | | |
| geriatrics | 4% | | 15% | | 6% | 5% | | | 5% | 13% | | 5% | 13% | 4% | | | | | | 7% | 96% | |
| radiotherapy | | 5% | 12% | | | 4% | | | | 21% | | 5% | | 7% | | | | | | 3% | | 100% |

We have analyzed the connections between primary specialisms in terms of connections in turnover and the number of specialisms seen by the patient. For both criteria we have two perspectives: (figure 26, figure 27):

- Importance of a primary specialism for other primary specialisms.
- Importance of other primary specialisms for a primary specialism.

Figure 26: Connections in primary specialisms compared for turnover

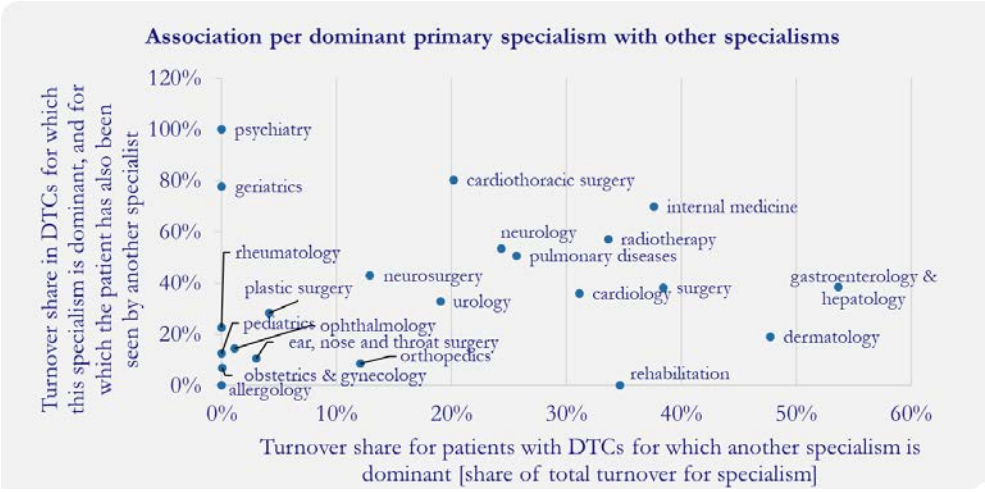
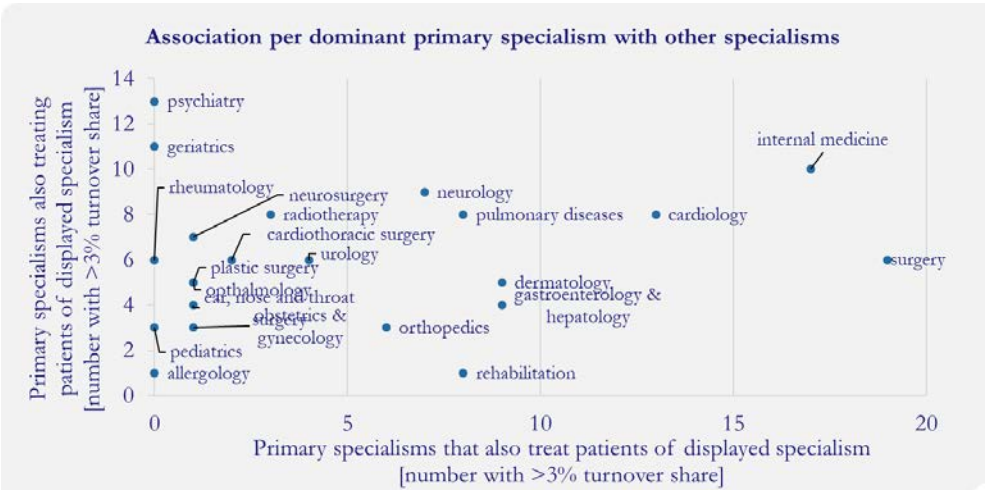



Figure 27: Connections between primary specialisms compared for the number of other primary specialisms that are also seen by the patient




We discuss the connections between medical specialisms below for groups of combinations which we distinguish in the table and figures above. The groups are for most and least connections, concentrated care and the core of the hospital.

*Group 1 – Most connection*

Gastroenterology & hepatology is the most interrelated with other medical specialisms. 17% of the turnover of DTC care products takes place for patients who are also seen by other specialisms.

This may have to do with the screening for bowel cancer for which people between 55 and 75 are called in every two years. The bowel cancer population survey has been introduced gradually. In 2014 it began with the following age groups: 63, 65, 67 and 75 and 76-year-olds. Patients with symptoms can also take part in the test, even if they are not part of the investigation group. The iFOBT test used produces a positive result in approximately one in 12 participants and hence grounds for a follow-up investigation (colonoscopy in the case of a gastroenterology & hepatology practitioner in the hospital). With roughly 873,000 people in the Netherlands invited in 2014 and expected participation of 60%, that amounts to roughly 40,000 expected referrals[64].

*Group 2– Least connection*

An empty column in table 3 means that for that primary specialism there is little involvement in DTC care products for which another primary specialism is dominant. We see this in pediatrics, rheumatology, allergology, geriatrics and psychiatry.

These specialisms are involved in fewer than 3% (by turnover) of the DTC care products of other primary specialisms. A hospital could therefore operate without these medical specialisms. This conclusion reflects the current state of affairs in psychiatry, for example, which is not represented as a primary specialism in all hospitals. However, there are also indications that geriatrics and psychiatry can have high added value in treatment programs of other medical specialisms.

Conversely, the patients for whom these five primary specialisms are dominant have had DTC care products in which other primary specialisms were involved. For psychiatry and geriatrics respectively 13 and 11 other primary specialisms; the most of all primary specialisms. This reflects the largely general nature of both psychiatry and geriatrics in the hospital. Their patients often come to the hospital precisely due to the combination of geriatric or psychiatric disorders and somatic care which is provided by other medical specialisms.

Pediatrics also has a very broad character. The interrelatedness with other specialisms is lower, however, because pediatricians themselves provide a lot of the care which other specialisms provide for adults.

[64] Slingeland kenniscentrum, NHG, CBS. Various disciplines are involved in the implementation of the population survey: iFOBT laboratories (analysis of feces samples), general practitioners (information and advice to participants). Colonoscopy centers (intake, coordination of diagnosis, surveillance and transfer to treatment), pathology laboratories (assessment of colonoscopies after referral/follow-up treatment), radiology departments (CT colonographies at request of colonoscopy centers).

For rheumatology 23% of the turnover of DTC care products was provided for patients for whom another primary specialism also carried out a procedure. This concerned internal medicine, surgery, orthopedics, gastroenterology & hepatology and pulmonary diseases.

### *Group 3 – Concentrated care*

Cardiothoracic surgery and neurosurgery also hardly see any patients who receive DTC care products in another specialism. Neurosurgeons see patients for approximately 4% (turnover, 3% by volume) of DTC care products of neurology. Cardiothoracic surgeons 4% (by turnover, 2% by volume) of DTC care products of cardiology. Both neurosurgery and cardiothoracic surgery are therefore not present in all hospitals. Where they are present, there is interrelatedness with part of the other primary specialisms. Logically in the case of cardiothoracic surgery often with cardiology. 40% of the turnover in cardiothoracic surgery is carried out for patients who are seen in the same hospital by cardiology, and also with general internal medicine (20%). For neurosurgery the connection is strongest with neurology (15%). These shares concern shares in the same hospital. The interrelatedness at patient level is stronger, but the contact with the cardiologist often takes place in another hospital. That interrelatedness therefore does not mean by definition that both specialisms have to be present in all hospitals. Cardiothoracic surgery and neurosurgery procedures are defined parts of a treatment for which the patient can travel to another hospital.

### *Group 4 'Core' of the hospital*

Surgery and general internal medicine are the most interrelated with other primary specialisms. Surgery and general internal medicine are involved in more than 3% of the turnover of almost all other primary specialisms; at any rate they also see patients from those other primary specialisms. An exception to this is allergology for both, and orthopedics and pediatrics for general internal medicine. If we raise the involvement threshold to 5%, both are still involved in care for patients with more than 10 other primary specialisms; 14 for surgery and 13 for general internal medicine. With a 10% involvement that is seven and nine respectively.

Almost three-quarters of the turnover for DTC care products for which internal medicine is the dominant specialism is provided for patients who also see one of 10 other primary specialisms in that year.

In surgery 38% of the DTC care products were provided for patients who are also seen by one of six other primary specialisms.

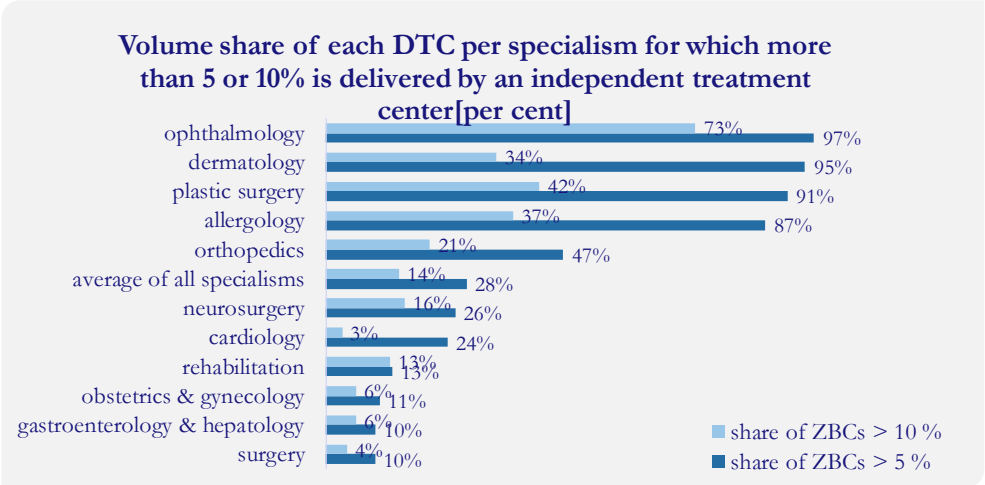
### 5.5.2 Autonomization of specialisms in independent treatment centers

Approximately 4% (by volume) of the care is provided by independent treatment centers. Often it concerns monodisciplinary care and no very expensive facilities are required, or the scale is sufficient in order to operate the required facilities or the required services can be bought in.

independent treatment centers provide approximately 4% (by volume, 3% by turnover) of the care. The volume of DTC care products for which independent treatment centers have a market share of more than 10% amounts to over 14% (by volume, 10% by turnover). At 5% that is almost double (28% by volume, 16% by turnover). Those DTC care products will also be carried out in part for patients who cannot be treated in a ZBC, for example due to comorbidity.

independent treatment centers compete particularly in the medical specialisms of ophthalmology, dermatology, plastic surgery and allergology. For these four specialisms independent treatment centers have a market share of more than 10% in more than one-third of the total market for that specialism. If we set that threshold at 5%, that is even more than 87%. For orthopedics, neurosurgery, cardiology, rehabilitation, gynecology, gastroenterology & hepatology and surgery part of the market competition also takes place with independent treatment centers.

Figure 28: For four specialisms independent treatment centers compete in a very large part of the market




### 5.5.3 Primary specialisms and support specialisms

We have classified the support specialisms into laboratory functions, imaging, support with patient contact and support with a treatment (table 4).

Table 4: Connections in primary and support specialisms [share of turnover for patients with procedure by support specialism]

| primary specialism | support specialism | | | | | | |
|---|---|---|---|---|---|---|---|
| | Cl. Chem. | Microbiol. | Pathol. | Radiology | Nucl. med. | Clin. med. | Anesth. |
| allergology | 99% | 45% | 6% | 20% | 3% | 2% | 5% |
| cardiothoracic surgery | 95% | 63% | 33% | 99% | 17% | 12% | 83% |
| cardiology | 94% | 31% | 14% | 77% | 14% | 4% | 22% |
| surgery | 73% | 33% | 38% | 86% | 14% | 3% | 63% |
| dermatology | 57% | 23% | 62% | 39% | 6% | 1% | 12% |
| geriatrics | 95% | 54% | 21% | 93% | 9% | 3% | 21% |
| internal medicine | 97% | 61% | 38% | 88% | 22% | 3% | 30% |
| pediatrics | 91% | 55% | 30% | 66% | 25% | 25% | 33% |
| ENT | 48% | 23% | 23% | 56% | 7% | 4% | 65% |
| pulmonary diseases | 92% | 52% | 33% | 92% | 20% | 2% | 24% |
| gastroenterology & hepatology | 85% | 40% | 57% | 73% | 9% | 2% | 26% |
| neurosurgery | 70% | 32% | 23% | 90% | 6% | 3% | 78% |
| neurology | 81% | 30% | 15% | 91% | 8% | 3% | 21% |
| obstetrics & gynecology | 85% | 38% | 36% | 26% | 4% | 6% | 47% |
| ophthalmology | 62% | 18% | 13% | 34% | 4% | 2% | 57% |
| orthopedics | 62% | 24% | 12% | 94% | 8% | 2% | 73% |
| plastic surgery | 45% | 15% | 42% | 52% | 6% | 2% | 69% |
| psychiatry | 98% | 47% | 23% | 77% | 10% | 3% | 37% |
| radiotherapy | 75% | 21% | 43% | 85% | 31% | 2% | 33% |
| rheumatology | 94% | 29% | 13% | 78% | 7% | 1% | 10% |
| rehabilitation | 67% | 14% | 17% | 60% | 17% | 2% | 12% |
| urology | 83% | 47% | 49% | 74% | 13% | 2% | 57% |
| turnover weighted average | **80%** | **37%** | **30%** | **75%** | **13%** | **4%** | **42%** |

### Laboratory functions

The support specialisms are of course closely connected to the primary specialisms. Over 80% of the turnover in the DTC care products, excluding OCPs, is claimed for patients for whom sooner or later a procedure is carried out by clinical chemistry. For medical microbiology that is 37% and for pathology 30%.

These three support specialisms provide the laboratory functions for a hospital. This is nowadays carried out increasingly frequently for multiple hospitals. Examples of that are LabWest in The Hague and the surrounding area, or LABPON (Laboratorium Pathologie Oost-Nederland), which supplies pathological laboratory services for hospitals in Enschede, Almelo, Hengelo and Winterswijk.

### Imaging

Three-quarters of the turnover is generated for patients involved with radiology. Imaging is used for almost all primary specialisms. We see the lowest degree of interrelatedness with allergology, obstetrics & gynecology, ophthalmology and dermatology. Obstetrics & gynecology often carry out ultrasounds themselves which in other fields are carried out by radiologists. The high degree of interrelatedness does not mean that radiologists must be available in the organization in every hospital. There are service providers who assess the images remotely and produce reports. This is done for example by TMC from Barcelona.

