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Financial incentives as a tool to a more sustainable healthcare system in the Netherlands

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Author: Eline Kikkert
Supervisors UT: dr. Michelle Kip & dr. Kris Lulofs
Supervisor Menzis: dr. Arthur Hayen

menzis

UNIVERSITY OF TWENTE.

Author
E.N. Kikkert
S1897683

Supervisor UT
Dr. M.M.A. Kip
Dr. K.R.D Lulofs

Supervisor Menzis
Dr. A.P. Hayen

Educational Program
MSc Health Sciences
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Educational Institute
University of Twente
Faculty of Science and Technology
Drienerlolaan 5
7522 NB Enschede
053 489 9111

Graduation organisation
Coöperation Menzis
Analysis team
Lawickse Alee 130
6709 DZ Wageningen
088 222 4040

Abstract

Eline Kikkert
Financial incentives as a tool to a more sustainable healthcare system in the Netherlands

Background
The healthcare sector accounts for 7% of the CO2 footprint in the Netherlands. Aligning payment models from healthcare insurers with the sustainability goals of the hospitals presents a promising approach to creating a more sustainable healthcare system. This study explores the possibility of using current payment models in promoting sustainability in the Dutch healthcare sector.

Objective
Using a case study approach, this research examines how financial incentives can be integrated into contracts with hospitals to encourage sustainability initiatives, focusing on circularity and reducing primary resource utilization.

Methods
Data collection involved surveys, interviews and a focus group. Thematic analysis was employed to analyse the responses from the survey, the interview data and the data from the focusgroup. The analysis of the data captures the complexity and nuances of participants' experiences.

Results
Sixteen survey responses were obtained from ten participating hospitals, along with interviews involving eighteen participants from these hospitals. The focus group included twelve participants from diverse sectors. Key discussion topics included organization sustainability, sustainability budgets, initiatives, awareness, relationships and contracts with healthcare insurers, finances, savings, collaboration, complexities and opportunities.

Findings
Current financial incentives provided by healthcare insurers and internal hospital funding do not effectively promote sustainability. Enhancing sustainability requires raising awareness, promoting behavioural change, fostering equal-level communication, providing rewards and allow hospital departments to maintain departmental savings. Payment-for-performance or shared savings models are possible suitable incentives for stimulating sustainability in hospitals.

Conclusions
Current circumstances do not favour the integration of sustainability within existing hospital payment models. The focus should be placed on incentivizing hospitals while keeping the base payment unchanged, thereby establishing a solid – risk minimized - foundation for promoting sustainability initiatives. Financial incentives should be incorporated into contracts with healthcare providers, utilizing models such as payment-for-performance or shared savings. Further research is needed to deepen our understanding of sustainability in the healthcare sector and facilitate the implementation of these payment models.

Keywords: sustainable healthcare - payment models - financial incentives – circularity – primary resource use

Acknowledgement

From the moment that I had heard of the available spot at Menzis I was determined to conduct this research. I succeeded and I am still very grateful for the opportunity I got from Menzis and the University of Twente. For five months, I had the pleasure to write my master's thesis there and be part of the team of data-analists.
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Contents

Abbreviations

AIOS	Trainee doctor (Arts in opleiding tot specialist)
DBC	Diagnosis-treatment combination
DRG	Diagnosis related group
EE-IOA	Environmentally Extended Input-Output Analysis
EIQ	Environmental Impact Quotient
FFS	Fee-For-Service
GDDZ	Green Deal Duurzame Zorg 3.0
HCW	Healthcare Waste
LCA	Life Cycle Analysis
MFA	Material Flow Analysis
MPZ	Milieu Platform Zorg
MsZ	Specialist Medical Care
NZa	Dutch Healthcare Authority (Nederlandse Zorgautoriteit)
OR	Operation Room
P4P	Pay-for-Performance
UN	United Nations
VBHC	Value based healthcare
VWS	Ministry of Health, Welfare and Sport
ZN	Zorgverzekeraars Nederland

Introduction

The healthcare sector is responsible for 7% of the consumption footprint in terms of the CO2 emission equivalent in the Netherlands. Next to that the healthcare sector accounts for 4% of the waste in the Netherlands and 13% of raw material use (1).
The healthcare sector aims to heal people and improve the quality of life for every individual person. Therefore, the paradox exists that the negative environmental impact of the healthcare sector actually contributes to making people sick and reducing their quality of life. For this paradox to be reduced a long-term transformation in healthcare in the form of sustainable healthcare is required. Sustainable healthcare is defined as healthcare with the lowest possible impact on climate, environment and living environment, in compliance with laws and regulations (2).

In order to make a transition in the healthcare sector the Green Deal Duurzame Zorg 3.0 (GDDZ) has been signed in September 2022 by multiple parties in the Dutch healthcare sector, among which are healthcare insurers and hospitals (2).
The GDDZ is an agreement between the government and the aforementioned parties. The GDDZ aims to set as concrete, quantifiable and time-bounded (intermediate) goals as possible at sector level, so that an irreversible transformation in healthcare is achieved with minimal impact on climate and environment by 2050. The parties who have signed the GDDZ are expected to work on its articulated goals, in the period 2023 to 2026.
One of the goals of the GDDZ is to work towards the most circular healthcare system possible and reduce the consumption of primary raw materials by half and to have 25% less unsorted residual waste by 2026 compared to 2018 (3). The environment and human health can both benefit from the decrease of primary resources used in healthcare. As an illustration, cutting back on energy use can assist to lower greenhouse gas emissions and lessen the consequences of climate change. Similarly, limiting the use of specific pharmaceuticals and medical devices can aid in minimising waste production and lowering the danger of environmental pollution.

Zorgverzekeraars Nederland (ZN), sector organisation for healthcare insurers in the Netherlands, guides the policy development of healthcare insurers with regard to making the healthcare sector more sustainable (4). ZN represents the healthcare insurers in the Netherlands and contributes to driving sustainability initiatives. Healthcare insurers work with organisations within the healthcare sector to identify a top three list of impactful sustainability initiatives, including associated measures and targets, for the whole healthcare sector by 2026. The outcome will be bundled into the integral implementation plan (5).

Healthcare insurers have a contract with care providers (such as hospitals) on behalf of their insured. The associated negotiations take place on the healthcare purchasing market (6). Part of the negotiations are about the payment models that will govern the exchange. With their payment models healthcare insurers can incentivize certain behaviours in healthcare providers. The financial incentives that follow from these payment models, are best understood as monetary cues such as financial rewards or penalties (7). Payment models have been used in the past to lower healthcare cost growth and encourage certain dimensions of quality. In light of this perspective, adapting payment models with the aim to incentivize the adoption of sustainable practices by healthcare providers could be a promising route to fulfil the aims set forward by the GDDZ. For example, at first glance, payment models that stimulate volume (such as receiving a fee-for-service) might be at odds with stimulating providers to lower primary resource use.

Within Menzis, there is a need to further investigate whether and how payment models should be adapted to foster sustainability.
We hypothesize that payment models can be designed such that they incentivize sustainability, since they have shown promising in stimulating desired behaviours in other domains.
In this thesis, we focus on two subdomains of sustainability: circularity and the use of primary raw materials.

Climate change is a global concern that impacts the entire world. If we look at the overall climate impact of healthcare, the use of primary raw materials and circularity are significant contributors to the current

situation in the Netherlands (1). In addition, the healthcare sector is a resource-intensive industry, and inefficient resource management can result in substantial financial burden. By adopting sustainable practices, including circularity and reducing primary resource use, healthcare organisations can fulfil their social responsibility by minimizing their negative impact on the environment and contributing to a healthier and more sustainable society. The focus of this master thesis therefore concerns two related subdomains of sustainability: the maximization of circularity and (thereby) the reduction of the consumption of primary raw materials within healthcare, which aligns with goal four of the GDDZ.

The following research question has been formulated:
How can financial incentives be included in contracts with healthcare providers in the hospital sector to encourage more circularity and thereby decrease the use of primary resource in healthcare?

The following sub-questions have been defined:

- What financial incentives follow from (current) payment models for healthcare providers?
- What are the current initiatives in the hospital sector which have already been implemented regarding the reduction of primary resources use and increasing circularity in healthcare?
- Do current financial incentives stimulate the development and uptake of these initiatives, if not what are the underlying causes?
- What payment model is best suited to stimulate sustainability in healthcare?

This case study will provide a deeper understanding of how financial incentives can be used to promote circularity and (thereby) reduce primary resource use in the Dutch healthcare system. The use of semi-structured interviews and a survey as a method of data collection and constant comparative analysis as a method of data analysis will allow for a rigorous and comprehensive exploration of the research question. A focusgroup will be organised to validate the data obtained from the survey and interviews. The findings of this study may inform policy and practice in the hospital sector (hospitals and healthcare insurers), thereby contributing to more sustainable and efficient use of resources in healthcare.

The theoretical framework will describe the theoretical concepts and relevant literature on health economics and sustainability within healthcare to support this thesis study. This will answer the first sub-question. In the chapter after the methodology will be explained followed by the results, discussion and conclusion. The results section will give answer to the second sub question. The last chapter will give answer to the last two sub questions and will give answer to the overall research question. In the last chapter, also the strengths and limitations of the study together with recommendations for relevant parties in the future and for further research are given.

Theoretical framework

This theoretical framework discusses payment models within the Dutch healthcare system and how they can potentially stimulate sustainability. Furthermore, the framework incorporates an in-depth exploration of relevant theoretical frameworks concerning sustainability in the healthcare sector. This theoretical framework will be employed to examine the applicability of the current payment models within the present context of sustainability in Dutch hospitals.