Nuclear medicine provides support particularly for imaging diagnostics and is also involved in oncological treatments with radioactive radiation. This latter aspect occurs particularly in the strong connection with radiotherapy. The first plays a role in the connection with other medical specialisms. In both cases physical presence is often required due to the use of radioactive materials in patients.

### With patient contact

Clinical genetics is a co-treater of patients in some cases. Physical presence is therefore more necessary than in the laboratory functions. However, this support specialism is relevant to fewer primary specialisms and is therefore not present in each hospital. Clinical genetics is linked particularly to pediatrics in connection with heredity factors in diseases.

### Support with treatment

Anesthesiology is used as a support specialism during operations. Almost all medical specialisms are interrelated with anesthesiology. That applies most of course to the surgical fields. Of the patients for whom they are the dominant specialism, a large proportion sooner or later have a procedure or other care product from the anesthesiologist; for more than three-quarters of the turnover of cardiothoracic

surgery, neurosurgery and orthopedics. The lowest interrelatedness is with allergology, rheumatology and dermatology.

Each hospital has anesthesiologists as a support specialism, although anesthesiology services can nowadays also be procured.

### 5.5.4 Medical technological facilities

Medical technological facilities refer to rooms or equipment that must be present in a hospital in order to carry out a DTC care product. We have classified these facilities in four groups: diagnostics, imaging, treatment rooms and IC (table5). For the first three groups we have broken down the facilities into simple, medium and difficult (section 4.3.6), patients also being able to use two or three of these facilities in a category simultaneously.

#### Diagnostic rooms

A simple diagnostic investigation, which requires no special treatment room, is used for almost all specialisms. Only patients in obstetrics & gynecology, and rehabilitation, receive a form diagnosis for which a specific room is required in fewer than 25% of cases. For cardiology and cardiothoracic surgery most diagnostic investigations are carried out with specific facilities. In one in three cases they use a special radiological invention room or operating room for diagnostic activities.

#### Imaging

For the patients associated with almost two-thirds of the turnover of the hospital, imaging diagnostics are used sooner or later. For one-third more complex imaging diagnostics are also used for which advanced equipment or an antiseptic room is necessary. The cardiothoracic surgeon uses imaging diagnostics in almost all cases, but more complex imaging diagnostics in only one in four cases. Rehabilitation and allergology, on the other hand, use imaging diagnostics in just one in 10 cases. The more difficult imaging diagnostics occur principally in neurosurgery, pulmonary diseases, neurology, internal medicine and radiotherapy, with around half of patients using this form of imaging diagnostics.

Table5: Connections in primary specialisms with facilities [share of turnover for patients with a procedure in which facility has been used]

| primary specialism | facility | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Diagn. Low | Diagn. Medium | Diagn. Difficult | Image low | Image high | Room - Treat. | Room - OOR | Room - OR | IC |
| allergology | 76% | 4% | 1% | 12% | 5% | 2% | 1% | 4% | 0% |
| cardiothoracic surgery | 86% | 25% | 34% | 97% | 24% | 4% | 19% | 96% | 69% |
| cardiology | 92% | 15% | 31% | 81% | 27% | 5% | 27% | 13% | 3% |
| surgery | 52% | 24% | 7% | 75% | 37% | 13% | 9% | 71% | 9% |
| dermatology | 30% | 8% | 1% | 24% | 10% | 40% | 7% | 37% | 0% |
| geriatrics | 98% | 19% | 4% | 84% | 32% | 7% | 5% | 18% | 2% |
| internal medicine | 67% | 36% | 7% | 80% | 48% | 10% | 5% | 30% | 3% |
| pediatrics | 32% | 11% | 2% | 48% | 14% | 2% | 1% | 11% | 5% |
| ENT | 52% | 35% | 2% | 26% | 31% | 5% | 5% | 62% | 3% |
| pulmonary diseases | 82% | 44% | 12% | 82% | 55% | 6% | 4% | 17% | 5% |
| gastroenterology & hepatology | 59% | 53% | 4% | 62% | 34% | 12% | 4% | 30% | 3% |
| neurosurgery | 44% | 12% | 9% | 69% | 57% | 12% | 8% | 86% | 15% |
| neurology | 71% | 18% | 5% | 52% | 51% | 7% | 5% | 14% | 4% |
| obstetrics & gynecology | 17% | 9% | 6% | 73% | 8% | 18% | 1% | 46% | 2% |
| ophthalmology | 75% | 6% | 1% | 24% | 8% | 13% | 52% | 7% | 0% |
| orthopedics | 40% | 8% | 18% | 86% | 33% | 6% | 9% | 75% | 3% |
| plastic surgery | 27% | 8% | 3% | 38% | 14% | 28% | 3% | 82% | 2% |
| psychiatry | 71% | 30% | 12% | 75% | 37% | 13% | 5% | 33% | 7% |
| radiotherapy | 29% | 27% | 4% | 39% | 46% | 5% | 2% | 22% | 1% |
| rheumatology | 33% | 17% | 3% | 70% | 24% | 5% | 3% | 10% | 0% |
| rehabilitation | 6% | 2% | 1% | 8% | 4% | 1% | 1% | 2% | 0% |
| urology | 54% | 53% | 4% | 73% | 28% | 5% | 5% | 65% | 4% |
| turnover weighted average | **56%** | **23%** | **10%** | **67%** | **32%** | **9%** | **9%** | **40%** | **5%** |

### Treatment room

The treatment rooms have been classified in three categories in which the most difficult category, an operating room, has the strongest connections with a specialism. This room occurs most in 19 of the 22 primary specialisms. For cardiothoracic surgery, neurosurgery, plastic surgery, orthopedics and surgery, patients undergo an operation in an OR in more than 70% of cases. These are the surgical fields. This reflects the current state of affairs. It is possible that more complex treatment rooms are used than are necessary.

Here too rehabilitation and allergology are the least interrelated with the facility; like rheumatology they need a treatment room for fewer than one in 10 patients.

### Intensive Care

The presence of Intensive Care is by far the most important for cardiothoracic surgery (69%). In addition there are three further medical specialisms for which patients have an IC episode in the same year for more than 5% of turnover: neurosurgery (15%), surgery (9%) and psychiatry (7%). Psychiatry possibly in connection with multiple organ failure as a result of addiction problems.

Overall 5.2% of the turnover is connected with the IC unit. The above shares are shares of turnover. In terms of volume (the share of DTC care products for patients who have had a procedure in the IC unit during that year) 1.4% of the care is connected with the IC unit.

A large part of the care can therefore be provided without an IC unit being present in a hospital. However, in some cases the facility is required if particular care is offered. An example of this is childbirth care and operations for patients above a certain ASA category.

## 5.5.5 Economic connection

Finally we distinguish the department in which the care is provided. We have analyzed the degree of connection in each specialism for these four parts of the hospital: outpatient, day admissions, clinic and emergency unit (table 6).

Table 6: Connections in primary specialisms with departments of the hospital [share of turnover for patients with a procedure in that department – idem for volume].

| | Turnover | | | | Volume | | | |
|---|---|---|---|---|---|---|---|---|
| | Outpatient | Day admission | Clinic | Emergency | Outpatient | Day admission | Clinic | Emergency |
| allergology | 98% | 18% | 5% | 7% | 99% | 11% | 5% | 7% |
| cardiothoracic surgery | 78% | 18% | 96% | 13% | 64% | 22% | 62% | 12% |
| cardiology | 91% | 34% | 71% | 38% | 96% | 26% | 41% | 33% |
| surgery | 99% | 29% | 68% | 53% | 99% | 19% | 29% | 55% |
| dermatology | 100% | 14% | 12% | 12% | 100% | 10% | 10% | 12% |
| geriatrics | 97% | 20% | 82% | 68% | 99% | 23% | 64% | 56% |
| internal medicine | 97% | 38% | 68% | 52% | 98% | 34% | 46% | 40% |
| pediatrics | 87% | 17% | 68% | 26% | 94% | 11% | 37% | 25% |
| ENT | 98% | 37% | 34% | 12% | 99% | 23% | 16% | 12% |
| pulmonary diseases | 94% | 28% | 74% | 54% | 97% | 25% | 46% | 39% |
| gastroenterology & hepatology | 96% | 49% | 57% | 48% | 96% | 49% | 33% | 32% |
| neurosurgery | 95% | 17% | 85% | 23% | 97% | 19% | 46% | 17% |
| neurology | 99% | 18% | 63% | 54% | 99% | 16% | 31% | 34% |
| obstetrics & gynecology | 95% | 22% | 60% | 9% | 91% | 17% | 32% | 12% |
| ophthalmology | 99% | 42% | 11% | 12% | 100% | 20% | 9% | 11% |
| orthopedics | 99% | 28% | 63% | 17% | 99% | 22% | 23% | 14% |
| plastic surgery | 99% | 38% | 36% | 16% | 99% | 27% | 17% | 13% |
| psychiatry | 100% | 18% | 78% | 65% | 100% | 18% | 75% | 66% |
| radiotherapy | 99% | 22% | 29% | 14% | 99% | 18% | 24% | 12% |
| rheumatology | 100% | 17% | 15% | 14% | 100% | 12% | 13% | 14% |
| rehabilitation | 48% | 2% | 45% | 4% | 77% | 7% | 17% | 13% |
| urology | 99% | 33% | 61% | 29% | 99% | 23% | 32% | 23% |
| weighted average | **94%** | **29%** | **61%** | **35%** | **97%** | **22%** | **29%** | **27%** |

### Outpatient

The outpatients department is used by all specialisms for almost all patients. In addition, an outpatient room does not involve any high investments. It is therefore not a determinant of any barriers to entry for new providers.

### Day admissions

22% of the total volume of DTC care products are provided for patients who also have a day admission. Weighted in terms of turnover, that is approximately 29%. For gastroenterology & hepatology that is almost 50% (by turnover and volume). With the exception of allergology, all specialisms in 2014 provide care for patients of whom one in seven had a day treatment during the same year. The provision of day treatment requires no high barriers to entry. The nursing takes place in regular hours, so any economies of scale play no role due to 24/7 nursing.

### Clinic

Overall 61% of the turnover is provided for patients with a clinical admission. In terms of volume that concerns 29% of the claimed DTC care products.

The four medical specialisms which are least associated with the clinic are allergology, ophthalmology, rheumatology and dermatology. For these specialisms the connection is less than 13% (by volume, 15% by turnover). Some of the treatments can therefore be carried out effectively in an outpatient unit or a ZBC. In terms of volume the connection is somewhat lower.

The ENT and plastic surgery specialisms also have relatively limited connections with the clinic.

### Emergency unit

Over one-third of the care turnover (35%) is provided by patients for whom a procedure has been recorded in the emergency unit in that year (27% by volume). The emergency unit is most relevant to the specialisms of geriatrics and psychiatry (68% and 65% respectively). The emergency unit is also important for patients in neurology, surgery, internal medicine, urology, cardiology and gastroenterology & hepatology.

Specialisms for which emergency care is less relevant are allergology, rheumatology, ophthalmology and dermatology. These specialisms may nevertheless have a share of turnover that is connected through the patient to the emergency unit because they often treat older patients. That does not apply to the specialisms of obstetrics & gynecology, ENT and allergology.

## 5.6 Clusters of connected DTC care products

A classification of interrelatedness at product level shows which care is can be provided separately from the rest of the hospital. To the extent that it involves no complex care, entry into the market for clusters with less interrelatedness is probably easier than entry for clusters of DTC care products which require a fully equipped hospital.

In a cluster analysis we define which DTC care products use comparable shares of the various primary specialisms, support specialisms and facilities. Here we therefore view connections on integrated basis. Some resulting clusters can be placed outside the hospital with limited investment and can serve as an indication of possible supply substitution or entry. We do consider any economies of scale here, for example if different clusters share facilities.

We describe the methodological details and considerations for the cluster analysis in Annex D. Here we limit ourselves to a brief description of the clustering:

- We cluster on the basis of the average scores per DTC care product on all the above groups of variables: specialisms[65] and facilities.
- DTC care products with fewer than 1,500 claims have been excluded from the analysis. These observations could have a disproportionately large impact on the results of the clustering.
- The DTC care products in category C*, as defined in section 4.3, have been analyzed separately. We have analyzed categories A* and B* here. The clustering of DTC care products in category C* gave no clearly interpretable set of clusters. Therefore this has not been included in this report.
- The selection of the cluster model is based on strong inter-cluster variation and low intra-cluster variation in the use of specialisms and facilities.
- Add-on medicines have been excluded from the clustering.

In total we cluster 860 DTC care products in categories A* and B*. That corresponds to 80% (by volume, 65% by turnover) of the DTC care products. It therefore concerns DTC care products in which we expect relatively low care complexity on the basis of travel behavior. This clustering results in 19 clusters (table 7). The clustering has been carried out in two stages. The first stage provided 15 clusters. In the second

[65] Oral surgery is not included in the analysis because it operates not with DTC care products but with care products that are claimed individually.

stage we arranged a reclustering of the DTC care products in the largest residual cluster by the algorithm. That resulted in eight subclusters, of which four were actually distinctive. The remaining four subclusters were again combined and are presented here as a residual cluster. We thus have 19 clusters.

We discussed the 19 clusters on the basis of a classification of their characteristics. The characteristics we looked at are:

- Involvement of the dominant specialism in the DTC care products in the cluster. For 13 of the 19 clusters this is equal to or greater than 90%. For 7 clusters is it is even equal to or greater than 98%.
- Involvement of the remaining primary specialisms in the DTC care products in the cluster. For eight of the 19 clusters this is fairly low (the next specialism has procedures at 4% to 6% of the patients for whom the DTC care product was provided). For seven clusters it is around 10% and for two clusters above 15%.
- Share supplied by independent treatment centers as an indication that the care possibly can indeed be provided separately from a hospital. For four clusters that is above 8%.
- Use of the infrastructure of a hospital (clinic, emergency unit, IC unit). For each cluster it has been determined what percentage of DTC care products in the cluster use that infrastructure. The ranking in use has been determined on that basis.
- Logical connections in medical specialisms in terms of types of clusters, for example surgical and diagnostic fields.

These characteristics were the guideline for classifying the 19 clusters in seven types. We refer to the clusters with the dominant specialism for that cluster. That does not mean that the cluster covers all the care for that specialism.

Table 7: Clustering of DTC care products leads to 19 clusters varying in size, characteristics

| | ENT | ophthalmology | plastic surgery | orthopedics | dermatology | rheumatology | pediatrics | O&G | surgery | cardiology | neurology | pulmonary diseases | internal medicine | gastroenterology & hepatology | urology | gastroenterology & hepatology | surgery | internal medicine | none |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Ia** | **Ia** | **Ia** | **Ia** | **Ia** | **Ib** | **II** | **II** | **III** | **IVa** | **IVa** | **IVa** | **IVa** | **Iva** | **IVb** | **V** | **VI** | **VI** | **VII** |
| importance of cluster for specialism | 71% | 81% | 20% | 53% | 62% | 73% | 69% | 66% | 47% | 61% | 58% | 50% | 26% | 14% | 61% | 19% | 8% | 30% | 10% |
| involvement of dominant specialism | 100% | 100% | 100% | 96% | 95% | 92% | 100% | 98% | 84% | 100% | 99% | 94% | 90% | 70% | 96% | 82% | 88% | 77% | 10% |
| involvement of next specialism | 4% | 4% | 13% | 5% | 6% | 5% | 4% | 4% | 5% | 9% | 10% | 13% | 12% | 8% | 9% | 11% | 17% | 29% | 9% |
| involvement of next 3 specialisms (average) | 4% | 4% | 7% | 4% | 4% | 4% | 3% | 3% | 4% | 8% | 9% | 12% | 8% | 7% | 8% | 8% | 11% | 18% | 6% |
| involvement of other specialisms (average) | 1% | 1% | 2% | 1% | 1% | 2% | 1% | 1% | 1% | 2% | 3% | 3% | 2% | 2% | 2% | 2% | 3% | 5% | 2% |
| share provided by ZBC | 1% | 13% | 11% | 8% | 11% | 0% | 1% | 2% | 2% | 3% | 1% | 0% | 0% | 2% | 0% | 2% | 1% | 2% | 5% |
| use of support (rank) | 15 | 18 | 17 | 10 | 19 | 11 | 4 | 16 | 14 | 12 | 8 | 3 | 6 | 13 | 5 | 9 | 2 | 1 | 7 |
| use of clinic, emergency unit, IC (rank) | 15 | 17 | 11 | 14 | 19 | 18 | 13 | 16 | 6 | 5 | 9 | 4 | 8 | 7 | 10 | 3 | 1 | 2 | 12 |
| use of diagnostics (rank) | 12 | 16 | 17 | 8 | 18 | 13 | 19 | 15 | 14 | 5 | 7 | 1 | 9 | 11 | 6 | 3 | 4 | 2 | 10 |
| use of facilities (rank) | 6 | 11 | 1 | 5 | 4 | 18 | 19 | 10 | 9 | 16 | 15 | 14 | 13 | 17 | 7 | 12 | 2 | 3 | 8 |
| Number of DTC care products in cluster | 53 | 54 | 9 | 32 | 38 | 16 | 64 | 59 | 63 | 60 | 89 | 48 | 60 | 14 | 38 | 11 | 41 | 81 | 30 |
| Volume in cluster (x 1,000) | 672 | 1,295 | 90 | 620 | 826 | 181 | 379 | 725 | 1,292 | 1,120 | 619 | 413 | 602 | 155 | 403 | 177 | 197 | 823 | 353 |
| Volume in cluster (share of total) | 5% | 10% | 1% | 5% | 6% | 1% | 3% | 5% | 9% | 8% | 5% | 3% | 4% | 1% | 3% | 1% | 1% | 6% | 3% |
| Turnover in cluster (x 1,000,000) | €281 | €395 | €93 | €729 | €209 | €91 | €312 | €735 | €661 | €1,011 | €480 | €529 | €313 | €177 | €311 | €177 | €882 | €1,239 | €341 |
| Turnover in cluster (share of total) | 2% | 3% | 1% | 5% | 2% | 1% | 2% | 5% | 5% | 7% | 4% | 4% | 2% | 1% | 2% | 1% | 6% | 9% | 2% |

Table 7: Clustering of DTC care products leads to 19 clusters varying in size, continued – importance of primary specialisms

| | ENT | ophthalmology | plastic surgery | orthopedics | dermatology | rheumatology | pediatrics | O&G | surgery | cardiology | neurology | pulmonary diseases | internal medicine gastroenterology & hepatology | urology gastroenterology & hepatology | surgery | internal medicine | none |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Ia** | **Ia** | **Ia** | **Ia** | **Ia** | **Ib** | **II** | **II** | **III** | **IVa** | **IVa** | **IVa** | **IVa** | **IVb** | **V** | **VI** | **VI** | **VII** |
| ENT | 100% | 1% | 1% | 1% | 1% | 1% | 4% | 1% | 1% | 2% | 2% | 3% | 1% | 1% | 1% | 1% | 2% | 9% |
| ophthalmology | 2% | 100% | 2% | 2% | 2% | 2% | 0% | 0% | 1% | 3% | 2% | 3% | 3% | 1% | 2% | 2% | 3% | 1% |
| plastic surgery | 1% | 1% | 100% | 1% | 3% | 2% | 0% | 1% | 1% | 1% | 3% | 1% | 2% | 1% | 1% | 2% | 2% | 3% |
| orthopedics | 2% | 2% | 3% | 96% | 2% | 4% | 1% | 1% | 4% | 3% | 5% | 3% | 3% | 2% | 3% | 2% | 6% | 4% | 3% |
| dermatology | 2% | 3% | 13% | 3% | 95% | 3% | 0% | 2% | 2% | 4% | 3% | 4% | 4% | 2% | 4% | 3% | 3% | 6% | 0% |
| rheumatology | 0% | 0% | 0% | 1% | 0% | 92% | 0% | 0% | 0% | 0% | 0% | 1% | 0% | 0% | 0% | 0% | 0% | 1% | 0% |
| pediatrics | 1% | 1% | 0% | 0% | 0% | 0% | 100% | 0% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 0% | 0% |
| obstetrics & gynecology | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 98% | 1% | 1% | 1% | 1% | 2% | 1% | 2% | 1% | 2% | 2% | 0% |
| surgery | 4% | 4% | 6% | 5% | 6% | 5% | 4% | 4% | 84% | 8% | 10% | 10% | 12% | 8% | 8% | 11% | 88% | 29% | 6% |
| cardiology | 4% | 4% | 3% | 3% | 4% | 4% | 0% | 1% | 3% | 100% | 8% | 13% | 8% | 4% | 6% | 4% | 7% | 13% | 2% |
| neurology | 2% | 2% | 2% | 1% | 1% | 2% | 1% | 1% | 2% | 4% | 99% | 4% | 4% | 1% | 2% | 1% | 4% | 6% | 2% |
| pulmonary diseases | 2% | 1% | 1% | 1% | 1% | 2% | 0% | 1% | 1% | 5% | 3% | 94% | 3% | 2% | 2% | 2% | 3% | 5% | 10% |
| internal medicine | 3% | 4% | 3% | 2% | 4% | 4% | 0% | 3% | 5% | 9% | 8% | 12% | 90% | 8% | 9% | 9% | 17% | 77% | 2% |
| gastroenterology & hepatology | 2% | 2% | 2% | 2% | 2% | 3% | 0% | 2% | 3% | 4% | 3% | 5% | 5% | 70% | 4% | 82% | 9% | 13% | 1% |
| urology | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 1% | 2% | 2% | 2% | 2% | 1% | 96% | 2% | 3% | 4% | 0% |
| geriatrics | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 1% | 1% | 0% | 0% | 1% | 0% | 1% | 11% | 0% |
| rehabilitation | 1% | 1% | 2% | 1% | 0% | 2% | 1% | 0% | 1% | 2% | 3% | 2% | 1% | 1% | 1% | 1% | 2% | 4% | 2% |
| psychiatry | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 3% | 0% |
| radiotherapy | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 2% | 1% | 0% | 1% | 0% | 1% | 2% | 0% |
| neurosurgery | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 3% | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 3% |
| cardiothoracic surgery | 0% | 0% | 0.1% | 0% | 0% | 0.1% | 0% | 0% | 0% | 1% | 0% | 1% | 0% | 0% | 0% | 0% | 0% | 1% | 0% |
| allergology | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |

Table 7: Clustering of DTC care products leads to 19 clusters varying in size, continued – importance of support specialisms and facilities

| | ENT | ophthalmology | plastic surgery | orthopedics | dermatology | rheumatology | pediatrics | O&G | surgery | cardiology | neurology | pulmonary diseases | internal medicine | gastroenterology & hepatology | urology | gastroenterology & hepatology | surgery | internal medicine | none |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Ia** | **Ia** | **Ia** | **Ia** | **Ia** | **Ib** | **II** | **II** | **III** | **IVa** | **IVa** | **IVa** | **IVa** | **IVa** | **IVb** | **V** | **VI** | **VI** | **VII** |
| clinical chemist | 52% | 73% | 35% | 39% | 60% | 94% | 87% | 75% | 46% | 94% | 72% | 86% | 95% | 86% | 85% | 70% | 84% | 97% | 46% |
| radiology | 50% | 39% | 42% | 97% | 35% | 73% | 54% | 27% | 82% | 67% | 86% | 94% | 69% | 56% | 64% | 54% | 90% | 90% | 85% |
| anesthesiology | 41% | 39% | 45% | 35% | 11% | 9% | 24% | 29% | 25% | 16% | 18% | 19% | 16% | 14% | 26% | 18% | 61% | 36% | 62% |
| medical microbiology | 31% | 23% | 11% | 12% | 26% | 26% | 46% | 40% | 17% | 22% | 22% | 39% | 26% | 32% | 40% | 23% | 36% | 62% | 13% |
| pathologist/anatomist | 16% | 15% | 58% | 8% | 58% | 11% | 22% | 39% | 23% | 13% | 12% | 26% | 21% | 40% | 34% | 76% | 38% | 35% | 10% |
| nuclear medicine | 6% | 4% | 4% | 6% | 5% | 5% | 20% | 3% | 9% | 13% | 7% | 15% | 15% | 6% | 8% | 5% | 13% | 18% | 7% |
| clinical genetics | 4% | 3% | 2% | 1% | 1% | 1% | 20% | 3% | 5% | 2% | 3% | 1% | 2% | 2% | 1% | 1% | 3% | 2% | 1% |
| | | | | | | | | | | | | | | | | | | | |
| outpatient | 100% | 100% | 99% | 100% | 100% | 100% | 93% | 98% | 99% | 98% | 100% | 99% | 100% | 98% | 99% | 93% | 99% | 96% | 73% |
| clinic | 13% | 9% | 9% | 23% | 9% | 11% | 37% | 34% | 15% | 39% | 29% | 47% | 26% | 19% | 28% | 20% | 93% | 68% | 18% |
| emergency | 11% | 11% | 13% | 12% | 11% | 12% | 26% | 9% | 56% | 34% | 35% | 44% | 32% | 29% | 22% | 17% | 65% | 54% | 11% |
| day admission | 23% | 19% | 32% | 21% | 10% | 10% | 9% | 17% | 17% | 26% | 14% | 26% | 25% | 32% | 21% | 78% | 22% | 37% | 27% |
| IC | 1% | 0% | 1% | 1% | 0% | 0% | 1% | 1% | 1% | 1% | 1% | 3% | 1% | 1% | 1% | 1% | 7% | 2% | 1% |
| | | | | | | | | | | | | | | | | | | | |
| diagnosis simple | 50% | 59% | 29% | 26% | 24% | 30% | 17% | 16% | 27% | 95% | 55% | 82% | 48% | 55% | 51% | 40% | 57% | 72% | 36% |
| diagnosis medium | 28% | 6% | 6% | 7% | 7% | 13% | 2% | 10% | 12% | 13% | 11% | 34% | 20% | 23% | 45% | 91% | 22% | 31% | 19% |
| diagnosis difficult | 2% | 1% | 1% | 15% | 1% | 3% | 1% | 4% | 3% | 14% | 3% | 9% | 4% | 3% | 3% | 3% | 6% | 7% | 4% |
| imaging simple | 23% | 21% | 28% | 77% | 22% | 64% | 27% | 74% | 59% | 72% | 44% | 78% | 59% | 46% | 65% | 41% | 85% | 81% | 52% |
| imaging medium/difficult | 21% | 8% | 9% | 33% | 9% | 18% | 4% | 6% | 17% | 24% | 47% | 47% | 31% | 17% | 18% | 18% | 41% | 45% | 31% |
| | | | | | | | | | | | | | | | | | | | |
| treatment room simple | 4% | 8% | 41% | 4% | 34% | 5% | 1% | 12% | 14% | 5% | 8% | 6% | 6% | 5% | 5% | 7% | 8% | 10% | 8% |
| treatment room medium | 3% | 21% | 3% | 3% | 4% | 3% | 0% | 1% | 4% | 7% | 6% | 4% | 4% | 3% | 4% | 3% | 4% | 5% | 28% |
| treatment room difficult | 32% | 7% | 78% | 35% | 26% | 9% | 7% | 27% | 25% | 12% | 13% | 15% | 16% | 12% | 31% | 18% | 71% | 34% | 13% |

### 5.6.1 Type I

These six clusters clearly have a dominant primary specialism. We use that specialism to name the cluster. The DTCs have relatively little connection with other parts of hospital care.

For these clusters the specialism from which they take their name is involved in 92% or more of the DTC care products in that cluster. These clusters are also important for the specialism; for five of the six half to four-fifths of the volume of DTC care products for that specialism falls within the cluster[66]. The DTC care products for this type of cluster are provided for patients who attended relatively few other primary specialisms. In five cases fewer than 7%.

In addition the patients made little use of relatively heavy facilities such as the IC unit, emergency unit and complex diagnostic activities. That relates particularly to elective care.

A large part of the DTC care products in the six clusters in type I can possibly be offered outside a hospital. In total almost one-quarter of the claimed DTC care products (27% by volume, 13% by turnover) fall in these six clusters.

These are five clusters of surgical specialisms (Ia), and one cluster of a diagnostic specialism (Ib)

#### Type Ia

Examples of DTC care products in each cluster are:

- ENT: operations on adenoids or tonsils, middle ear, nasal concha with infection, allergy or disease. Outpatient visits for deafness or vertigo.
- Ophthalmology: cataract surgery (one-third of the turnover in cluster), injection into vitreous, procedure on eyelid, tear duct or eye socket, laser treatments, investigation and treatment of diabetes-related conditions, and outpatient visits with diagnostic investigation.
- Plastic surgery: Reconstruction operations, operative trigger finger release, procedure for carpal tunnel syndrome, eyelid correction.
- Orthopedics: fitting of knee or hip prostheses (jointly half of turnover in cluster), extensive operations on the shoulder, knee, ankle/foot and related investigations and treatments in the outpatient unit.

[66] Shares are as a proportion of all DTC care products.

- Dermatology: (one, two or more) operations for skin cancer and precursor signs, various procedures for skin conditions (blisters, eczema, lumps, flakes), conditions of tallow and sweat glands and outpatient visits for such conditions.

These clusters consist of care which could possibly be provided independently. For ophthalmology, orthopedics, dermatology and plastic surgery that is already happening. The care supplied in those specialisms is provided respectively by 13%, 11%, 8% and 11% (by volume) by independent treatment centers. More evidence of this is that in the case of the independent treatment centers which supply quality information to Zorginzicht, that was done predominantly for ophthalmology (indicator sets: cataract), for orthopedics (indicator sets: hip prosthesis, knee prosthesis, meniscus and front cruciate ligament) and dermatology (indicator sets: constitutional eczema, psoriasis and melanoma[67].