Payment

An essential aspect entails assessing whether current payment models can effectively incentivize sustainability initiatives within hospital settings, drawing on relevant theoretical frameworks.

We illustrate the workings of the different payment models discussed in this framework, by means of the following fictional sustainability initiative: hospital A is planning on increasing the length of its consultations, the result of which will be that patients can be examined more thoroughly and end up needing fewer follow-up examinations (such as endoscopy). The healthcare insurer now needs to find a payment model that stimulates the implementation of this initiative.

Zorgverzekeraars Nederland and Menzis

ZN represents the healthcare insurers in the Netherlands. They describe their goal as follows: '*The association aims to support healthcare insurers in their mission: to achieve good, affordable and accessible care for all insured, aimed at promoting health and quality of life.'* (4).
ZN states that to provide adequate healthcare in the future, the healthcare sector must become more sustainable now (5).
The sustainability of the hospitals is the responsibility of the hospital itself. It is the responsibility of healthcare insurers, among other things, to promote sustainability in their healthcare procurement. In which ZN supports the healthcare insurers.

ZN has eleven members in the year 2023, of which Menzis is one. This means that Menzis is committed to the goals set by the ZN (4).
In 2022, Menzis wrote a policy document for sustainability. Menzis wants to contribute to social and environmental issues for a liveable world, which fits emphatically with the identity of Menzis and its social responsibility that they propagate (8).

As a prominent actor in the Dutch healthcare sector, Menzis plays a crucial role in shaping the provision of healthcare services and affecting the ways in which healthcare providers conduct their business through contractual agreements. These agreements provide Menzis with substantial leverage to exert influence over the financial aspects of healthcare provision, including the integration of financial incentives within the payment models.

Agency theory

The agency theory helps in motivating why payment models support in stimulating desired behaviours. In healthcare markets, the patient, the healthcare provider and the healthcare insurer are engaged in a (contractual) relationship with one another (9). In this study the focus is on the relationship between the healthcare insurer and the hospital in which the healthcare insurer, as principal, delegates the task of 'providing healthcare' to the agent (hospital). The interests of these parties naturally diverge. For example, hospitals may want to provide the best possible care that meets the needs of their patients – irrespective of its costs. Instead, the healthcare insurer's focus is on providing accessible and affordable healthcare for everyone who needs it. Diverging interests could lead to conflicts. Furthermore, since healthcare markets are characterized by information asymmetry (e.g. doctors typically have more information about the health of their patients, and about what to do in case of illness), this asymmetry can be used by parties to their own advantage – leading to suboptimal outcomes. Information-asymmetry will no longer pose a problem when interests are perfectly aligned with each other (10).

Financial incentives are a way of 'controlling' the agent (hospital) by stimulating the agent towards certain behaviour. In this way the principal (healthcare insurers) can align the interests of the agent with their own. Financial incentives follow from a certain payment model (11). An example of a financial incentive entails a scenario in which hospitals are paid for every delivered activity, thereby incentivizing them to maximize the number of activities conducted. From this perspective, the agency theory could serve as a guiding mechanism, an "invisible hand", leveraging financial incentives to guide hospitals towards adopting more sustainable practices.

Payment models

In order to link sustainability initiatives to the payment models which healthcare insurers use, some explanation of payment models is provided first.

Healthcare insurance is an effective way to make expensive healthcare affordable and accessible for everyone in the society. However, it is important to recognize that moral hazard could be a consequence of such a system. Moral hazard refers to the phenomenon where individuals or entities, such as patients or healthcare providers, alter their behaviour due to the presence of insurance or other risk-sharing mechanisms (11). Fox example when individuals with health insurance engage in riskier behaviour or overutilize healthcare services because they are shielded from the full cost of those services.

When it comes to the relationship between a hospital and a healthcare insurer, moral hazard can also play a role. For example, if the healthcare insurer agrees to pay a fixed fee for a certain procedure, the hospital may be incentivized to perform more of those procedures than necessary, since they are guaranteed payment (10). Similarly, if the healthcare insurer agrees to pay for all of the costs associated with a patient's hospital stay, the hospital may be incentivized to keep the patient in the hospital for longer than necessary, since they are guaranteed payment for the additional time. The moral hazard it tries to address, has an impact on sustainability. For example, in light of lowering primary resource use, it is desirable that – at the same time – a doctor is not incentivized to overprovide care. In the context of sustainability and resource allocation, it is desirable that care is delivered only when the cost of delivering care, and the (indirect) damage that delivering care causes to the environment is smaller than the benefits to the patient.

Through the utilization of an appropriate payment model, it becomes possible to manage and control outcomes. Jegers, Kesteloot (12) describe a payment model as: '*the way in which money is allocated to the provider of care by healthcare payers (e.g. government, healthcare insurers patients)'*. Each payment model has a unique set of financial incentives (11). The next section provides an overview of the different payment models. Currently, healthcare providers are mostly paid through a mix of payment models (13).

Base payment vs. incremental payment

Payment models can be roughly divided into base payment models and incremental payment models. The base payment model is the healthcare provider's main source of income. In addition to the base payment model, there may be incremental rewards and/or penalties (14). These are called incremental payment models.

Base payment models

Miller (13) analysed several payment models and ranked them on a scale of risk as seen in *Figure 1*. The scale of risk means to what extent the payment model carries risk for the healthcare insurer or hospital. For example the healthcare provider is at risk for the cost and processes within the fee-for-service payment model, but is not at risk for the amount of services. In a conventional capitation system, healthcare providers bear the risk associated with the total care costs of patients, as all health care costs are deduced from their budget. In the event of excessive costs, a financial deficit may ensue. The risk shifts with every payment model (13).

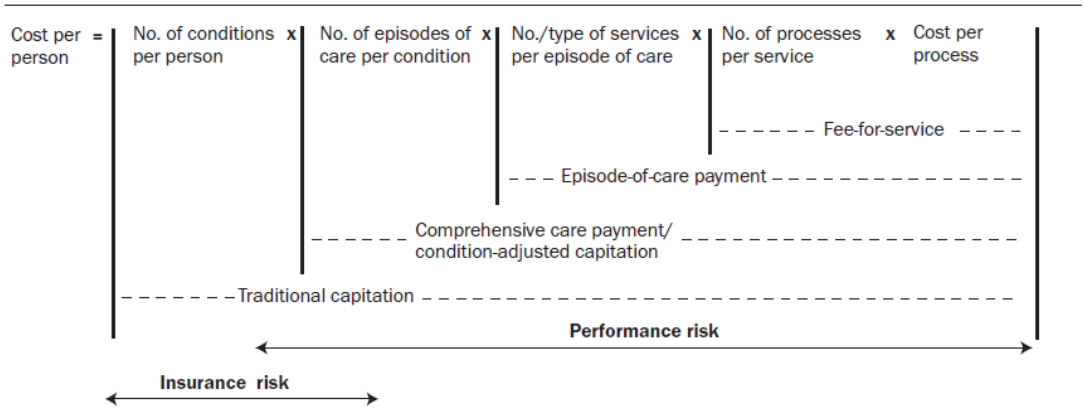

Figure 1, Risk division payment systems (13)

In *Figure 1* there are multiple dimensions of risk when looking at the models from right to left. Risk refers to the potential impact of those dimensions on reducing your surplus.
On the left of the figure is the traditional capitation model where the hospital is accountable for the provided healthcare and is dependent on the healthcare insurer for the amount of money they receive. There is some financial uncertainty due to fixed payment and not knowing what the exact costs will be. On the right of the model there is the Fee-for-service model where the healthcare insurer is fully at risk since the healthcare insurer is completely dependent on what the hospital will provide in terms of healthcare. As the hospital bills a higher volume of care, the corresponding financial obligation of the healthcare insurer increases accordingly.
Next, several payment models will be discussed with their corresponding structure. The models discussed include those presented in *Figure 1*, as well as selected models sourced from relevant literature.

Fee-for-service (FFS)
This payment model is very common in the healthcare sector worldwide. It is sometimes also referred to as payment per-item-of-service (10). With this payment model the healthcare provider is at risk for the amount of processes within each service and the cost of each process. However, this model does not restrict the amount of services and the providers are paid for each delivered service regardless of the quality of the service. (13) Thus, this payment model is volume based and providers are incentivized to overprovide. Not only overprovision could be a consequence of this system, also wrong allocation of patients in a different treatment class with higher fees could be a possibility, which is referred to as upcoding (10).

When we look at the situation of our fictional hospital A, a fee-for-service model incentivizes the hospital to generate a higher volume of consultations, in order to maximize their reimbursement from the healthcare insurer.
Thus, by conducting longer (and thus, fewer) consultations and reducing the number of follow-up examinations, hospital A will experience a decrease in revenue resulting from fewer claims. Therefore, hospital A is discouraged to implement this sustainability initiative.

Payment per case
This payment model is also referred to as case rates. Providers receive an amount of money for each episode of care a patient needs, in which all services needed within a certain timeframe by the patient with a specific medical condition are covered (10). The provider is only at risk of the amount of services and the type of services *within* an episode of care. As a consequence, the provider is not at risk of the prevalence of a particular condition in the enrolled population. This payment model incentivizes the healthcare provider to eliminate unnecessary services within an episode, for example by improving communication between the involved providers (13). By enhancing communication, healthcare providers can collaborate more effectively, share information, coordinate care, and avoid redundant or duplicative services. Mainly to avoid unnecessary costs and to divide the system more efficiently.
This payment model is still a volume-based payment model since they get paid for each episode of care they deliver.