For four clusters (excluding ophthalmology) an OR is used in hospitals. In independent operation, sufficient volume is required in order to cover the costs, or there is a focus on treatments in which that OR is not necessary. It may also be that the care can also be provided in a less fully equipped treatment room. For the plastic surgery cluster, a procedure in the OR is also recorded for over three-quarters (78% by volume) of the patients. A large part (41%) are assisted in a simple treatment room.

Of these clusters orthopedics uses the highest share of highest share of medium/difficult imaging (33%). In elective procedures this imaging can also be carried out elsewhere, for example in an MRI center.

The plastic surgery cluster appears in this cluster the most interrelated with other specialisms. These are dermatology (13%) and surgery (6%). These patients may see these other specialisms for another part of the treatment.

After that, the dermatology cluster is the most interrelated with the other specialisms in this type (surgery and internal medicine). These are primarily DTC care products involved with the treatment of venous ulcers.

ENT is offered in the Netherlands only to a limited extent as an independent specialism by independent treatment centers, whereas we saw above that the specialism has relatively little connection with other specialisms. More than two-thirds of the volume of ENT falls in this cluster.

[67] Analysis by SiRM based on the 164 ZBCs which have supplied quality indicators to Zorginzicht (program of the National Health Care Institute).

### Type Ib

The rheumatology cluster contains 73% of the volume of rheumatology. For 5% or fewer of the patients a procedure in another specialism was also recorded. Mainly simple diagnostics and imaging are used and there is hardly any use of facilities such as IC, clinic and emergency.

## 5.6.2 Type II

The dominant specialisms in the two clusters of type II are:

- Pediatrics: neonatology (almost half the turnover in the cluster), other DTC care products for admission and outpatient treatment for various conditions such as asthma, infection of the airways, gastrointestinal tract (diarrhea), diabetes, injury, behavioral problems, etc. Almost no operative procedures.
- Obstetrics & gynecology (O&G): DTC care products that are related to pregnancy and childbirth (approximately two-thirds of the turnover), fertility, pelvic floor complaints. The cluster includes no oncological gynecology.

They are involved in almost all DTC care products these clusters, whereas their patients hardly see any other specialisms. Two-thirds of their total volume of DTC care products, including non-clustered DTC care products, fall in these clusters.

O&G and pediatrics are not offered for childbirth care independently of a hospital in the Netherlands. As we saw earlier, this is associated on only a few cases with other specialisms. The supporters, facilities and departments are nevertheless required to provide childbirth care, so that action can be taken where necessary. For O&G there are clinics that offer care outside the hospital. The DTC care products in this cluster that are supplied more than 5% by independent treatment centers are: day/outpatient treatment for reduced fertility, menopause complaints, urine leakage/prolapse.

For the DTC care products in type II a significantly higher proportion of clinical admissions is required than in type I and for pediatrics the emergency unit is crucial. These two clusters jointly account for approximately 8% (by volume, 8% by turnover) of all DTC care products.

## 5.6.3 Type III

Type III consists of a cluster for which surgery is dominant (84%). Examples are: investigation or treatment in an outpatient unit for injury, excluding hip fracture (approximately 30% of turnover in cluster), outpatient investigation and treatment for breast cancer, operation on hemorrhoids, varicose veins, inguinal hernia, operations on the skin.

Together the DTC care products in this cluster account for almost half (47%) of the volume for surgery. The care also has relatively little connection with other specialisms. The cluster does have the highest importance of the emergency unit for a cluster, linked to the high proportion of outpatient investigations for injuries. 56% of the DTC care products in this cluster are provided for patients who also visit the emergency unit, while 15% of DTC care products are provided for patients who are admitted to the clinic. For approximately one-quarter of the patients a procedure is recorded in the OR.

Part of this cluster consists of treatments that are also offered in independent treatment centers. That is true in more than 5% of the cases for the treatment of varicose veins, hemorrhoids and benign skin tumors, jointly making up approximately 16% (by volume, 20% by turnover) of this cluster.

The cluster covers a total of 9% (by volume, 5% by turnover) of the DTC care products. We estimate approximately 1.4% points (by volume, 1% point of turnover) of that can be supplied outside the hospital.

### 5.6.4 Type IV

Type IVa consists of five clusters with DTC care products for which diagnostic fields are the dominant specialism. In addition type IVb consists of a cluster for a surgical field, urology. For these six clusters there is always a clearly dominant specialism present, while other specialisms have registered more procedures for their patients than for types I, II and III.

The DTC care products in the six clusters of type IV account for over one-quarter (24% by volume, 21% by turnover) of the specialist medical care. This appears to be part of the 'diagnostic core' of the hospital.

#### Type IVa

The dominant specialisms in the five clusters and examples of DTC care products in type IVa are:

- cardiology: fitting of pacemakers, day treatment or admission for breast pain, arrhythmia, acute heart failure, chronic heart failure.
- neurology: investigation, admission and treatment for CVA or TIA.
- pulmonary diseases: admission for pneumonia, COPD, lung cancer, provision of chemotherapy, outpatient visit and treatment of asthma.

- internal medicine: investigation and treatment in the outpatient unit for general complaints or diseases of the digestive system, infusion for cancer, outpatient visits for diabetes.

- gastroenterologists: treatment or investigation, mainly in an outpatient unit or in day treatment for (mainly benign) tumors in liver or alimentary canal or for diseases of the digestive system.

Within the clusters the turnover is divided among many care products that typically make up the bulk of the specialism. The five specialisms are involved in almost all DTC care products and provide 50% to 60% of their production in these clusters, with the exception of internal medicine and gastroenterology & hepatology (26% and 16%). Other specialisms are also involved in these patients. That mainly concerns surgery in approximately one in eight to 12 patients. These are diagnostic fields and patients have relatively few procedures in the OR (i.e. also with regard to the other specialisms that are involved). There are nevertheless admissions (20% to 50% of the patients are admitted to the clinic) and day admissions (14% to 32%), and an average inflow through the emergency unit (approximately one-third). For the DTC care products in pulmonary medicine, that is 44% higher.

#### Type IVb

Urology is dominant for the cluster of DTC care products in type IVb (96%). Examples of DTC care products are: diagnosis and treatment (often keyhole surgery) for tumors of the bladder or kidney stones, or benign enlargement of the prostate.

As in the case of the other clusters, surgery has also been involved in approximately one in eight patients. The share of patients who have undergone a procedure in the OR (31%) is greater, because urologists also perform operations themselves. The patients in this cluster come to the emergency unit less frequently (22%).

### 5.6.5 Type V

The cluster in Type V has gastroenterology & hepatology as the dominant specialism (82%). That was also the dominant specialism for a cluster in type IV. This mainly relates to investigation and treatment of cancer in the digestive system, such as bowel cancer.

This cluster distinguishes itself from the gastroenterology cluster in type IV by having a high share of day admissions (78%), a high share of patients with a pathological investigation (76%) and diagnostic activities of medium complexity for almost all patients (91%).

### 5.6.6 Type VI

For the two clusters in type VI the following are dominant:

- internal medicine
- surgery

As in the case of type V, in both clusters very many different conditions arise with comparable shares. The field occurs in full breadth for both internal medicine and surgery. Examples of DTC care products would give an incorrect picture because the turnover is spread across various DTC care products.

Both specialisms are involved in 77% and 88% respectively of the DTC care products in these clusters. For both clusters the second important specialism is then surgery (29%) or general internal medicine (17%) respectively. In addition procedures have also been recorded for other medical specialisms for the patients who have consumed DTC care products in these two clusters. The two clusters of type V make up almost 7% (by volume, 16% by turnover) of the care.

The share with a procedure in the OR is relatively high and half to one-third of the patients have been in the emergency unit. Of all 15 clusters, these have by far the highest share with a clinical admission (93% for surgical cluster, 68% for the cluster in which internal medicine is dominant).

### 5.6.7 Type VII

Finally, there remains one cluster (3% by volume, 2% by turnover) for which no dominant specialism can be clearly designated. The DTC care products are mainly supplied by ENT, pulmonary medicine and surgery. A relatively low share of patients come to the emergency unit (11%); approximately one-third of the average.

## 5.7 Conclusion concerning care connections in hospitals

Different types of connections or interrelatedness can be distinguished. Here we analyzed in particular the connections within a hospital. For each patient we investigated the involvement of the primary specialisms and the use of the hospital's facilities. We also investigated which separate clusters of care could be distinguished.

### 5.7.1 Multidisciplinary collaboration

#### Substitution between specialisms

Substitution between specialisms plays a minor role. The top five substitution combinations between specialisms are as follows (in order of the turnover share that is substituted): gastroenterology & hepatology for general internal medicine (17%), gastroenterology & hepatology for surgery (8%), neurosurgery for surgery (8%), surgery for orthopedics (6%). Supply substitution between specialisms is therefore possible for these combinations. In total it concerns 3.8% (by turnover, 5.7% by volume) with the 2% cut-off limit of 2% substitution applied between specialisms (without that limit it is 7.6% and 9.9% respectively). Supply substitution between specialisms is therefore limited. The product market definition based on supply substitution will be dominated by supply substitution within specialisms.

That does not mean that every primary specialism constitutes its own product market. On the one hand, they may need to be divided, for example into basic care and complex care as discussed in the previous section. On the other hand, such a definition may be too narrow due to connections between specialisms. These connections were investigated in this section.

#### Multidisciplinarity

Across the entire volume of patients, a single primary specialism is involved in approximately 10%, two are involved in 68% of care and three or more in the remainder. In turnover shares, approximately 13% is monodisciplinary, 45% bidisciplinary, while 42% of care turnover is for patients who have seen three or more primary specialisms in the same year. It may also be that these are not related care requirements. In addition, this degree of connection does not mean that care must by definition be provided in that way. It reflects the current working method. It is possible that part of the care could be provided outside or in another hospital without any negative impact on quality or accessibility.

### 5.7.2 Independence of specialisms in independent treatment centers.

Independent treatment centers provide approximately 4% (by volume, 3% by turnover) of the care. We estimate that independent treatment centers have a significant presence in 14% to 28% of the market for specialist medical care (by volume, 10% to 16% by turnover). independent treatment centers compete in almost the entire markets for ophthalmology, dermatology, plastic surgery and allergology. In the case of orthopedics, neurosurgery, cardiology, rehabilitation, gynecology, gastroenterology & hepatology and surgery, competition with independent treatment centers takes place in part of the market.

### 5.7.3 Connections between primary specialisms

Seven medical specialisms have little involvement among patients who receive care products for which another specialism is dominant.

- Pediatrics, rheumatology, allergology, geriatrics and psychiatry. These specialisms are involved in fewer than 3% (by turnover) of the DTC care products of other primary specialisms. Conversely, their patients do see other medical specialists, particularly geriatrics and psychiatry patients.

- Cardiothoracic surgery and neurosurgery also barely see any patients who receive DTC care products in another specialism (3% to 4%). Both neurosurgery and cardiothoracic surgery are therefore not present in all hospitals. Cardiothoracic surgery and neurosurgery procedures are defined parts of a treatment for which the patient can travel to another hospital.

In four medical specialisms we find that independent treatment centers obtain market shares of up to 10% on approximately one-third of the volume of DTC care products for those specialisms. These are ophthalmology, dermatology, plastic surgery and allergology. For other specialisms too, competition from independent treatment centers can be important. independent treatment centers have a market share of at least 10% in over 14% (by volume, 10% by turnover) of the market. If we set that limit at 5%, the figure is double that (28% volume, 16% turnover).

On the other hand, surgery and internal medicine are the most interrelated with other primary specialisms. Patients in almost all other medical specialisms also see a surgeon or internist for at least 3% of turnover in the same year.

### 5.7.4 Connections with clinic and emergency care

For a new entrant, the clinic and emergency care facilities probably represent the highest barriers to entry. These involve large investments and sufficient scale is required in order to make profitable use of these facilities.

- The four medical specialisms which are least associated with the clinic are allergology, ophthalmology, rheumatology and dermatology. Some of the treatments can therefore be carried out effectively in an outpatient unit or a ZBC. The ENT and plastic surgery specialisms also have relatively limited connections with the clinic.

- Over one-third of the care turnover (35%) is provided by patients for whom a procedure has been recorded in the emergency unit in that year (27% by volume). Acute care is the most relevant to the specialisms of geriatrics and psychiatry. (That does not necessarily mean that a fully equipped emergency unit is required for those specialisms.) Emergency care is also important for patients in pediatrics, neurology, surgery, general internal medicine, urology, cardiology and gastroenterology & hepatology. Specialisms for which emergency care is less relevant are allergology, rheumatology, ophthalmology and dermatology. The specialisms of obstetrics & gynecology, ENT and allergology also receive relatively few patients through emergency care.

### 5.7.5 Clusters of DTC care products

We have carried out a cluster analysis of all care which we have not classified as probably complex. DTC care products which have been claimed less than 1,500 times and add-on medication have also been disregarded. In a cluster analysis, clusters are formed with the least possible difference within a cluster and the greatest possible difference between the clusters. In this way 80% of the DTC care products (by volume, 65% by turnover) have been classified in nineteen clusters. We have grouped them in seven types:

I. Six clusters each supplied with 92% or more care by: ophthalmology, orthopedics, ENT, rheumatology, plastic surgery and dermatology. Half to three-quarters of the volume of DTC care products for those specialisms falls within the cluster, except for plastic surgery. The DTC care products for this type of cluster are supplied to patients who see relatively few other specialisms. This care is already provided to a relatively large extent by independent treatment centers. That may be possible for all these six clusters, i.e. 27% (by volume, 13% by turnover) of the care.

II. Obstetrics & gynecology (excluding gynecological oncology) and pediatrics. They are involved in almost all DTC care products in their cluster, while their patients hardly see any other specialisms; the fewest of all clusters. Two-thirds of their own volume of DTC care products falls within these clusters. This requires a significantly higher share of clinical admissions than in the case of type I and a higher share of emergency care for pediatrics.

III. A cluster for which surgery is dominant (84%). The care has relatively little connection with other specialisms. The cluster does have the highest importance of emergency care for a cluster (56%). Polyclinic visits due to injuries and various operations make up the core of this cluster. It is possible that part of this cluster can be offered outside the hospital. This concerns less than 1.4% (by volume, 1% by turnover) of all the DTC care products provided in 2014 which are already being provided for more than 5% by independent treatment centers.

IV. Six clusters: Five clusters with diagnostic specialisms of internal medicine, neurology, cardiology, pulmonary medicine and gastroenterology & hepatology. One cluster with urology as the dominant specialism. Approximately one in nine patients is also seen by surgery.

V. One cluster with gastroenterology & hepatology as the dominant specialism with a high proportion of day care, and diagnostic procedures with medium complexity.

VI. Two clusters: general internal medicine and surgery. In both clusters there is a relatively strong connection with the other field (surgery and general internal medicine). The share with a procedure in the OR is relatively high and half to one-third of the patients have been in the emergency unit. Of all nineteen clusters, these have by far the highest share with a clinical admission.

VII. Finally, there remains one cluster (3% by volume, 2% by turnover) for which no dominant specialism can be clearly designated. A relatively low proportion of patients come to the emergency unit (11%); almost one-third of the average.

### 5.7.6 Possible product markets

On the basis of the analysis of clusters and the description of the connections, we estimate that we can define six clear product markets. In addition there are 13 clusters of care which can possibly each form their own product market or can be further subdivided.

- Approximately 28% (by volume, 14% by turnover) of the DTC care products can possibly be provided without requiring a fully equipped hospital organization. These are the six clusters of DTC care products in type I, and part of the type III cluster. The dominant specialisms are: ophthalmology, orthopedics, ENT, dermatology, rheumatology, plastic surgery and surgery. In a large part of these product markets, independent treatment centers already have market shares above 5%.

- Approximately 51% (by volume, 49% by turnover) of care is provided in nine clusters which are connected with care in the remainder of the hospital. Whether there are actually separate product markets depends on whether these clusters have sufficient scale to operate the required facilities themselves, or whether these facilities can also be purchased externally.

- Part of the care remains in a broadly defined residual cluster of 3% (by volume, 2% by turnover) of the DTC care products.

- The remainder of the DTC care products have not been included in the clustering (20% by volume, 35% by turnover). These are care products with a very low volume or which have been previously classified as possibly complex care.

In the definition of product markets, due account must be taken of the qualitative aspects of collaboration. We found that connection is becoming increasingly important, both within and between hospitals for certain treatments.

# 6 Conclusion

The market for specialist medical care is highly fragmented when it is defined on the basis of possible demand substitution. For example, a patient with an inguinal hernia will not benefit from 99.6% of the remainder of specialist medical care. Product market definition from the demand perspective leads to many different product markets.

On the basis of supply substitution, the product markets for specialist medical care with comparable competition conditions are larger.

This mainly concerns supply substitution within specialisms. Supply substitution between specialisms is limited to 4% to 8% of turnover. We find that substitution in general internal medicine with gastroenterology & hepatology and rheumatology, and for surgery with neurosurgery and orthopedics.

The fact that there is scarcely any substitution of treatments between specialisms does not mean that every specialism constitutes its own product market. On the one hand, they may need to be subdivided, for example into basic care and complex care. On the other hand, a specialism-based definition is too narrow where there is a connection between specialisms.

The conditions under which providers of specialist medical care compete differ between complex care and basic care. Basic care is provided by almost every hospital, whereas complex care is provided by appropriately specialized hospitals (including academic hospitals). Hospitals which provide complex care also provide basic care. The proportion of complex care naturally differs depending on the specialism. Based on our analysis for 2014, we estimate the following key figures for complex care for which travel takes place:

- approximately one-third of the 4,250 Diagnosis Treatment Combination (DTC) care products
- approximately one-tenth of the volume of the 13.6 million DTC care products
- approximately one-fifth of the analyzed turnover of almost €14 billion

The complement to complex care has been analyzed in greater detail. Basic care is supplied by all specialisms with the exception of neurosurgery and cardiothoracic surgery, which both provide only complex care. This concerns 80% (by volume, 65% by turnover) of the DTC care products. On the basis of a cluster analysis looking at the relationship between care and other specialisms and the hospital, we have

identified seven product markets and eleven clusters which possibly also form full or partial product markets. There is also a residual cluster.

- Approximately 28% (by volume, 14% by turnover) of the DTC care products are supplied in seven product markets with the following dominant specialisms: ophthalmology, orthopedics, ENT, dermatology, rheumatology, plastic surgery and surgery. This care can be provided outside the hospital setting. A large part of this care is also provided by independent treatment centers ( independent treatment centers). In the case of surgery, that concerns non-complex operations such as the treatment of varicose veins, hemorrhoids and benign tumors. Is possible that more separate product markets can be found through more detailed investigation.

- Approximately 51% (by volume, 49% by turnover) of care is provided in eleven clusters which are connected to care in the remainder of the hospital. Whether there are actually separate product markets depends on whether these clusters have sufficient scale to operate the required facilities themselves, or whether these facilities can also be purchased externally.

    - Two clusters with obstetrics & gynecology (excluding oncology) and pediatrics operate relatively independently of other primary specialisms. However, they do require hospital facilities in order to be able (and permitted) to provide their care. It is possible that due to economic necessity they do not form an entirely separate product market, because they do not have the volume required in order to make sufficient use of the necessary facilities themselves.

    - Five clusters with diagnostic specialisms of internal medicine, neurology, cardiology, gastroenterology & hepatology and pulmonary medicine. Approximately one in nine patients is also seen by surgery.

    - A cluster with gastroenterology & hepatology as the dominant specialism that is focused on oncology investigation and treatment.

    - A cluster with urology as the dominant specialism that also is very similar to the previous four clusters.

    - Two clusters: general internal medicine and surgery. In both clusters there is a relatively strong connection with the other field (surgery and general internal medicine). Of all nineteen clusters, these have by far the most connection with the facilities in a hospital.

The degree to which the product markets suggested above also have uniform conditions for competition also depends on other factors. Many hospitals are engaged

in strategic reorientation and reviewing the way in which they organize themselves and the networks in which they operate.

# 7 Annexes

## 7.1 Annex A – Results based on DIS 2013

To verify the stability of the results obtained, we have carried out a sensitivity analysis on the basis of the DIS data from 2013. This analysis shows that the degree of complexity and interrelatedness observed between primary and support specialisms, facilities and diagnostics in 2014 are highly comparable to those of 2013.

In this annex we illustrate these similarities on the basis of a number of figures and tables which were also included in the main text for 2014. In this analysis we have only used the DTC care products that were also claimed in 2014. In addition, the clustering was only carried out once. That means we have not reclustered the DTC care products in the residual cluster.

Figure 29: In 2013, as in 2014, more than 40% of patients do not go to the nearest hospital

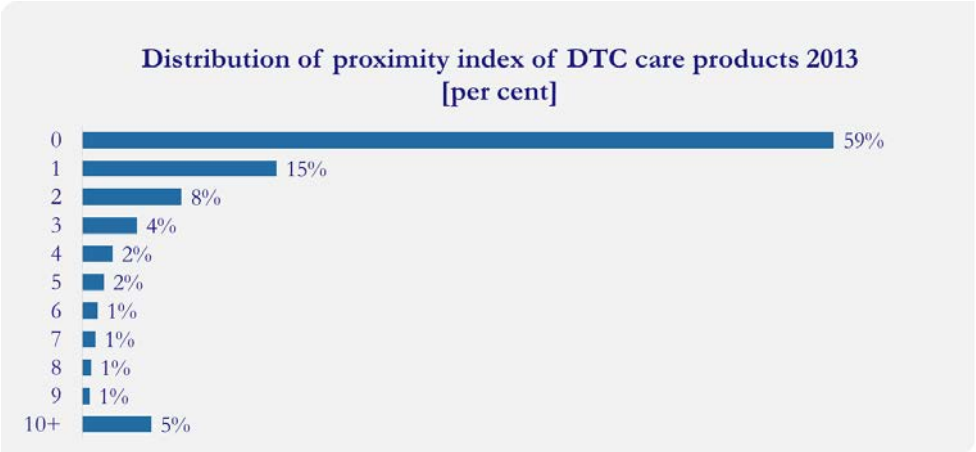


Figure 30: The number of claims per DTC care product in 2013 and 2014 is strongly correlated, but there is some variation

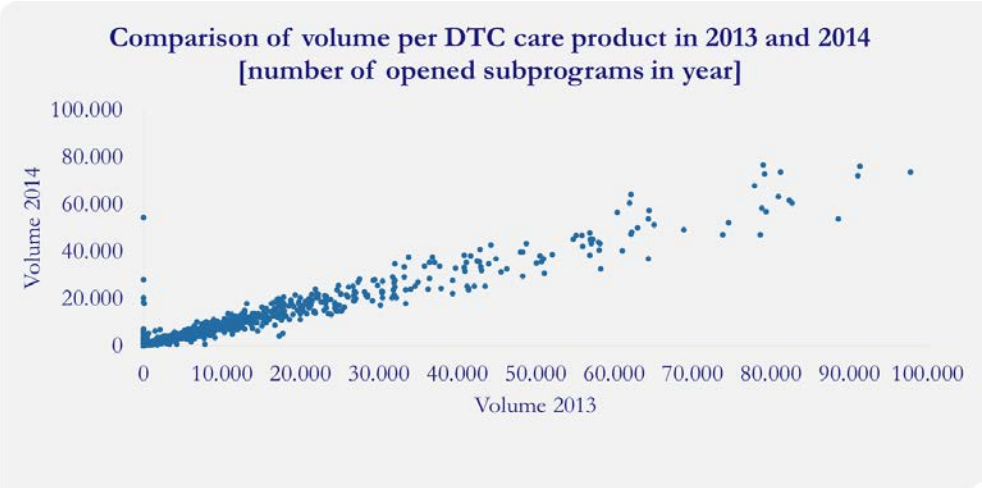



Figure 31: The proximity index is stable over the years, but here too there is some variation

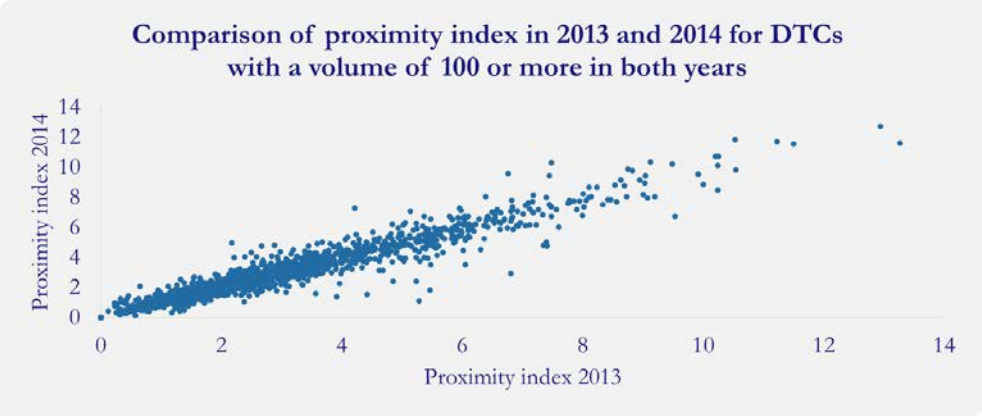


Figure 32: The proximity index in 2013 appears to rise faster only with a slightly higher cumulative share of the volume than the 83% from 2014

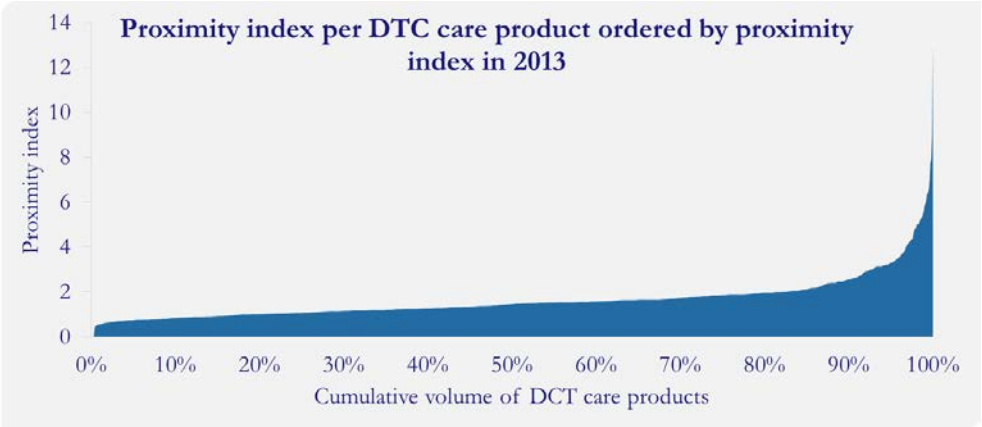



Figure 33: The classifications on the basis of travel behavior are comparable for DIS 2013 and 2014

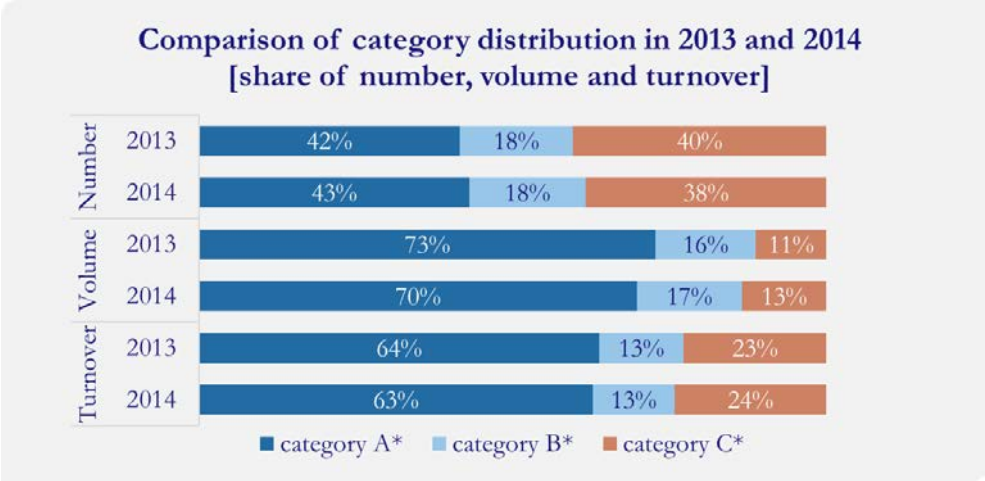


Table 10: Approximately one-tenth of the DTC care products from 2014 were not opened in 2013. The impact on volume and turnover is limited.

| | | 2014 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Number | | | Volume | | | Turnover | | |
| | | A* | B* | C* | A* | B* | C* | A* | B* | C* |
| 2013 | A* | **32%** | 4% | 1% | **66%** | 3% | 1% | **58%** | 2% | 0% |
| | B* | 4% | **8%** | 4% | 3% | **12%** | 1% | 3% | **10%** | 1% |
| | C* | 1% | 4% | **31%** | 0% | 1% | **10%** | 0% | 1% | **22%** |
| | No claims | 6% | 2% | 3% | 1% | 0% | 2% | 1% | 0% | 1% |

Figure 34: The overlap with other indicators of complexity is slightly smaller in 2013 than in 2014