A variation on the case rate model is Diagnosis-related group (DRG) payment where the provider receives a single payment for all the services a patient needs with a specific condition within a particular time frame. In the Netherlands, this model is referred to as Diagnosis-treatment combination (DBC). The discrepancy between the payment and actual spending is borne by the healthcare providers. In other words, if the payment received is lower than the actual costs incurred, the providers will have to absorb the financial burden of the shortfall. Healthcare providers are incentivized to execute their services and activities in such a way that no unnecessary tasks will be provided. On the other hand it may encourage risk selection of the population, implying that healthcare providers will only accept patients who need the least possible care (10).

Under payment per case, our fictional hospital A receives a single prospective payment out of which it has to cover both the consultation and the follow-up examination. Therefore, it will strive to optimize the allocation of healthcare by critically assessing the necessity of longer consultations to achieve cost savings. By performing longer consultations, fewer follow-up examinations are ultimately needed, leading to a cost reduction for the hospital. Furthermore, since the hospital receives a payment per case, cost reductions also lead to a higher surplus. Thus, the hospital is incentivized with this model to implement the sustainability initiative.

Capitation

A system based on capitation is different from DRG, as the provider does not get a fixed amount for every activity for a certain condition but for every person over a specific timeframe (e.g. a quarterly payment per person). Within this time frame the healthcare provider has to conduct all necessary healthcare activities, irrespective of the quantity of care episodes a patient goes through (13). It incentivizes healthcare providers to focus on preventive care and population health management since they bear the financial risk associated with the health outcomes of their registered patients.

The amount of money the provider receives is irrespective of how well or how sick the provider's patients are (13). Risk selection is also possible with this model where it could be that the provider avoids sick patients who are expensive to treat in order to save costs.

Under capitation our fictional hospital A receives a prospective payment per patient per quarter from which it has to cover all expenses within this timeframe. Within the capitation system, hospital A is incentivized to deliver care as efficient as possible. By providing longer consultations that reduce the need for follow-up examinations, they will reduce costs and increase their surplus accordingly. Thus, the capitation model encourages to implement this sustainability initiative.

Incremental payment models

Incremental payment models are models that incentivize healthcare providers based on the incremental value they deliver or the progress they make in achieving specific goals set by the healthcare insurer (15).

P4P (Pay For Performance)

The Pay For Performance (P4P) payment model rewards specific dimensions of a healthcare provider. The P4P payment model is specifically designed to directly incentivise providers to improve various domains of quality and efficiency of healthcare (16). Payments may be based on how well providers perform on metrics of structure (e.g., using an electronic medical record), processes (e.g., giving beta-blockers after a heart attack), and/or outcomes (e.g., 30-day mortality-rate after surgery). In this payment model the healthcare provider can get a reward, penalty or both.

Although the ultimate goal of P4P will be to improve health outcomes, a significant issue with using outcome measures is that they are more difficult for healthcare providers to influence than process measures. Furthermore, it might prove challenging to define what quality constitutes. To prevent teaching to the test, performance should preferably be defined widely, as long as the collection of measurements is still comprehensible (16).

Under the P4P model, the healthcare insurer sets clear targets for the hospital A. Accordingly, hospital A receives a reward when it achieves the set targets. A typical target that could be set in this situation is the proportion of patients that have received a long consultation. In this case, the reward is distinct from any potential savings that may be generated. If they meet the set target they will receive a reward from the healthcare insurer on top of the base payment model. Thus, hospital A is incentivized to implement the sustainability initiative.

Shared savings/risk

Within this model healthcare providers share the financial risk by taking accountability for spending. Accountability comes in several forms: providers may share in savings relative to a spending target, or may have to share in the healthcare insurer's losses in case of excess spending (14). The shared saving model contains financial incentives for healthcare providers to decrease the costs of healthcare, for example by lowering the number of services (17). The shared savings model is a form of value-based payment since the shared savings rate is commonly dependent on quality (14).

Within the shared savings model, a contractual arrangement can be established between the healthcare insurer and hospital A, whereby the hospital retains a portion of the realized cost savings as a means to mitigate its healthcare expenditures. This agreement allows for a financial alignment between the parties, whereby hospital A is encouraged to actively pursue cost control and sustainability. Therefore, hospital A is incentivized to implement the sustainability initiative.

Typologies

The different payment models are structured in *Table 1* with their characteristics.

Payment model	**Characteristics**
Base payment	The standard payment that is made to providers for delivering healthcare, according to the agreements with the healthcare insurer.
Fee-For-Service (FFS)	Compensation for each service or procedure performed, directly proportional to the volume of services provided.
Case rates / DBC	A fixed amount paid for a particular episode of care, regardless of the actual number of services provided, based on the diagnosis, procedure, or a combination of both.
Capitation	A fixed amount of compensation paid for each patient enrolled in their care for a specific timeframe, regardless of the number of services provided. Capitation payments may be adjusted based on the patient's age, sex, or health status.
Incremental payment	Rewarding healthcare providers for achieving specific goals, such as improved patient outcomes or reduced healthcare costs.
Pay for Performance (P4P)	Incentivizing healthcare providers to achieve specific performance targets, such as improved patient satisfaction or reduced hospital readmissions, with variable payment amounts based on their level of performance.
Shared savings/risk	Incentivizing healthcare providers to reduce healthcare costs while maintaining or improving patient outcomes, with providers sharing in the savings achieved but also bearing financial risk if costs exceed expectations.

Table 1, Typologies payment models

Payment models for MsZ in the Netherlands

Organisation MsZ

Current services in the Specialist Medical Care ('Medisch Specialistische Zorg, MsZ) sector are classified into DBCs (10). From the beginning of the medical consultation through the conclusion of this trajectory, a DBC includes all care services and activities offered by the hospital (both inpatient and outpatient) in connection to the patient's need for care. A- and B-segments make up the DBC-system. Within the A-segment the DBCs are open for price negotiations with a max up to the rate set by the Dutch healthcare authority (NZa, Nederlandse Zorgautoriteit). In practice, almost all products in the A-segment are agreed at the NZa-max price. DBCs in the B-segment are eligible for price negotiations between healthcare insurers and hospitals. Hospitals are encouraged to expand production levels for DBCs in this segment by the combination of open-ended financing in segment B and the rising percentage of hospital revenues dependent on this segment (18).

At Menzis, specific payment models are used that partly correspond to those found in the literature, those mentioned before. In the next section, the models are explained with their characteristics.

- Global budget

  Hospitals receive a prospective budget, from which they have to cover all expenses and is unaffected by output levels. Hospitals have freedom in determining how money is spent. This fee is frequently determined by a variety of variables, such as past expenses, inflation rates, and capital investment choices. Hospitals have less production pressure since the amount they get from this fee is unrelated to productivity. Hospitals may then concentrate on value rather than volume thanks to this. This model includes agreeing on a graduated scale with the healthcare provider.
  The agreement may be for a set period of time, such as one year, with the option to renew or renegotiate the terms at the end of that period.

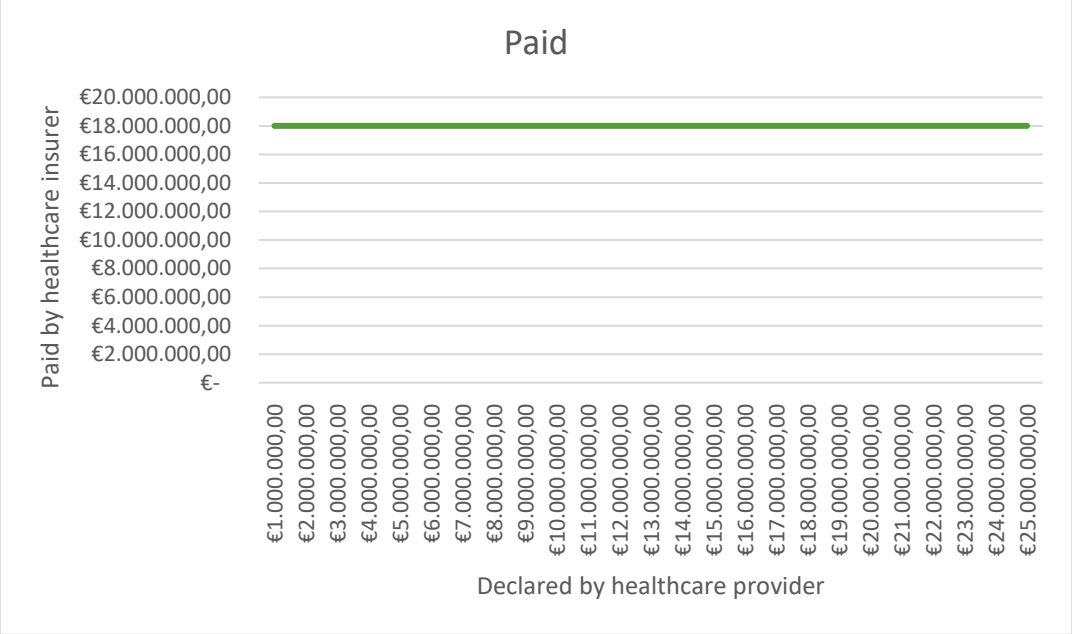

Figure 2, contractors fee €18 million

Under a fixed budget constraint the healthcare insurer gives a fixed budget from which hospital A has to cover all expenses. Hospital A is incentivized to optimize the utilization of healthcare services, aiming for maximum efficiency. In this context, the approach of conducting longer consultations, leading to a reduced need for subsequent follow-up examinations, becomes advantageous due to the reduction in healthcare costs. Thus, hospital A is incentivized to implement the sustainability initiative.