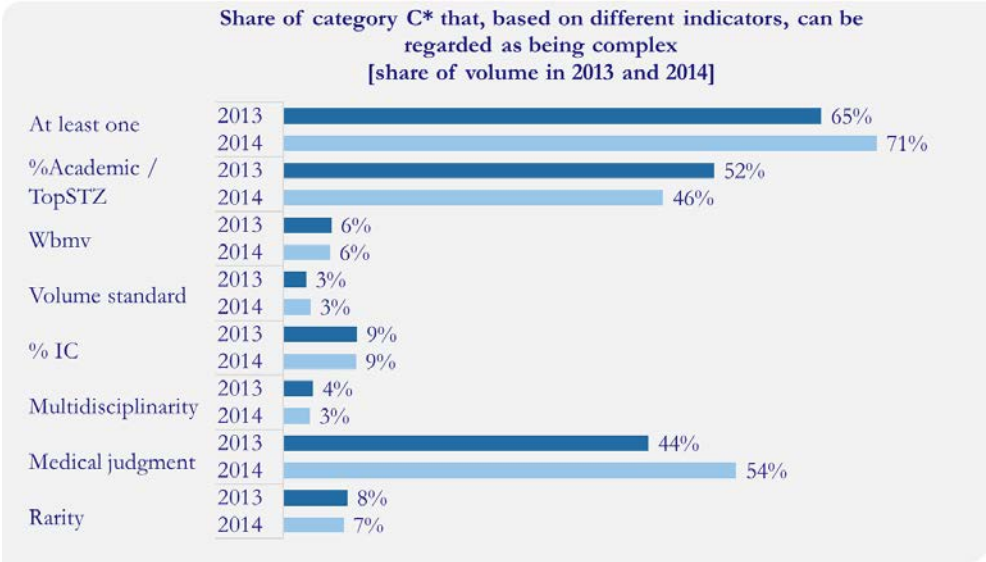


Figure 35: The share of the care from category C* in 2013 with an overlap with other indicators of complexity is somewhat lower

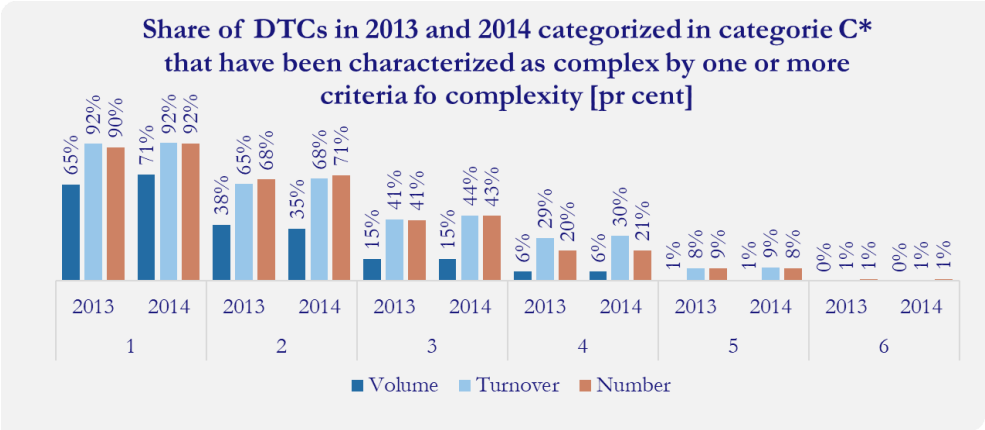


Table 8: Clustering in 2013 leads to comparable clusters to those of 2014, characteristics per cluster

| | ENT | ophthalmology | orthopedics | dermatology | pediatrics | obstetrics & gynecology | surgery | internal medicine | cardiology | neurology | pulmonary diseases | urology | internal medicine | none |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Ia** | **Ia** | **Ia** | **Ia** | **II** | **II** | **III** | **IVa** | **IVa** | **IVa** | **IVa** | **IVb** | **VI** | **VII** |
| importance of cluster for specialism | 70% | 77% | 57% | 67% | 73% | 70% | 53% | 28% | 60% | 59% | 58% | 64% | 29% | 75% |
| involvement of dominant specialism | 100% | 100% | 72% | 90% | 100% | 98% | 85% | 90% | 100% | 99% | 82% | 97% | 77% | 49% |
| involvement of next specialism | 5% | 5% | 12% | 7% | 4% | 4% | 7% | 10% | 9% | 10% | 11% | 8% | 31% | 35% |
| involvement of next 3 specialisms (average) | 4% | 4% | 7% | 5% | 3% | 3% | 5% | 8% | 8% | 9% | 10% | 7% | 19% | 17% |
| involvement of other specialisms (average) | 1.3% | 1.3% | 1.7% | 1.4% | 0.6% | 0.9% | 1.7% | 2.3% | 2.4% | 2.6% | 3.1% | 2.2% | 5.2% | 3.3% |
| share provided by ZBC | 2% | 12% | 9% | 12% | 2% | 3% | 2% | 0% | 3% | 1% | 1% | 0% | 2% | 1% |
| use of support (rank) | 12 | 13 | 11 | 14 | 2 | 10 | 7 | 6 | 8 | 9 | 3 | 4 | 1 | 5 |
| use of clinic, emergency unit, IC (rank) | 12 | 13 | 11 | 14 | 6 | 10 | 2 | 7 | 4 | 5 | 3 | 8 | 1 | 9 |
| use of diagnostics (rank) | 9 | 12 | 7 | 13 | 14 | 11 | 10 | 8 | 3 | 5 | 2 | 4 | 1 | 6 |
| use of facilities (rank) | 5 | 8 | 1 | 2 | 14 | 7 | 4 | 11 | 10 | 9 | 12 | 6 | 3 | 13 |
| Number of DTC care products in cluster | 55 | 53 | 65 | 48 | 74 | 62 | 107 | 66 | 60 | 95 | 61 | 40 | 97 | 53 |
| Volume in cluster (x 1,000) | 837 | 1,536 | 1,107 | 1,254 | 485 | 885 | 1,711 | 751 | 1,398 | 716 | 687 | 549 | 907 | 736 |
| Volume in cluster (share of total) | 5% | 10% | 7% | 8% | 3% | 5% | 11% | 5% | 9% | 4% | 4% | 3% | 6% | 5% |
| Turnover in cluster (x 1,000,000) | €338 | €432 | €1,275 | €330 | €395 | €834 | €1,676 | €371 | €1,134 | €525 | €735 | €379 | €1,396 | €465 |
| Turnover in cluster (share of total) | 2% | 3% | 9% | 2% | 3% | 6% | 11% | 2% | 8% | 4% | 5% | 3% | 9% | 3% |

Table 8: Clustering in 2013 leads to comparable clusters to those of 2014, importance of specialisms for cluster

| | ENT | ophthalmology | orthopedics | dermatology | pediatrics | obstetrics & gynecology | surgery | internal medicine | cardiology | neurology | pulmonary diseases | urology | internal medicine | none |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Ia** | **Ia** | **Ia** | **Ia** | **II** | **II** | **III** | **IVa** | **IVa** | **IVa** | **IVa** | **IVb** | **VI** | **VII** |
| ENT | 100% | 2% | 1% | 1% | 4% | 1% | 1% | 2% | 2% | 2% | 10% | 2% | 2% | 1% |
| ophthalmology | 2% | 100% | 1% | 2% | 0% | 1% | 1% | 3% | 3% | 2% | 2% | 2% | 4% | 2% |
| orthopedics | 2% | 2% | 72% | 2% | 1% | 1% | 5% | 3% | 4% | 5% | 3% | 3% | 4% | 3% |
| dermatology | 3% | 3% | 3% | 90% | 0% | 2% | 3% | 4% | 4% | 3% | 4% | 4% | 7% | 3% |
| pediatrics | 2% | 1% | 0% | 0% | 100% | 0% | 1% | 0% | 0% | 0% | 0% | 0% | 0% | 0% |
| obstetrics & gynecology | 1% | 1% | 1% | 1% | 1% | 98% | 1% | 2% | 1% | 2% | 1% | 2% | 2% | 1% |
| surgery | 5% | 4% | 5% | 7% | 4% | 4% | 85% | 10% | 8% | 10% | 8% | 8% | 31% | 8% |
| internal medicine | 3% | 4% | 2% | 4% | 0% | 3% | 7% | 90% | 9% | 8% | 10% | 8% | 77% | 8% |
| cardiology | 4% | 5% | 3% | 3% | 0% | 2% | 4% | 8% | 100% | 9% | 11% | 7% | 13% | 5% |
| neurology | 2% | 2% | 1% | 1% | 1% | 1% | 2% | 3% | 4% | 99% | 6% | 2% | 6% | 2% |
| pulmonary diseases | 2% | 1% | 1% | 1% | 0% | 1% | 1% | 3% | 5% | 3% | 82% | 2% | 6% | 2% |
| urology | 1% | 1% | 1% | 1% | 0% | 1% | 1% | 2% | 2% | 2% | 2% | 97% | 5% | 1% |
| geriatrics | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 1% | 1% | 1% | 11% | 0% |
| gastroenterology & hepatology | 2% | 2% | 1% | 2% | 0% | 2% | 4% | 4% | 4% | 3% | 4% | 4% | 12% | 49% |
| rheumatology | 0% | 0% | 1% | 0% | 0% | 0% | 0% | 1% | 1% | 1% | 1% | 0% | 1% | 35% |
| plastic surgery | 1% | 1% | 12% | 3% | 0% | 1% | 1% | 1% | 1% | 2% | 1% | 1% | 2% | 1% |
| rehabilitation | 0% | 0% | 3% | 0% | 0% | 0% | 1% | 1% | 1% | 2% | 1% | 1% | 3% | 1% |
| psychiatry | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 3% | 0% |
| radiotherapy | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 0% | 0% | 1% | 1% | 2% | 0% |
| neurosurgery | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 0% | 0% | 3% | 0% | 0% | 1% | 0% |
| cardiothoracic surgery | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 0% | 1% | 0% | 1% | 0% |
| allergology | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | 1% | 0% | 0% | 0% |

Table 8: Clustering in 2013 leads to comparable clusters to those of 2014, importance of support specialisms and facilities

| | ENT | ophthalmology | orthopedics | dermatology | pediatrics | obstetrics & gynecology | surgery | internal medicine | cardiology | neurology | pulmonary diseases | urology | internal medicine | none |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Type** | **Ia** | **Ia** | **Ia** | **Ia** | **II** | **II** | **III** | **IVa** | **IVa** | **IVa** | **IVa** | **IVb** | **VI** | **VII** |
| radiology | 53% | 47% | 89% | 42% | 54% | 33% | 87% | 67% | 67% | 86% | 88% | 65% | 91% | 65% |
| nuclear medicine | 6% | 5% | 6% | 6% | 17% | 3% | 10% | 12% | 13% | 7% | 12% | 8% | 19% | 7% |
| clinical chemist | 54% | 72% | 45% | 63% | 87% | 76% | 56% | 95% | 94% | 75% | 82% | 87% | 96% | 88% |
| medical microbiology | 34% | 26% | 14% | 26% | 46% | 43% | 21% | 25% | 23% | 24% | 34% | 41% | 61% | 30% |
| pathologist/anatomist | 18% | 15% | 15% | 56% | 19% | 43% | 22% | 19% | 13% | 13% | 22% | 35% | 34% | 38% |
| anesthesiology | 42% | 39% | 46% | 13% | 22% | 27% | 31% | 14% | 15% | 18% | 22% | 24% | 35% | 14% |
| clinical genetics | 4% | 2% | 2% | 2% | 17% | 2% | 5% | 2% | 2% | 3% | 1% | 1% | 2% | 1% |
| outpatient | 100% | 99% | 98% | 99% | 95% | 98% | 99% | 99% | 99% | 100% | 99% | 99% | 97% | 99% |
| clinic | 12% | 8% | 19% | 8% | 33% | 31% | 24% | 21% | 36% | 27% | 40% | 25% | 65% | 17% |
| emergency | 1% | 2% | 4% | 2% | 17% | 2% | 50% | 11% | 16% | 22% | 20% | 7% | 26% | 7% |
| day admission | 23% | 24% | 29% | 12% | 10% | 20% | 19% | 20% | 28% | 17% | 26% | 21% | 41% | 35% |
| IC | 1% | 0% | 1% | 0% | 1% | 1% | 2% | 1% | 1% | 1% | 2% | 1% | 3% | 1% |
| | | | | | | | | | | | | | | |
| diagnosis simple | 51% | 59% | 28% | 30% | 20% | 18% | 33% | 48% | 95% | 57% | 84% | 53% | 73% | 43% |
| diagnosis medium | 28% | 6% | 7% | 7% | 2% | 11% | 13% | 18% | 14% | 11% | 36% | 44% | 30% | 37% |
| diagnosis difficult | 2% | 2% | 13% | 2% | 1% | 5% | 3% | 4% | 14% | 3% | 8% | 3% | 7% | 3% |
| imaging simple | 24% | 22% | 69% | 24% | 27% | 75% | 64% | 56% | 72% | 46% | 69% | 66% | 82% | 54% |
| imaging medium/difficult | 21% | 8% | 30% | 9% | 4% | 7% | 20% | 27% | 24% | 46% | 38% | 18% | 46% | 19% |
| | | | | | | | | | | | | | | |
| treatment room simple | 5% | 8% | 9% | 32% | 1% | 11% | 14% | 6% | 6% | 8% | 6% | 5% | 11% | 6% |
| treatment room medium | 3% | 19% | 12% | 6% | 0% | 1% | 5% | 4% | 7% | 6% | 4% | 4% | 6% | 3% |
| treatment room difficult | 33% | 7% | 38% | 30% | 7% | 27% | 29% | 14% | 13% | 13% | 14% | 28% | 34% | 14% |

## 7.2 Annex B – Results for complexity of care on the basis of relative travel time

Figure 36: For 10% of the DTC care products (by volume) patients travel three times longer than to the nearest hospital

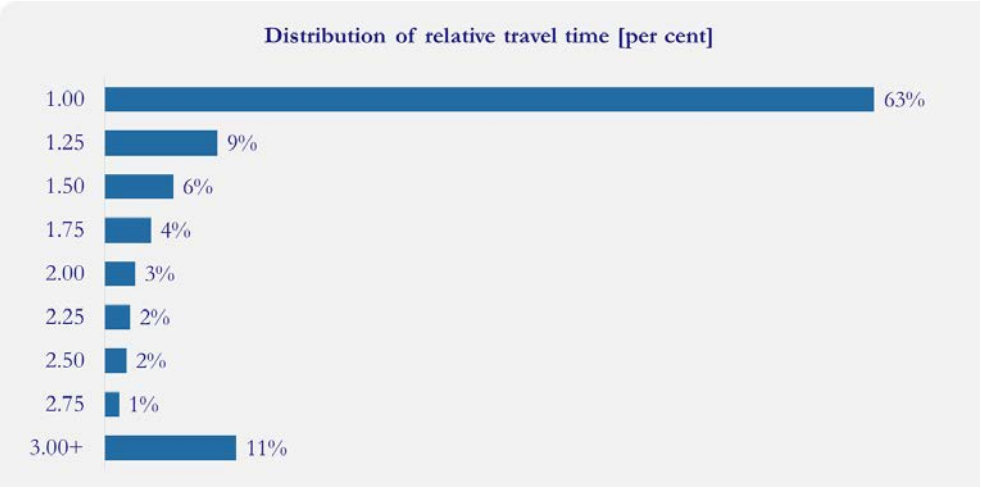
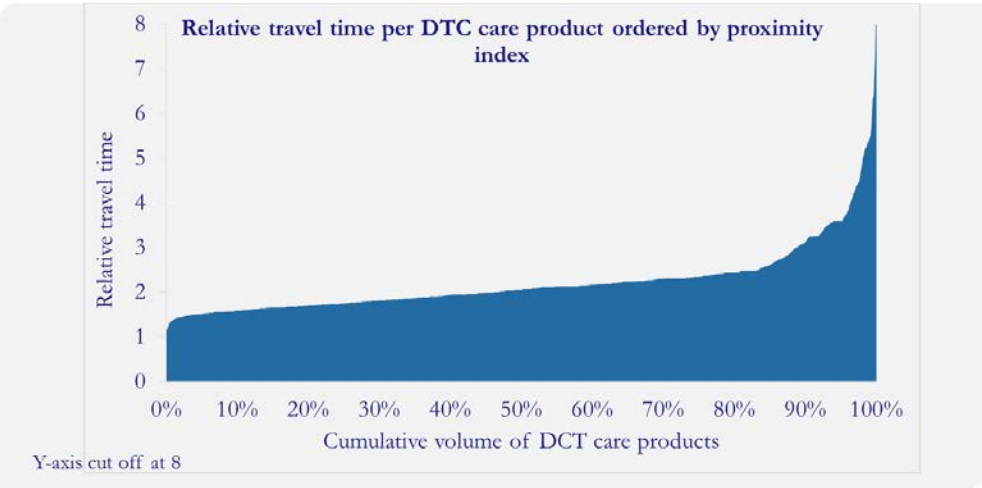



Figure 37: Relative travel time also rises on a linear basis for 83% of least complex care



## 7.3 Annex C – Participants in focus groups

Three focus groups were held. During these focus groups we discussed the analyses with the participants. In addition to the participants, the researchers and two ACM employees were present.