- Price ceiling

  In the context of healthcare reimbursement, a price ceiling refers to an arrangement between hospitals and healthcare insurers wherein they establish a mutually agreed-upon maximum limit on annual costs. This price ceiling serves as a threshold beyond which the healthcare insurer is not obligated to reimburse the hospital for additional expenses incurred within a given year. The cost-ceiling frequently takes into account hospitals' spending levels from prior years.

  In addition, the healthcare insurer may choose to agree on a price cap in combination with a graduated scale, of 50% for example. They pay up to the price ceiling and anything claimed above that the healthcare provider receives half the price for (19).

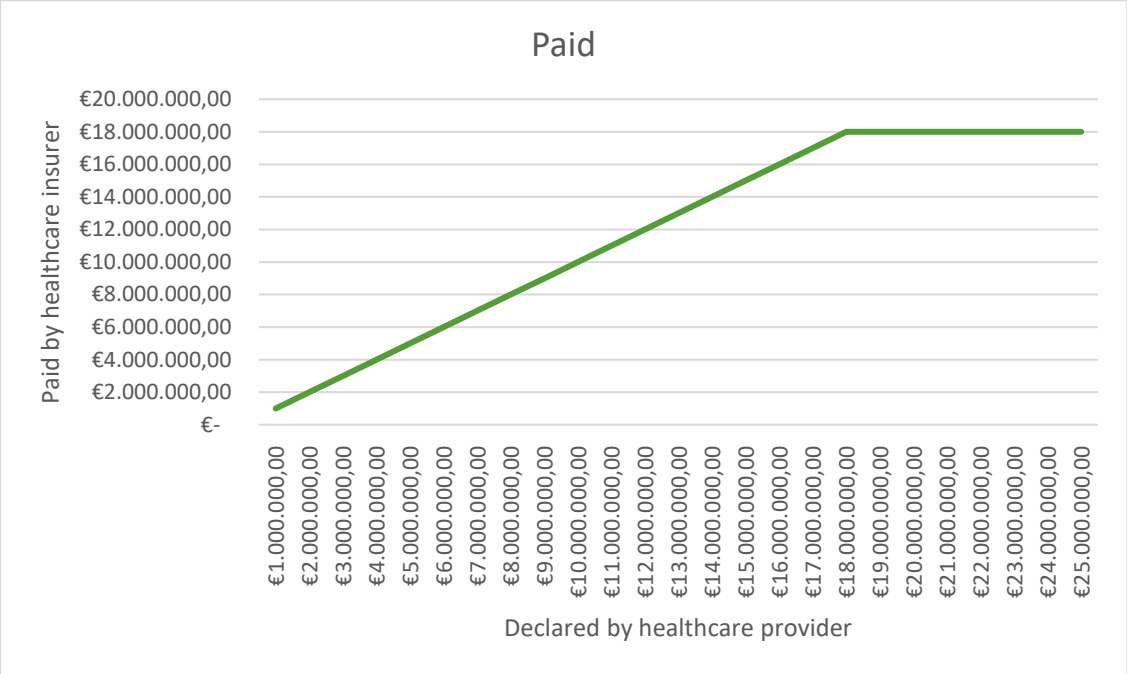

Figure 3, example price ceiling up to €18 million maximum limit

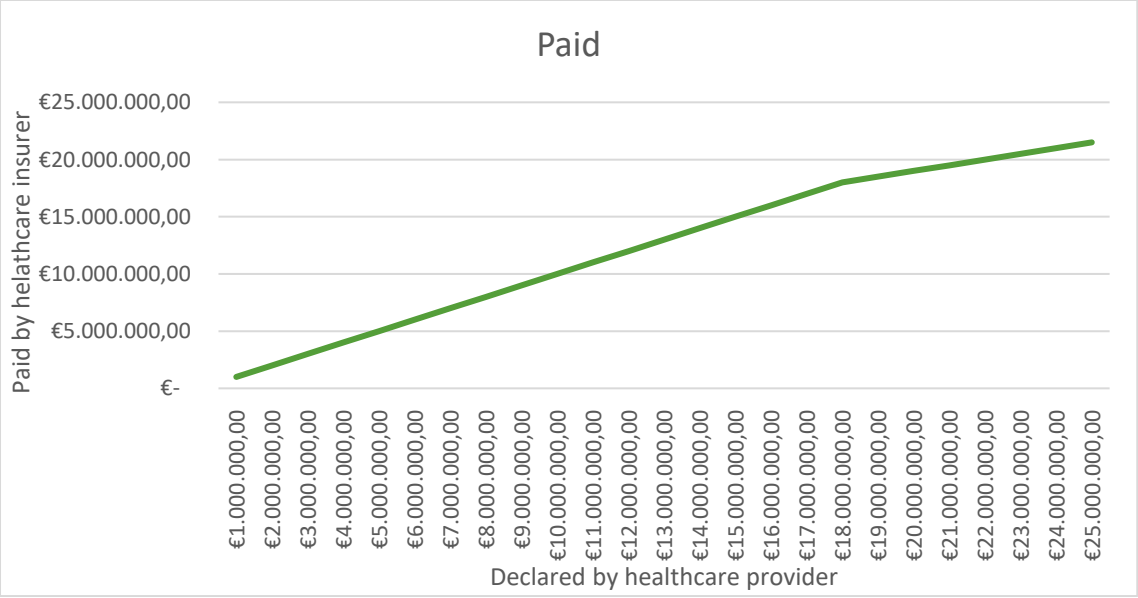

Figure 4, Example price ceiling up to €18 million graduated scale

Under a price ceiling agreement hospital A gets paid for every DBC claim until the price ceiling is reached. Due to longer consultations and less follow-up examinations, Hospital A is expected to

submit fewer DBC claims. As a result, it receives less reimbursement from the healthcare insurer, compared to the situation with a standard duration of the consultation. Therefore, it is not incentivised to implement the sustainability initiative.

- PxQ agreement

  A PxQ agreement is also known as a volume-based agreement. The agreement specifies that the hospital will provide a certain quantity (Q) of healthcare services to the healthcare insurer's members in exchange for a set price (P).
  The agreement specifies when and how the hospital will be paid for the services it provides, such as through regular instalments or lump sum payments. The agreement may be for a set period of time, such as one year, with the option to renew or renegotiate the terms at the end of that period.
  By entering into a PxQ agreement, the hospital and healthcare insurer aim to achieve several benefits. The healthcare insurer can secure access to healthcare services for its members at a predictable cost, while the hospital can generate revenue by serving a larger patient population. Additionally, the agreement can encourage the hospital to focus on improving the quality and efficiency of its services in order to maximize profitability under the fixed price per service model.

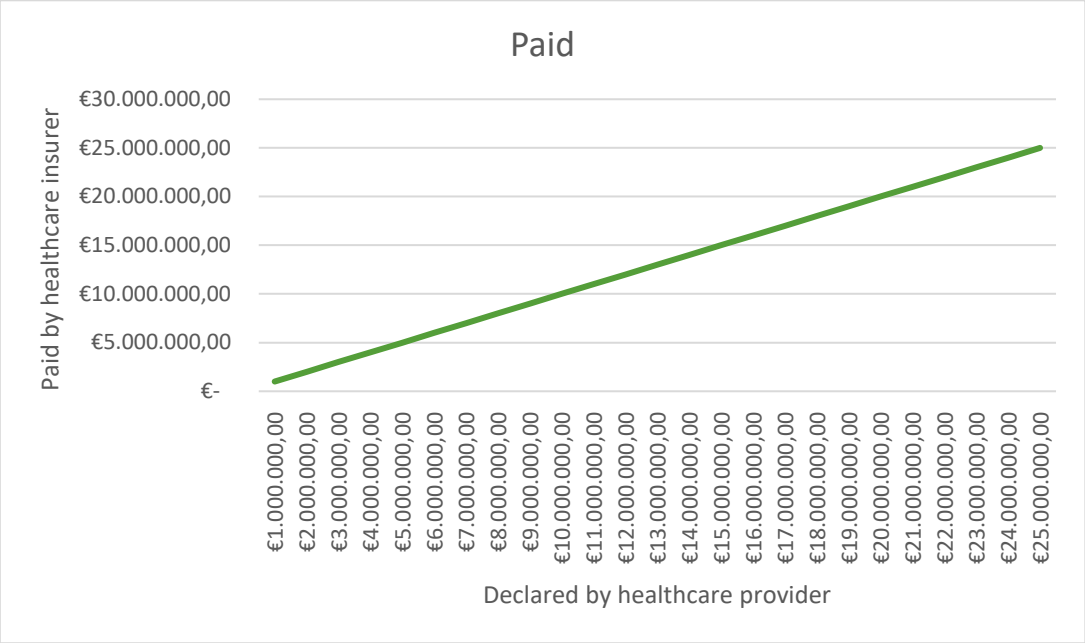

Figure 5, PxQ agreement

Under a PxQ agreement, hospital A receives a payment for every claim they make. With a PxQ agreement the incentive is the same as with a fee-for-service system. The hospital will want to declare as much as possible to generate more income. Thus, by conducting longer (and thus, fewer) consultations and reducing the number of follow-up examinations, hospital A will experience a decrease in revenue resulting from fewer claims. Thus, hospital A is not incentivized to implement the sustainability initiative.

Internal payment

Internally, healthcare providers have an allocation key for the budgets received, which the healthcare insurer has no influence on. The distribution of these budgets can be scaled under a particular funding model which affects the care provided.

The distribution of money within a Dutch hospital can vary depending on several factors, including the hospital's size, ownership structure, and funding sources.
In general, Dutch hospitals receive funding from different sources. Funding is provided by the government, healthcare insurances and also from patient payments, donations, or grants.

Once a hospital receives its funding, it is responsible for allocating the money to various departments and expenses. This process is typically overseen by hospital administrators and financial managers, who work to ensure that the hospital's resources are used effectively and efficiently.
Within a hospital, money may be distributed to cover a range of expenses, including salaries for healthcare professionals, medical supplies and equipment, facility maintenance and operations, research and development, and patient care services.
In some hospitals, medical specialists are paid through salaried employment, while at other hospitals there are partnerships. A partnership is a type of company where many so-called partners engage in the same line of work. Each partner in a partnership provides a contribution, such as money, work, or commodities. The level of collaboration among the people is frequently quite equal. The members of the partnership will receive more income the more care is provided by the hospital. A balance between the interests of the partnership and salaried specialists is needed to keep the workload healthy, the hospital financially sound and the DBC rate as low as possible (20).

Negotiations hospital and healthcare insurer

Every year, the hospital and the healthcare insurer negotiate what the contract will look like. In these negotiations, the terms and conditions of both sides are discussed.
Two types of budget contracts are current frequently used: cost-ceiling contracts with graduated scale and a PxQ agreement (19).
The types of funding and the type of contract used with the healthcare provider directly affects the premium of the insured, given that the premium is a large part of the healthcare insurer's overall budget.
The number insured is significantly linked to the pricing of premiums, driven by competitive dynamics among healthcare insurers. A healthcare insurer's decision to increase premium rates can prompt insured to migrate to other healthcare insurers offering relatively lower premium rates.
Choosing to collect money in the budget to reward healthcare providers for their sustainability initiatives will directly affect insured, with them most likely having to pay more money to the healthcare insurer. In order not to disadvantage one healthcare insurer, ideally such a decision is made jointly, by all healthcare insurers together, whether or not to reward sustainability initiatives among healthcare providers.

Sustainability in the Dutch hospitals

To assess the compatibility of payment models with the sustainability context in hospitals, an overview of the status of sustainability will be presented to provide insights into the current situation.
The healthcare sector is among the most polluting sectors in the society. To illustrate this, the healthcare sector in the Netherlands contributes to 7% of total greenhouse gas emissions. This is more than the aviation sector which contributed 4.5% to the CO2 footprint in the Netherlands in 2021 (21). The climate change can have a negative impact on the global public health. For example, the changing environmental conditions make it more favourable for pathogens to move around, which is a problem for the overall health of the population. It may, for instance, result in epidemics brought on by the transmission of viruses (22). Additionally, at least in absolute terms greenhouse emissions arising from the healthcare sector might further increase due to aging of the population (23). The grey pressure in 2022 was 34%, meaning that for every person over 65, there are three persons who are in working age (20 to 65) (24). According to CBS, this will rise to over 50% over the next several years. This phenomenon can be attributed to the heightened care requirements of elderly individuals, which subsequently amplifies the overall burden of care. This data could also imply that healthcare has a substantial role to play in realizing climate targets (1, 25).
Recently, the environmental impact of the healthcare sector has been investigated by the National Institute for Public Health (1). The environmental impact of the healthcare sector is a combination of direct (e.g. energy costs of buildings) and indirect effects (e.g. due to procurement and waste). The analysis of the National Institute for Public Health looked at how much economic activity is needed in the global value chain to deliver a given product or service and analysed the environmental impact (1). The study demonstrates that a significant portion of the environmental effect of healthcare is caused by chemical items, which include consumables and medications. The study did not show the exact amount of economic activity needed.

The start of this kind of analysis and drive for change by the government signals the beginning of a new era of joining forces to make sustainability more central. One way to put sustainability on the priority list of healthcare organisations was the development of the GDDZ. The goals from the GDDZ are now adopted by many healthcare organisations to become more sustainable in the coming period (2).
Financial support plays a crucial role in facilitating sustainability initiatives. The inflow of funds, commonly referred to as funding, is vital for these initiatives, while the allocation and distribution of funds, known as the payment models or costing, are equally significant. It is imperative that financial resources reach the appropriate destinations to effectively drive transformative change. In this context, healthcare insurers can actively contribute to this process. The urgency of securing adequate financial resources was underscored by a letter addressed to the government in March 2023 (26). The letter highlighted the pressing need for increased funding across diverse healthcare sectors.

The Green Deal

The Green Deal is used as a basis for policy and strategy documents within healthcare organisations who signed the GDDZ.
Green deals offer individuals, businesses, and organisations a collaborative opportunity with governmental entities to foster sustainability and facilitate the transition towards a more sustainable society. As part of the GDDZ 'Sustainable Care for a Healthy Future', over 300 organisations collaborated with the federal government to promote sustainability in the healthcare industry and quicken sustainability projects (2).

In their comprehensive implementation plan created in 2023, the GDDZ attempts to identify as many specific, measurable, and time-bound (intermediate) targets as possible at sector level. Government-wide policies and (international) legislation on climate, environment, healthcare and public health form the basis for this. The GDDZ consists of five targets for the period from 2023-2026 that the organisations commit to, which contribute to achieving the goals up to 2050 (2).

The five goals are as follows (27):

- Promote health among patients, clients and employees;
- Raise awareness and understanding of the impact of healthcare on climate and vice versa;
- Reduce CO2 emissions by 55% by 2030 and to be climate neutral by 2050;
- Reduce the consumption of primary raw materials by 50% by 2030 and maximise circularity in healthcare by 2050;
- Reduce environmental harm caused by (use of) medication.

Healthcare organisations are required to publish their pathway to achieving these goals in annual reports and the promises are made accessible to the general public to boost visibility. Via this way, interested parties may contact and cooperate with signatory healthcare organisations based on shared objectives and areas of expertise (28).

The GDDZ's objectives are made to create changes in as many different areas as possible because sustainability is a broad concept. To bring focus to this thesis study, it was chosen to look at circularity and primary resource use based on waste streams in the healthcare sector. Waste streams are a good reflection of material use in the healthcare sector. Furthermore, healthcare insurers might have an impact on it through the purchasing of healthcare.

Based on the GDDZ, the central government has published the following goal in terms of circularity and primary raw material use focussed on healthcare waste (HCW) (3): “The healthcare sector should focus more on reuse and less consumption of raw materials and materials where possible. The aim is that by 2030, a maximum of 25% of all waste in the healthcare sector will be 'unsorted residual waste'. Moreover, the aim is to have 25% less unsorted residual waste by 2026 compared to 2018. By 2030, a maximum of 25% of healthcare waste should be unsorted residual waste.
The healthcare sector aims to achieve this by:

- including sustainable and circular procurement as a principle in its procurement policy, for example by purchasing reusable products and services wherever possible;

- reducing the consumption of nappies and continence materials."

Circularity and primary resource use

The government describes a circular economy as an economy in which ideally there is no waste and raw materials are continually reused or derived from inexhaustible sources, including biotic resources that can regrow (29). Circularity usually refers to consuming raw materials without generating new ones. By extending the product life and/or "looping" the product or its components back into the system for reuse, a circular economy seeks to eliminate "waste" and thus minimize the impact on the environment of resources (30).

A 50% reduction in primary resource use in healthcare would imply reducing the total amount of primary resources used by half, compared to the current level of use. Primary resources refer to the raw materials and energy inputs that are required to provide healthcare services, such as medical equipment, pharmaceuticals, and energy for heating and cooling (15).
The reduction of primary resources in healthcare can have a positive impact on both the environment and human health. For instance, reducing energy consumption can help to reduce greenhouse gas emissions and mitigate the effects of climate change. Similarly, reducing the use of certain medications and medical equipment can help to minimize the amount of waste generated and reduce the risk of environmental pollution.

Conceptual framework for sustainability

As outlined previously, the ultimate aim is to achieve circularity in all operational domains; however, executing this objective is often complex and not devoid of challenges. Today's society is characterized by complex global supply chains, making it difficult to trace the origin and destination of materials and products (31). Measuring circularity requires access to comprehensive and reliable data on material flows, product lifecycles, and waste generation and management. However, such data is often lacking or of poor quality, particularly in emerging economies or developing countries, where waste management systems are less developed. Achieving a circular economy also requires active engagement from consumers, who must be willing to adopt behaviours such as repairing, repurposing, or sharing products instead of buying new ones. However, consumer awareness and engagement on circular economy principles are still limited, making it challenging to achieve widespread adoption of circular practices.
Strategies can be used by an organisation as a foundation and to streamline their workflow. Circular economy strategies can be prioritized based on the extent to which they add to sustainability. The R10-ladder is an example of such a classification model, see *Figure 6* (32).