We have incorporated relevant comments and observations as much as possible. Participation in the focus groups was voluntary and on a personal basis. Participation in the focus group does not signify agreement to this report. The content was integrated entirely for the account of SiRM and Twynstra Gudde.

### 7.3.1 Health Insurers Focus Group (22 June 2016)

- Kees Birkhoff, de Friesland
- Cas Ceulen, VGZ
- Jan Kroes, Zorg en Zekerheid
- Daan Rooijmans, CZ

### 7.3.2 Hospital Managers Focus Group (7 July 2016)

- Chiel Huffmeijer, Haga Ziekenhuis
- Ruurd-Jan Roorda, Tergooi Ziekenhuizen
- Jan Harm Zwaveling, Máxima Medisch Centrum

### 7.3.3 Medical Practitioners Focus Group (20 July 2016)

The medical practitioners focus group comprised members of the Professional Interests Board who participated in a personal capacity:

- Goedele Beckers, urologist
- Saskia de Mare, dermatologist
- Marlon Scheuer, anesthesiologist

In addition Iris Sengers, policy assistant for the of the Federation Medisch Specialisten was present.

## 7.4 Annex D – Method

### 7.4.1 DTC care products

#### Health-care Market Regulation Act

According to the Health-care Market Regulation Act (Wmg) the 'product market' for healthcare consists of the services determined by the NZa which care providers can claim from health insurers under certain conditions. For curative care the services are set down in the DTC care products (also known as DTCs of DTC care products).

Health insurers and care providers negotiate on price, volume and quality of care. The final payment takes place at the level of DTC care products. For competition analysis the level of DTC care products is therefore also relevant.

#### Definition of DTC care products

A DTC care product is a care service. Care services describe the care which care providers provide for a specific care requirement. The care provider can then claim for these care services from the health insurer or the patient. The DTC system was introduced in the Netherlands to promote efficiency and allow more market forces. DTC care products and other care services form the basis of the funding of care. Care providers and care purchasers can negotiate with DTC care products on the quality, price and number of treatments.

When a patient presents to the medical specialist with a care requirement, a care program is opened in the DTC records. The care program records all care activities (procedures) which have been carried out for patients in the framework of diagnosis and treatment. The care program is identified by means of the care program number.

During the treatment process it is possible to claim for the supplied care at certain times - which are described in the registration rules. The period of a care program for which the supplied care has been claimed is known as a subprogram. In a care procedure it is therefore possible to distinguish one or more (serial) subprograms[68].

This claim is also known by the name of 'DTC care product'. A DTC care product is 'derived' on the basis of the procedures. Care providers offer procedures based on an algorithm (also known as a 'grouper') which determines on the basis of questions such as "is procedure X part of the subprogram? Yes/No" whether a care product can be claimed. For care providers it is therefore important to ensure that procedures that determine the progress of the derivation are recorded correctly.

[68]The three paragraphs above are taken from http://www.werkenmetdbcs.nza.nlJuly 2016

### 7.4.2 Data used for investigation

In the quantitative analysis we use multiple data sources to have visibility on the complexity and interrelatedness of care:

- The main source is the national DTC information system (DIS). The NZa receives and manages all data on concluded DTC programs in the hospital care. These are data from the basic records of hospitals on the supplied and claimed care. DIS ensures secure management of the data and the statutory supply of data to public end-users.[69]
- The Geodan® travel time matrix describes the travel time by car from every four-figure postcode in the Netherlands to every other four-figure postcode.
- The RIVM Care Atlas describes the location of all general and academic hospitals and outpatient clinics in the Netherlands. We have linked this list to the DIS using the AGB code list from Vektis.
- For category-based hospitals and other institutions we have used information from the NZa hospital list where available. If possible, institutions have been added manually on the basis of the information on the hospital's website.

#### Selection – Period and DTC care products

For this investigation a selection has been made of the subprograms opened in 2014 from DIS. These in principle concern only the DTC care products, but for some analyses (e.g. interrelatedness) OCPs have also been analyzed.

Not all DTC care products are evaluated. The following exclusion criteria apply:

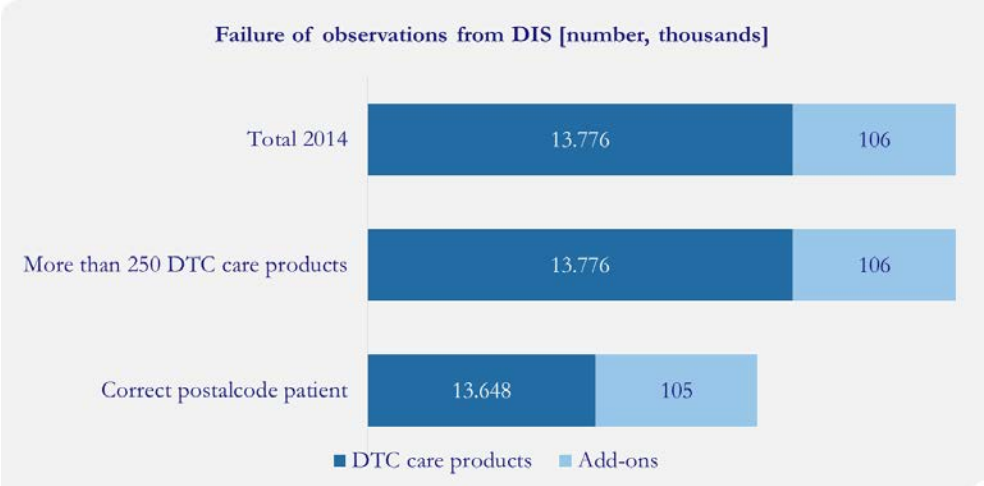
- The DTC care product must be included in the DIS. This excludes non-reimbursed claims. These are DTC care products which fall outside the basic insurance or for which no medical indication exists.
- Other care products (OCPs) apart from DTC add-ons have been excluded. These care products include procedures on behalf of other care providers (primary diagnostics, paramedical treatment and investigation, other procedures) and probably do not determine the patient's choice of hospital. This mainly does concerns non-complex care. While DTC add-ons (expensive and orphan medicines, IC admissions and administration of coagulation factor) probably do describe complex care.

[69] http://www.dbcinformatiesysteem.nl

## Selection – Data cleaning

Of the total dataset of selected DTC care products, 99% has been included in the quantitative analysis. We have disregarded DTC care products claimed in institutions (AGB codes) with a total of fewer than 250 claims. These institutions with few claimed DTC care products may have a high impact in the analysis as a nearby hospital (see section 0), but not as a providing hospital. That is because they can increase the proximity index for all care in the nearby hospitals, while their volume is too small to have an impact. In addition, patients with an incorrect postcode have not been included in the analysis. A postcode may be incorrect if it is missing, does not exist or belongs to a PO box number. In addition, the postcode 9999 has been excluded in the municipality of Eemsmond, because the number of claims at this postcode was disproportionately high for the number of residents. It is known that this postcode is sometimes used if no postcode is known for a patient. Fewer than 1% of the DTC care products are excluded for these reason (see figure 38).

Figure 38: A small proportion of all DTC care products falls outside the analyses



### 7.4.3 Complexity

#### Proximity index & relative travel time

- For each DTC care product the patient's travel time for the supplied care is determined. The travel time is based on the postcode of the address of the patient and of the hospital. The number of minutes travelled between these postcodes is determined using the Geodan® travel time table[70].

- In addition we determine the travel time to every other general and academic hospital. We also determine the travel time to all other care institutions, as long as they themselves actually provide this DTC care product for which the patient has travelled.

- On the basis of all calculated travel times we produce a ranking, starting at zero for the nearest hospital, of the proximity of all institutions. The rank for the providing institution is the proximity index for the DTC care product consumed by the patient.

- For the relative travel time we use the travel time for the providing hospital and the hospital with the zero ranking, i.e. the nearest hospital. The gap between these travel times is the relative travel time of the DTC care product consumed by the patient.

#### Information for each DTC care product

- For each DTC care product we record the number of times that it has been opened in 2014. This is the volume of the DTC care product.

- For each DTC care product we link the average selling price on the basis of OpenDis data. For DTC care products for which no OpenDIS data are available, we use the average of the claimed selling price from the DIS as the average selling price. The volume times the average selling price is the turnover of the DTC care product.

- For both the complexity index and the relative travel time we determine the average across all patients who have consumed a specific DTC care product. Patients who have consumed the same DTC care product several times also count several times in the calculation of this average.

[70]The use of this table is based on the assumption that all patients visit the hospital by car. If many patients travel to the hospital by public transport, that will lead to an overestimate of the complexity of care provided in urban hospitals close to railway stations and other public transport services.

- For each DTC care product we calculate the share of turnover by type of institution that supplies the DTC care product. The institution types are based on the AGB code in accordance with the COD016-VEKT list from Vektis. STZ hospitals have been manually designated and classified the top and basic STZ. See section 0 for details.

Definitions of complexity

- We classify DTC care products belonging to the 17% of DTC care products (by volume) with the highest average proximity index, which also belong to the 17% of DTC care products (by volume) with the highest average relative travel time, as homogeneously complex.

- Similarly, we classify the DTC care products belonging to the 50% of lowest DTC care products on average (by volume), which also belong to the 50% of DTC care products (by volume) with the lowest average relative travel time, as homogeneously non-complex.

- We define the remaining DTC care products as heterogeneously complex.

### 7.4.4 Interrelatedness

Descriptive connections

- We assess the connection on the basis of all care activities which a patient undergoes in all care programs for which a subprogram was opened in 2014.

- For support of primary specialisms we include only care activities that fall within the care profile categories 2, 3, 5, 6, 14, 15, 18, 19, 20, 21 and 22.

- In order to determine whether there is collaboration between specialisms in the care of a patient or whether there is interrelatedness, we record for each patient whether care is provided by one or both specialisms.

- For support specialisms all activities from all care profile categories have been included. We have also examined whether the support specialisms have carried out another care product (e.g. a laboratory analysis.

- The use of facilities has been ascertained in accordance with the following rules:

    - Outpatient: at least one care activity in care category 1 ("outpatient and first aid visit")

- Day admission: at least one care activity in care profile category 2 ("day nursing")
- Clinic: at least one care activity in care profile category 3 ("clinic")
- Emergency unit: care activity "Emergency care contact in the emergency care department" (care activity code: 190015). Note that the care activity "Emergency care contact outside the emergency department, elsewhere in the hospital" (care activity code: 190016) has not been included. That is because this support from the emergency unit is provided outside the emergency unit in another department.
- IC care has been analyzed on the basis of add-ons recorded as separate subprograms of care type 51 ("Program of internal support or IC within existing care program") or 52 ("IC Outside an existing care program"). This subprogram does not form part of the care program which leads to the IC admission. The IC subprograms are recorded by hospitals in their own care program. We therefore link an IC program ourselves to another care program. We do this if the start date of the IC admission is between the start and end dates of another care program of the patient within the same hospital.
- In imaging diagnostics a distinction has been drawn between care activities requiring advanced equipment and the use of an antiseptic room:
    - Simple**:** care activity in ZPK 7 does not take place in an antiseptic room and no advanced equipment is used.
    - Medium and heavy: care activity in ZPK 7 takes place in an antiseptic room or advanced equipment is required.
- For the diagnostic activities the classification is based on how specialized the room is in which the care activity has to take place.
    - Simple**:** diagnostic care activities (ZPK 4) are not tied to a specially equipped environment.
    - Medium**:** diagnostic care activities (ZPK 4) require the use of sterile tools or involve an endoscopy.
    - Difficult**:** diagnostic care activities (ZPK 4) for which a special radiological intervention room or operating room is required.

- Operative procedures are also scored on the basis of the amount of space required:
  - Simple**:** care activities (ZPK 7) take place in the treatment room.
  - Medium**:** care activities (ZPK 7) in a suitably equipped treatment room or outpatient operating room (OOR), as in the case of radiology and cardiology.
  - Difficult: care activity (ZPK 4) requires an operating room.

- We translate this classification back to the level of the DTC care product. All activities recorded for a patient are linked to all DTC care products claimed by the patient.

- For each DTC care product the average of all claimed DTC care products is calculated. This is the input for both the descriptive tables concerning interrelatedness and the clustering.

- Each DTC care product has been classified in a 'dominant specialism' that is the primary specialism that on average is most often involved in the care (all care activities) of all patients for whom the DTC care product has been claimed. DTC care products which involve no primary specialisms have not been classified in a 'dominant specialism'.

### 7.4.5 Clustering

- In the cluster analysis DTC care products are grouped by means of an algorithm into clusters based on the described characteristics. The number of characteristics corresponds to the number of dimensions in which the clusters are positioned. In the cluster analysis the differences and similarities in these characteristics between the objects play a decisive role in the classification. The algorithm looks for internal homogeneity within the clusters and the greatest possible differences between the clusters.