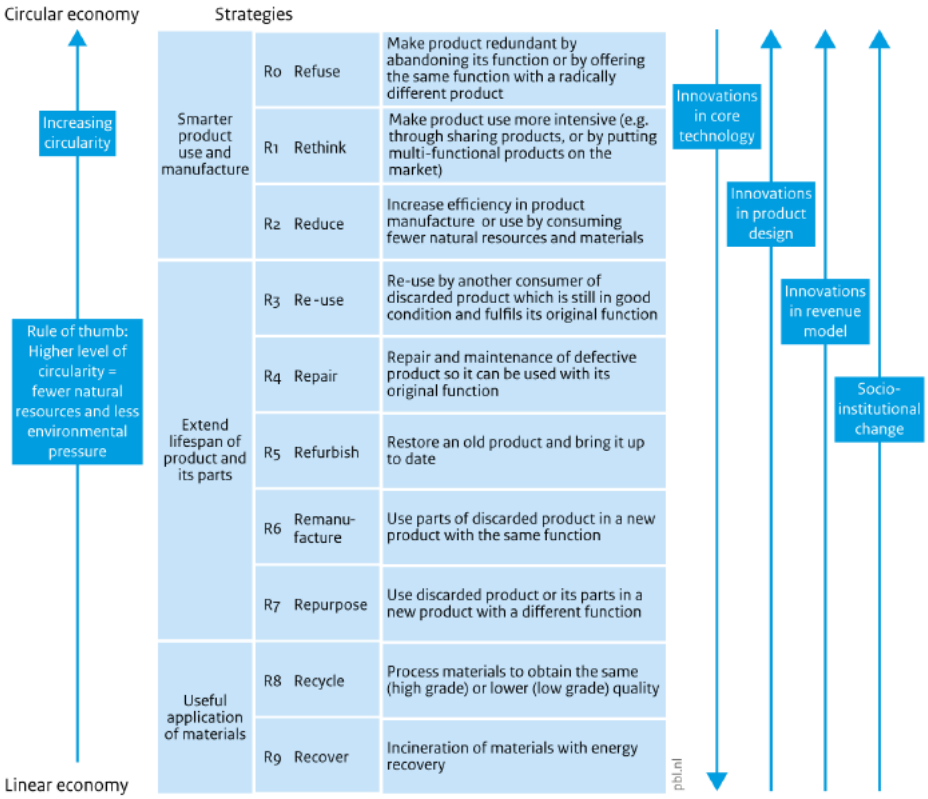

Figure 6, R10 ladder (32)

In *Figure 6*, the levels are scaled from R0 to R9, where R9 equals a linear economy (with a start and end point) and R0 equals a circular (continuous) economy. A strategy associated with a lower R-number is more favoured to implement since it shows a more circular economy and less resource use than a strategy related to a larger R-number (32).

Mapping primary resource use is the first step in making an organisation more sustainable (32). In the long run, it is imperative to ensure sustainability as a fundamental goal. Questionable is if a 50% primary resource use reduction really is helping to be more sustainable within the healthcare sector, since not all primary resources are hazardous (33). In order to comprehensively examine the implications of diminished primary resources for sustainability, a thorough sustainability evaluation of the healthcare industry is required.

Analysis

It can be questioned whether, if all the targets are met, the healthcare sector has actually become more sustainable for the environment. Meaning that it is not the case that circularity and reducing primary resource use by definition lead to more sustainability within an organisation, though at least it is likely that this leads to steps in the appropriate direction. Considerations arise when examining the implications of using reusable materials in hospitals, particularly regarding the utilization of cleaning agents and additional equipment required for the cleaning process. This cleaning process involves energy consumption, both within the hospital and potentially at external facilities involved in the supply chain. In addition, there is still no agreement on how to measure whether the goals have been achieved (1). Thus, while the GDDZ is a valuable initial step towards sustainability, some shortcomings still exist in the proposed objectives to claim that this leads to sustainability of hospitals. However such expectations, healthcare without footprint, is unrealistic.

Certain tools or frameworks could be used to measure sustainability especially with regard to the lenses we dive into in this research, which are the reduction of primary resources used and more circularity, some mentioned in literature are: the Waste hierarchy (34), Lifestyle Cycle Assessment (LCA) (1), Material Flow

Analysis (MFA) (35), Ecological Footprint (36), Environmental Impact Quotient (EIQ) (37), Environmentally Extended Input-Output Analysis (EE-IOA) (1), etc.
The commonality among these frameworks is their measurement of environmental impacts associated with specific resources or systems. However, there is no single framework that is optimal for every kind of analysis. For example, the EIQ mainly measures the impact of pesticide for growers (37), which is less suitable for healthcare organisations.

A part of the analysis on a hospital's primary resource use and circularity could be analysed in terms of waste management. In the process, waste streams have an indirect effect on the environment and waste materials will not always be reused.

Waste management

According to the Cambridge dictionary the definition of waste is: '*unwanted matter or material of any type, especially what is left after useful substances or parts have been removed*' (38).
HCW generation grows at a rate of 2% to 3% globally per year (34). In the year 2018, healthcare was responsible for 328 million kilos of waste, which is about 4% of the total amount of waste produced by all Dutch households (39). And according to the United Nations (UN), more than half of the world's population is at danger of sickness brought on by HCW (30).
As opposed to that, the advent of disposable items in the medical business has significantly decreased infection and thus improved health outcomes. Medical product design is a high-risk industry where any potential loss of functionality or rise in risk might jeopardise the health or even the lives of patients, which makes changing a product's material a complex process (30). In conclusion, how the manufacturing process is set up for medical products is crucial for the quality of the products but also creates a health hazard for the population.
Some initiatives to reduce waste in healthcare are for example encouraging suppliers to use less packaging material, use more reusable resources and use products more often where possible (40). Practical examples are custom kits in operating rooms or providing less single use tools during surgery, in order to dispose less untouched products (40). By making these customised kits, fewer surgical instruments are packed before they are needed, which reduces the number of instruments that must be cleaned, transported, and disposed of afterwards (40). If waste is being reduced in healthcare this will also lead to less transportation of waste and eventually to less emission as well (34). Presently, there exists heterogeneity among hospitals concerning the adoption of proactive measures. To address this concern, the healthcare insurer could assume a pivotal role by delineating a framework for initiatives to be implemented, leveraging its affiliation with healthcare providers across the nation.

The Waste Hierarchy

The Waste Hierarchy is a tool introduced by the European Commission in the EU Waste Framework Directive The Waste Hierarchy is commonly used tool for analysing circularity (33, 41-44). The model provides structure and general lessons for maintaining waste management within an organisation. The Waste Hierarchy contains the most preferable forms of waste management within healthcare (33), see *Figure 7.* The principles of the waste hierarchy are based on circular economy theory. Thus, the steps are similar to those in *Figure 6* (33).
Therefore, the Waste Hierarchy is chosen as a basis for this research on the sustainability initiatives within hospitals in this thesis study. The waste hierarchy can be used within healthcare to assess circularity and primary resource use by evaluating the different stages of the hierarchy in relation to the healthcare sector's activities. For instance, healthcare providers can measure their primary resource use and waste streams in terms of the waste hierarchy. The framework is easy to interpret which makes it very insightful for someone to measure their targets (34).
To illustrate, an incentive to move up the waste hierarchy with recycling could be the benefit it has financially, for example due to reduced disposal costs or by a financial concession from the waste management company (33).

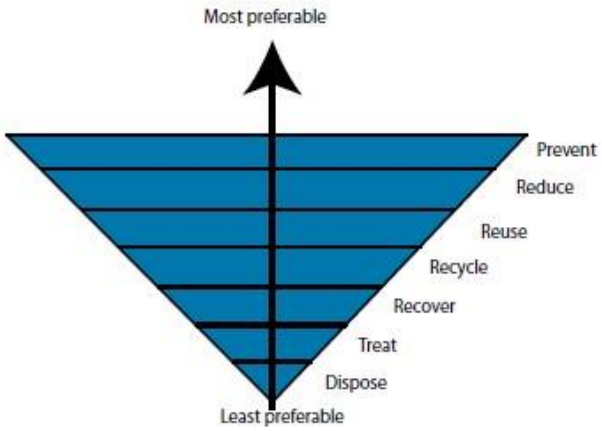

Figure 7, Waste hierarchy (33)

Conclusion

In this section, we provide an answer to the first sub-question.
What financial incentives follow from (current) payment models for healthcare providers and which different working mechanisms are these payment models based on?
The payment models most frequently cited in the literature, as referenced in this study, encompass the following seven models, accompanied by the following financial incentives:

1. **FFS**: reward of higher service volumes or specific procedures.
2. **Case rates/DBC**: financial incentives within this model may emphasize cost-effective and efficient healthcare delivery within the defined case or treatment scope.
3. **Capitation**: the inclusion of financial incentives in this model can serve as a catalyst for proactive and coordinated healthcare delivery, aiming to enhance population health outcomes while effectively managing costs.
4. **P4P**: financial incentives within this model may incentivize high-quality care, patient satisfaction, and adherence to clinical guidelines.
5. **Shared savings/risk**: financial incentives within this model encourage cost-consciousness, healthcare coordination, and quality improvement.

The prevailing payment models employed by healthcare purchasers at Menzis, as outlined in this study, encompass the following three models, accompanied by the following financial incentives:

1. Global budget: financial incentives within this model may emphasize cost containment, efficiency, and the appropriate allocation of resources.
2. Price ceiling: financial incentives within this model may focus on promoting price transparency, cost control, and value-based care.
3. PxQ agreement: financial incentives within this model may encourage providers to deliver services efficiently while maintaining quality standards and to provide as much care as possible, since it enhances revenue generation from the healthcare insurer.

The characteristics correspond to the payment models described in the literature. The payment model used varies by hospital and what the interests/conditions of both parties are for that specific year.

In order to establish a connection between the financial incentives and sustainability initiatives, it is essential to enable the quantification of primary resource reduction and the degree of circularity within a hospital. This can be achieved through the utilization of frameworks such as the waste hierarchy or the R10 ladder.

Methodology

This study aims to explore how financial incentives can be included in contracts with healthcare providers in the hospital sector. This to encourage more circularity and (thereby) less use of primary resources in healthcare focussed on the waste management among Dutch hospitals. Semi-structured interviews and a short survey are used as a method of data collection.

Study design

This study will use a case study approach to explore if financial incentives can be included in contracts with healthcare providers in the hospital sector to encourage 1) more sustainability initiatives focussed on circularity and 2) (thereby) less use of primary resources in healthcare. The case study method is a qualitative research method used to understand the perspective of the participants in this setting and to assess observations against the theoretical framework. Using this method, this study will provide, an in-depth and detailed investigation of the complex issues around sustainability in the Dutch healthcare system and payment from the healthcare insurer.
Semi-structured interviews and a short survey will be used to collect data from a diverse range of healthcare providers and employees in the hospital sector. The survey will consist of a set of standardized questions to be completed by participants, providing additional insights into their perspectives, allowing for analysis of the collected data and comparison between the participants.
Semi-structured interviews are a flexible and open-ended approach that allows participants to share their experiences, opinions, and perspectives in their own words (45). This method can capture the complexity and nuance of participants' experiences and provide rich and detailed data for analysis.

Participants

Participants will be recruited through purposive sampling. The target population for this study comprises employees working in Dutch hospitals. The sample will consist of 8-12 hospitals, with a maximum of two participants per interview.

A. Hayen, employee of Menzis and supervisor, placed a message on LinkedIn to ask healthcare professionals from the MsZ sector to participate in this study through an interview. A selection was made based on the responses and the inclusion criteria. Participants were recruited through direct invitation via e-mail.

Inclusion criteria

To be eligible to participate in this study, individuals must meet the following criteria:

- Be an employee of a Dutch hospital with knowledge about sustainability in the organisation and/or healthcare sales;
- The hospital has a contract with Menzis;
- The hospital engages in some form of sustainability initiative, such as reducing waste, improving energy efficiency, or promoting sustainable transportation.

In addition, hospitals were included regardless of the location (in or outside Menzis' core region (east of the Netherlands, including Twente and Groningen). The participating hospitals were a mix of general, top clinical and academic hospitals.

Data Collection

The survey is conducted using the programme Qualtrics. Participants were asked to complete the survey prior to the interview, in which they were asked about five questions.
The interviews will be conducted in a private and comfortable location, such as their own workplace or a secure video call via Microsoft Teams. Participants will be informed of the purpose of the study and their right to withdraw at any time. Oral informed consent will be obtained prior to the interview. The interviews will be audio-recorded, with participants' permission, and will last approximately 45 minutes. The interviews and transcriptions will be anonymised.

Survey

The survey questions are designed to have a prior understanding of the participant and the state of sustainability in his or her organisation. The questions were asked in Dutch, this being the main language of the interview and the native language of all participants.
The questions can be found in *Appendix A. Preparation interviewees.*

Interview Questions

The interview questions were designed to elicit detailed and rich responses from participants regarding the existing payment models and the state of sustainability within the hospital. The interviews were conducted in Dutch.
With the interview questions the aim is to investigate the utilization and extent of implementation of the aforementioned payment models, as well as the level of integration of sustainability within these models. Additionally, it examines the current sustainability initiatives in the studied context, evaluating the extent to which they prioritize the reduction of primary resource usage, the promotion of circular practices and how much priority sustainability has within their hospital.

Questions will be open-ended and will cover the following topics:

- Sustainability;
- Payment models;
- Relationship with healthcare insurer and future initiatives.

Examples of interview questions include:

- How is sustainability made visible within the organisation? And how do you encourage sustainability in the organisation?
- Is current funding affected by agreements with healthcare insurers?
- How do you see the healthcare insurer's role regarding sustainability?

For a full overview of the interview topics, see *Appendix B. Interview topics.*
The interviewer will also use probes and follow-up questions to elicit more detail and clarification.

Data Analysis

The survey was analysed using the program Qualtrics. The interviews are transcribed verbatim and analysed using a thematic analysis approach. Amberscript is used for the transcription. The data is inductively coded to identify key themes and patterns. The coding is done using Atlas.ti. The codes are grouped into higher-order themes and the relationships between themes were explored. The used codes can be found in *Appendix C. List of codes.*
The quotations from the interviews used in this study are translated to English and the codes were checked by a second person (A. Hayen) to preserve interpretation of the quotations.

Ethical Considerations

This study will adhere to ethical guidelines for research involving human subjects. Informed consent is obtained from participants, and their confidentiality and anonymity will be maintained throughout the study. Participants will be informed of their right to withdraw at any time. Any potential risks to participants will be identified and minimized. The study has been approved by the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente.

Focus group

To examine and reflect the results from the interviews a focus group was organized to analyse the experiences of the healthcare professionals and employees of the hospitals interviewed. To limit the time investment for participants, the choice was made to organise one session with one group of participants. Data is collected through group interaction with the participants. The discussed topics were the same as in the interviews. The session is audio-recorded, with participants' permission.

The focus group is a representation of stakeholders for this study. The focus group consists of participants who did not participate in the study as an interviewee and represent their professional group, for example the Ministry of Health, Welfare and Sport.
The focus group was an online Teams meeting scheduled for 1-1.5h.

Results

The findings of this study are categorized into three sections: the responses obtained from the short survey, the analysis derived from the interviews conducted and the findings from the focus group.

Survey

Sixteen replies were received using Qualtrics from the same ten hospitals as the interviews. This means that for some hospitals, multiple people from that hospital completed the survey.

The sixteen participants from the survey had the following functions: coordinator sustainability (n = 5), manager facility healthcare (n = 1), healthcare sales (n = 6), head Green Team OR and nurse anaesthetist (n = 1), doctor in training (n = 1), head of logistics (n= 1), urologist (n = 1).

The experience they had with sustainability differed from sustainable purchasing in the hospital to being responsible for sustainability within the organisation.

The following initiatives were given as sustainability initiatives within the organisations: collection of blue wraps (packaging material surgical instruments), reduction of medical products, reusable blankets, coffee cups, reusable clothing, reduce anaesthetic gases, waste sorting, recycling resources, replacing disposable plastic laryngoscope blades with reusable metal, replace intravenous paracetamol with tablets, increase awareness around sustainability, reducing gastroscopy by means of better indication, reuse medication, dose optimization, reduce the use of personal protective equipment and draw up a multi-year waste plan.

The participants expressed various funding needs from the healthcare insurer, including:

- Urine bags for collecting contrast fluid.
- Technical installations.
- Initiatives supported by a favourable LCA, indicating that transitioning to or reverting to reusable materials is both environmentally preferable and compliant with relevant laws and regulations.
- Green financing or a surcharge for capital costs from the healthcare insurer.
- Funding for the project or transition organisation as requested by the green deal.
- Preference and financial support from healthcare purchasers for sustainable options.
- Recycling of incontinence materials and their associated processes.
- Replacing disposable sterile surgical gowns with reusable textiles.
- Longer consultation times and evaluating their impact on reducing the need for additional diagnostics.
- Reusing medication whenever feasible.
- Shredding hard PET packaging with various compositions.
- Initiatives aimed at reducing the use of disposables and improving the sustainability of healthcare facilities.

Semi-structured interviews

In the period April-May 2023 the interviews were conducted with the several hospitals, shown in *Table 2*. The message on LinkedIn received 79 responses with 49 names of individuals being mentioned. Based on these responses, a selection was made out of the 49 individuals resulting in a final selection of 20 individuals.
20 participants were invited, 18 participants participated in 11 interviews from 10 hospitals.

	Name hospital	**Location**	**Number present from hospital**	**Function interviewees**
1	Rijnstate	Arnhem	3	• Sustainability coordinator • Healthcare sales

				• President Green Team OK
2	Haaglanden Medisch Centrum	Den Haag	2	• Urologist + member Green Team, • Healthcare sales
3	Medisch Spectrum Twente (MST)	Enschede	2	• Program coordinator Sustainability MST • Healthcare sales
4	Radboud UMC	Nijmegen	2	• Member Green team, AIOS MDL • Healthcare sales
5	OLVG	Amsterdam	2	• Chief logistics • Manager logistics
6	St. Jansdal	Harderwijk	2	• Sustainability coordinator • Healthcare sales
7	Hagaziekenhuis	Den Haag	1	• Surgeon + member green team
8	Flevoziekenhuis	Almere	1	• Manager facility healthcare company
9	Maasstad Ziekenhuis	Rotterdam	1	• Program manager sustainability
10	St. Antonius	Nieuwegein	2	• Sustainability coordinator • Healthcare sales
Total			18	

Table 2, overview group of participants

Data saturation was achieved at interview number eight. From that interview, the main themes of the answers were repeated.

For the analysis 69 codes were used to code the interviews divided into three code groups with their own colour: 'sustainability' (green), 'payment' (yellow) and 'other' (blue).
The code group 'sustainability' contained 21 codes, the code group 'payment' contained 22 codes and the code group 'other' contained 28 codes. This results in 71 codes, which means that two codes are placed in two groups.
A total of 1093 quotations, highlighted sections of text, were made in 11 transcriptions. A piece of text was highlighted when it matched with one or more codes from the list. Multiple codes can be used within a quotation. Each document had an average of 99 quotations. The transcription of Rijnstate has the most quotations with a number of 184 and the transcription of Radboud has the fewest quotations with a number of 57. The length of quotations in text varies from one transcription to another and varies from one phrase to several sentences.
The first five codes of each topic are discussed and explained below.