- We make a number of selections for the clustering of care products:
  - Only care from categories A* and B* are included in the clustering

- Care products with a volume smaller than 1,500 are excluded due to a possibly disproportionate impact of low-volume DTC care products. Theoretically the interrelatedness between a specialism and a facility with a DTC care product claimed once would weigh more heavily than on the basis of a DTC care product claimed a hundred thousand times where a specialism and a facility occurred together ninety thousand times. The likelihood of a chance connection in the first DTC care product is, however, higher than in the second DTC care product.

- In the measurement of interrelatedness a correction has been made for substitution. That means if primary specialism A or B provides the care product, only the interrelatedness with the specialism most involved in the care product will be included. The clustering could otherwise show that specialisms A and B are necessary for the provision of the product, whereas either is sufficient. The degree of substitution is described in section 5.5.1.

- The interrelatedness between specialisms and facilities has been determined on the basis of all care activities which a patient undergoes in a year in a single institution. The interrelatedness will in reality be smaller, because not all care used by a patient is by definition interrelated. The actual interrelatedness between specialisms and facilities will, however, be decisive in the clustering.

- The emergency unit is an exception to the way in which the interrelatedness is measured. This is not determined in the clustering on the basis of all care activities per person within an institution, but for each individual care program. Emergency care mainly takes place at the start of a care program. The care provided after the acute phase can in principle also be provided at another location, but is in any case no longer dependent on the presence of an emergency facility in the hospital.

- The cluster algorithm can be specified in different ways. The following choices have been made:

    - *The clustered variables.* For each DTC care product all variables for which the interrelatedness has been measured – importance of primary specialisms, support specialisms and facilities – as described in the previous section have been recorded. In the first instance the clustering has only been carried out on the connections between primary specialisms. The clustering has then been carried out on the basis of all variables. The differences have been discussed in the report.

- *Choice of similarity measure:* This is the way in which the distance between the objects to be clustered is determined. The most used methods of distance measurement are: Euclidean, quadratic Euclidean, Manhattan, Chebychev and Mahalanobis distances. The algorithm has been carried out in all cases on the basis of Euclidean, quadratic Euclidean and Chebychev distances.
- We use hierarchical cluster algorithms with *different connection rules*. Hierarchical algorithms operate in accordance with a tree structure. They begin with all observations as their own cluster. Clusters are then merged on the basis of different connection rules between the clusters. A distinction is drawn between: single linkage, complete linkage, average linkage, centroid method and Ward's method. In the clustering carried out all five of these connection rules have been included in all cases.

- The cluster analysis is an exploratory statistical technique and always generates a result. This makes a conceptual choice of building blocks and a good assessment of the results extremely important. The above choices (variables, similarity measure and connection rules) lead to many different results. In addition, each of these choices also includes the choice of the number of clusters. For example a cluster analysis on the basis of all variables, with Euclidean distances and a Ward connection rule, has results for two, three, four, five, etc. clusters. We therefore a choose the most suitable number of clusters for each method. We do this on the basis of the Calinski & Harabasz and Duda & Hart methods. The most suitable number of clusters according to each of these two methods has been assessed on the basis of the interpretability of the produced clusters.
  - Clusterings with more than 25 clusters have been disregarded.
  - Clusterings with clusters in which fewer than 1% of the volume of care occurs have been disregarded.
  - Of the remaining clusterings an assessment has been made on the basis of:
    - The size of the clusters. Two clusters with approximately 50% of the care, for example, provide little insight.
    - The cluster's logical connection in terms of care content. A cluster in which, for example, geriatrics and pediatrics are important jointly would be difficult to interpret.

- The clustering described in the report with 15 clusters is based on a connection of the interrelatedness of all specialisms and facilities using Ward's linkage with the aid of Minkowski distances.
- The four additional clusters following from the reclustering of the residual cluster are based on a Ward's linkage using quadratic Euclidean distances.

## 7.5 Annex E – Summary tables of interrelatedness weighted by volume

Table 9: Share of DTC care products per dominant primary specialism (row) that is substituted for another primary specialism (column) [per cent of volume of DTC care products for dominant specialism]

| | ophthalmology | ear, nose and throat surgery | surgery | plastic surgery | orthopedics | urology | obstetrics & gynecology | neurosurgery | dermatology | internal medicine | pediatrics | gastroenterology & hepatology | cardiology | pulmonary diseases | rheumatology | allergology | rehabilitation | cardiothoracic surgery | psychiatry | neurology | geriatrics | radiotherapy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ophthalmology | | | | | | | | | | | | | | | | | | | | | | |
| ear, nose and throat surgery | | | | | | | | | | | | | | | | | | | | | | |
| surgery | | | | | 8% | | | | 4% | 2% | | | | | | | | | | | | |
| plastic surgery | | | | | | | | | | | | | | | | | | | | | | |
| orthopedics | | | 5% | | | 3% | | | | | | | | | | | | | | | | |
| urology | | | | | | | | | | 3% | | | | | | | | | | | | |
| obstetrics & gynecology | | | 4% | | | | | | | 5% | | 3% | 6% | | | | | | | | | |
| neurosurgery | | | 7% | | 9% | | | | | | | | | | | | | | | | | |
| dermatology | | | 5% | | | | | | | | | | | | | | | | | | | |
| internal medicine | | | 3% | | | | | | | | | | | | | | | | | | | |
| pediatrics | | | | | | | | | | | | | | | | | | | | | | |
| gastroenterology & hepatology | | | 8% | | | | | | | 19% | | | | | | | | | | | | |
| cardiology | | | | | | | | | | | | | | | | | | | | | | |
| pulmonary diseases | | 3% | | | | | | | | 3% | | | | | | | | | | | | |
| rheumatology | | | | | | | | | | 8% | | | | | | | | | | | | |
| allergology | | | | | | | | | | | | | | | | | | | | | | |
| rehabilitation | | | | | | | | | | | | | | | | | | | | | | |
| cardiothoracic surgery | | | | | | | | | | | | | | | | | | | | | | |
| psychiatry | | | | | | | | | | | | | | | | | | | | | | |
| neurology | | | | | | | | | | | | | | | | | | | | | | |
| geriatrics | | | | | | | | | | 5% | | | | | | | | | | | | |
| radiotherapy | | | | | | | | | | | | | | | | | | | | | | |

Table 10: Share of DTC care products per dominant primary specialism (row) in which another primary specialism is involved (column) [per cent of volume of DTC care products for dominant specialism]

| | ophthalmology | ear, nose and throat surgery | surgery | plastic surgery | orthopedics | urology | obstetrics & gynecology | neurosurgery | dermatology | internal medicine | pediatrics | gastroenterology & hepatology | cardiology | pulmonary diseases | rheumatology | allergology | rehabilitation | cardiothoracic surgery | psychiatry | neurology | geriatrics | radiotherapy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ophthalmology | 100% | | 4% | | 2% | | | | 3% | 4% | | | 4% | | | | | | | | | |
| ear, nose and throat surgery | | 94% | 4% | | | | | | 2% | 3% | | | 3% | 3% | | | | | | 2% | | |
| surgery | | | 82% | | 4% | | | | 3% | 8% | | 4% | 4% | | | | | | | 2% | | |
| plastic surgery | | | 8% | 100% | 3% | | | | 7% | 4% | | | 2% | | | | 3% | | | | | |
| orthopedics | | | 4% | | 80% | | | | 2% | 2% | | | 3% | | | | | | | | | |
| urology | 2% | | 8% | | 3% | 94% | | | 4% | 9% | | 4% | 6% | 2% | | | | | | 2% | | |
| obstetrics & gynecology | | | 3% | | | | 81% | | | 3% | | | | | | | | | | | | |
| neurosurgery | | | 4% | | 4% | | | 83% | | 4% | | | 2% | | | | 4% | | | 12% | | |
| dermatology | | | 6% | 3% | 2% | | | | 93% | 4% | | | 3% | | | | | | | | | |
| internal medicine | 3% | | 20% | | 3% | 4% | | | 5% | 94% | | 7% | 10% | 4% | | | 2% | | | 4% | | 3% |
| pediatrics | | 4% | 4% | | | | | | | | 100% | | | | | | | | | | | |
| gastroenterology & hepatology | | | 12% | | | | | | 3% | 11% | | 76% | 5% | 2% | | | | | | | | |
| cardiology | 3% | | 8% | | 3% | 2% | | | 4% | 9% | | 4% | 100% | 5% | | | | 2% | | 4% | | |
| pulmonary diseases | 2% | 3% | 9% | | 3% | 2% | | | 3% | 11% | | 4% | 12% | 93% | | | | | | 4% | | 2% |
| rheumatology | | | 5% | | 4% | | | | 4% | 5% | | 3% | 5% | 2% | 92% | | | | | | | |
| allergology | | | 2% | | | | | | | 3% | | | | | | 100% | | | | | | |
| rehabilitation | | | 6% | 2% | 3% | | | | | 4% | | | 3% | | | | 100% | | | 7% | | |
| cardiothoracic surgery | | | 5% | | | | | | | 12% | | | 41% | 6% | | | 5% | 100% | | | | 2% |
| psychiatry | | 3% | 25% | | 6% | 5% | 6% | 2% | 3% | 38% | | 11% | 14% | 10% | | | 6% | 2% | 100% | 11% | | 2% |
| neurology | 2% | | 9% | 2% | 4% | | | 3% | 3% | 8% | | 3% | 8% | 3% | | | 3% | | | 97% | | |
| geriatrics | 4% | | 21% | | 9% | 5% | | | 5% | 17% | | 6% | 15% | 6% | | | 2% | | | 8% | 95% | |
| radiotherapy | | 4% | 9% | | | 3% | 2% | | 2% | 18% | | 4% | | 5% | | | | | | 3% | | 100% |

Table 13: Connection between primary and support specialisms [share of volume for patients with procedure by support specialism]

| | support specialism | | | | | | |
|---|---|---|---|---|---|---|---|
| primary specialism | Cl. Chem. | Microbiol. | Pathol. | Radiology | Nucl. med. | Clin. med. | Anesth. |
| allergology | 99% | 43% | 7% | 20% | 3% | 2% | 6% |
| cardiothoracic surgery | 90% | 56% | 27% | 97% | 15% | 8% | 64% |
| cardiology | 94% | 24% | 13% | 68% | 13% | 2% | 17% |
| surgery | 53% | 21% | 26% | 83% | 10% | 4% | 34% |
| dermatology | 61% | 26% | 54% | 37% | 6% | 2% | 12% |
| geriatrics | 94% | 40% | 18% | 88% | 9% | 2% | 25% |
| internal medicine | 97% | 46% | 29% | 80% | 19% | 2% | 26% |
| pediatrics | 87% | 46% | 22% | 56% | 19% | 20% | 25% |
| ENT | 54% | 29% | 16% | 52% | 6% | 4% | 43% |
| pulmonary diseases | 86% | 38% | 25% | 88% | 14% | 2% | 19% |
| gastroenterology & hepatology | 82% | 32% | 54% | 62% | 7% | 2% | 20% |
| neurosurgery | 50% | 18% | 14% | 86% | 5% | 2% | 59% |
| neurology | 73% | 23% | 13% | 84% | 7% | 3% | 19% |
| obstetrics & gynecology | 77% | 44% | 37% | 38% | 6% | 5% | 39% |
| ophthalmology | 72% | 23% | 15% | 39% | 5% | 3% | 39% |
| orthopedics | 39% | 13% | 10% | 94% | 7% | 2% | 41% |
| plastic surgery | 37% | 12% | 33% | 61% | 5% | 3% | 53% |
| psychiatry | 99% | 48% | 24% | 73% | 10% | 4% | 36% |
| radiotherapy | 77% | 17% | 33% | 76% | 24% | 2% | 24% |
| rheumatology | 94% | 27% | 12% | 75% | 6% | 1% | 10% |
| rehabilitation | 43% | 18% | 12% | 94% | 9% | 4% | 19% |
| urology | 84% | 41% | 35% | 65% | 9% | 1% | 30% |
| volume weighted average | **72%** | **29%** | **25%** | **66%** | **9%** | **3%** | **29%** |

Table 1411: Connections between primary specialisms with facilities [share of volume for patients with a procedure in which facility was used]

| primary specialism | facility | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Diagn. Low | Diagn. Medium | Diagn. Difficult | Image low | Image high | Room - Treat. | Room - OOR | Room - OR | IC |
| allergology | 73% | 4% | 1% | 12% | 5% | 2% | 1% | 4% | 0% |
| cardiothoracic surgery | 64% | 16% | 27% | 64% | 24% | 3% | 11% | 45% | 29% |
| cardiology | 93% | 13% | 16% | 71% | 24% | 5% | 8% | 13% | 2% |
| surgery | 33% | 14% | 4% | 63% | 22% | 13% | 6% | 33% | 2% |
| dermatology | 27% | 7% | 1% | 23% | 9% | 31% | 5% | 25% | 0% |
| geriatrics | 94% | 19% | 5% | 73% | 32% | 8% | 6% | 26% | 3% |
| internal medicine | 57% | 26% | 5% | 70% | 41% | 8% | 4% | 25% | 2% |
| pediatrics | 23% | 3% | 1% | 32% | 6% | 1% | 0% | 7% | 1% |
| ENT | 54% | 30% | 2% | 24% | 21% | 4% | 3% | 31% | 1% |
| pulmonary diseases | 80% | 34% | 9% | 72% | 43% | 5% | 4% | 15% | 3% |
| gastroenterology & hepatology | 50% | 51% | 3% | 50% | 22% | 8% | 3% | 19% | 2% |
| neurosurgery | 43% | 9% | 5% | 52% | 49% | 21% | 9% | 48% | 5% |
| neurology | 58% | 13% | 4% | 43% | 45% | 7% | 5% | 13% | 2% |
| obstetrics & gynecology | 26% | 12% | 5% | 71% | 10% | 10% | 2% | 26% | 1% |
| ophthalmology | 61% | 6% | 1% | 21% | 8% | 9% | 22% | 7% | 0% |
| orthopedics | 26% | 7% | 11% | 74% | 33% | 5% | 10% | 31% | 1% |
| plastic surgery | 24% | 7% | 2% | 35% | 11% | 23% | 3% | 55% | 1% |
| psychiatry | 69% | 27% | 11% | 73% | 35% | 12% | 5% | 31% | 6% |
| radiotherapy | 24% | 22% | 3% | 33% | 36% | 5% | 2% | 17% | 1% |
| rheumatology | 32% | 15% | 3% | 66% | 20% | 5% | 3% | 10% | 0% |
| rehabilitation | 20% | 6% | 2% | 26% | 13% | 4% | 2% | 9% | 0% |
| urology | 50% | 44% | 3% | 66% | 20% | 5% | 4% | 35% | 1% |
| volume weighted average | 48% | 17% | 5% | 53% | 23% | 10% | 7% | 23% | 1% |