Thematic analysis

Sustainability

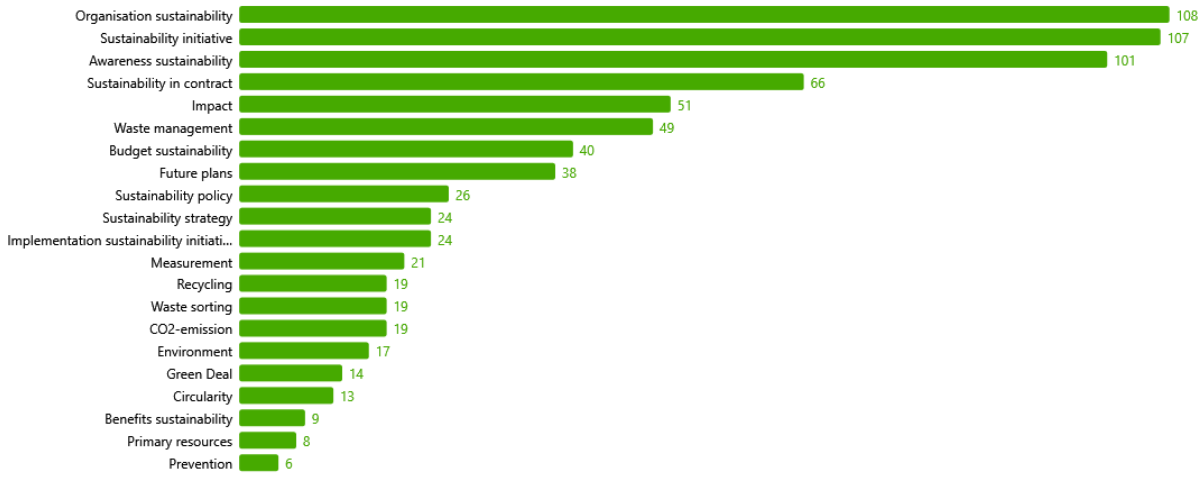

Figure 8, bar chart codes 'sustainability'

From the thematic analysis, as seen in *Figure 8* the following five codes emerged as the most frequently used: 'organisation sustainability', 'sustainability initiative', 'awareness sustainability', 'sustainability in contract' and 'impact'.

1. Organisation sustainability

Diverse organisational approaches to sustainability in hospitals: unveiling variations in implementation.

In each interview, participants were asked about how sustainability is organized in the hospital. The answers to this question were marked with the code 'organisation'. Every hospital had some form of organisation for sustainability. The answers revealed that all hospitals had a green team or a working group dedicated to sustainability initiatives within the hospital. These teams generate ideas and ensure their implementation. Decision-making processes varied among hospitals. In six hospitals, the sustainability coordinator had decision-making authority, while green teams were allowed to make decisions to a certain extent, such as up to a specific budget limit. These decisions mainly involved costs that needed to be paid.

Out of the ten interviewed hospitals, seven had an official sustainability coordinator. A detailed overview is provided *in Appendix E.* Organisation sustainability In all hospitals, the board of directors ultimately held the responsibility for the initiatives implemented in the hospital. Most green teams or working groups had no direct contact with the board of directors. They communicated information regarding sustainability to the board through an intermediary to keep the board informed about the latest developments in this area. Of the hospitals interviewed, only one hospital-wide green team had direct contact with the board of directors. This board is often informed by, for example, a member of the green team joining their meeting or vice versa.

"Interviewer: How is your contact with the board of directors?

Chairman of the Green Team: I don't have any contact with them."

***

"We are, of course, a group of volunteers."

***

"We have a hospital-wide green team. It started two and a half years ago under the leadership of the board of directors, with a sustainability ambassador for each department. To further promote sustainability and ensure that finances are not always a hindrance, the board of directors has established a sustainability fund. This allows us to implement initiatives that are not immediately profitable or cost-neutral, and the initial costs or one year's usage costs are covered. After that, the department must include it in its own budget."

***

"We would like to have a coordinator, so that you have a central point in the hospital who coordinates everything and serves as a contact person for sustainability questions."

Therefore, while each hospital had a form of organisation for sustainability, the structure and formal implementation varied among the hospitals. Participation of employees in sustainability initiatives was mainly voluntary, such as being part of a green team or participating in plastic recycling efforts within the department. One hospital confirmed in the interview that they are a group of volunteers. Another hospital had an official formal structure with a direct link to the board of directors, led by a sustainability coordinator. In several conversations, it became clear that coordination is a desired aspect of sustainability organisation.

2. Sustainability initiative

Sustainability initiatives in Dutch hospitals: hospitals copy best practices from each other.

Various initiatives are being implemented within the organisations. The initiatives mentioned in the interviews, marked with the code 'sustainability initiative,' focus on primary resource use and circularity. Many of the examples that emerged indicate that hospitals are implementing similar initiatives, suggesting the adoption of best practices from one another.

This is confirmed by the example of cellulose mats at one hospital, where the Santeon collaboration is exploring a collectively more environmentally friendly alternative. Another hospital also emphasizes the value of knowledge exchange within the Santeon collaboration. The first mentioned hospital highlights the importance of avoiding competition in sustainability with other hospitals, enabling free sharing of information to facilitate mutual progress and advancement. Additionally, ideas are frequently shared within professional associations and national organisations such as the Dutch Healthcare Authority, where sustainability working groups and meetings specifically focused on sustainability in healthcare take place. Participants from multiple hospitals join these types of consultations.

Several examples that were frequently mentioned include the establishment of 'green teams', replacing disposable operation room (OR) gowns with reusable ones, collecting and recycling blue packaging, replacing cellulose mats with reusable ones, replacing anaesthetic gases, monitoring air quality in operating rooms, and using urine bags after administering contrast agents to patients.

"I will engage with other hospitals because together we are stronger and can go further than if we try to solve it alone."

Other examples mentioned, although less commonly highlighted, include collecting plastic waste, separating waste, avoiding unnecessary use of equipment or healthcare supplies, replacing disposable instruments with reusable ones, lowering the active setting of infusion pumps so less is needed and

different (and less) infusion bags can be used, reducing personal protective equipment, developing a mobility plan, reducing meat consumption, sustainability meetings, conducting campaigns and the 'Freezer' Challenge where hospitals' use of freezers is scaled back.

The way initiatives are coordinated varies per hospital and the organisational structure regarding sustainability. However, in general, ideas are often presented to the sustainability coordinator or to one of the 'green teams'.

3. Awareness sustainability

Sustainability awareness more present at younger healthcare professionals and fostered by communication.

The importance of awareness is recognized as a crucial factor in motivating employees on the work floor to take action. Responses in which awareness played a role, both implicitly and explicitly mentioned, have been coded as 'Sustainability Awareness'. Awareness of sustainability is not always widespread within the organisation and can vary over time. For example, a hospital indicated that particularly young doctors who have just completed their training come up with numerous ideas. Furthermore, another hospital claims that sustainability is not yet a priority for the senior specialists in staff meetings, as their focus is mainly on financial aspects and quality considerations.

> *"I regularly have a new trainee doctor (AIOS) at my door wondering why we haven't implemented certain things yet. They then come up with a whole list of reasons why we should do that. The intrinsic motivation is definitely there."*

Internally, employees gather regularly, such as planned meetings within the sustainability network in a hospital, which prioritize knowledge exchange. Employees are encouraged to contribute their own ideas. Two hospitals note that in particular the younger generation of employees critically challenge their employers with many sustainability-related questions and are enthusiastic in the topic.

> *"It is remarkable how sustainable all trainee doctors or non-trainee doctors are. One of the medical specialists also told me that in the education of these young doctors, prevention is much more explicitly included in the curriculum. We didn't have that at all in our education."*

In addition, an interviewee reported that sustainability is now included in the Hippocratic Oath for doctors in the hospital. In the oath, doctors declare to provide meaningful and efficient healthcare.

> *"The Hippocratic Oath has been rewritten, adding the following: the doctor must handle resources and materials consciously in the context of sustainability."*

Even though awareness was considered low, especially among older doctors, the participants noted that it is increasing in the hospital setting. This is witnessed by the fact that sustainability is receiving increasing attention within hospitals, mentioned by interviewees. For example, the sustainability coordinator of an interviewed hospital is being invited more frequently to speak about sustainability, and the appointment of a sustainability coordinator in another interviewed hospital has been accompanied by the establishment of more green teams. As mentioned earlier, internal meetings are held in hospitals to exchange knowledge and establish connections in the field of sustainability. These initiatives contribute to the enhancement of sustainability awareness within the organisation. Moreover, at least seven hospitals have set up intranet pages or similar platforms for internal sustainability initiatives. The provision of a centralized repository for sustainability information facilitates accessibility and contributes to employees' awareness of sustainability practices. The interviewees could not provide a concrete answer to the question of how many people within the entire organisation are involved in sustainability, as this often was not clear or not known.

4. **Sustainability in contract**

Prioritizing sustainable practices is necessary.

In the interviews, the role of healthcare insurers in sustainability initiatives and the extent to which these initiatives are already embedded in current contracts was explored. The responses to this question have been labelled with the code 'Sustainability in contract'.

Since this year, sustainability aspects have been considered in the annual negotiations and have thus also been included in the contracts. Currently, the sustainability aspects in the contracts often consist of a few sentences, which was considered a small part by the interviewees. An example of this is the CO2 roadmap, which is required by almost every healthcare insurer as evidence of the hospital's sustainability. The CO2 roadmap outlines the planned measures, expected CO2 reduction, and the necessary investments for achieving sustainability goals. The roadmap includes all buildings of the healthcare institution, both owned and rented. The condition in the contract is that the hospital must be able to provide this CO2 roadmap. The absence of a CO2 roadmap currently results in minimal or no financial consequences, according to healthcare sales.

"The current passages in the contract, they are only five lines and that is actually quite simple."

Hospitals are sceptical about concrete agreements regarding sustainability in contracts with healthcare insurers. As a hospital, they wish to maintain a certain degree of autonomy in terms of operations within their organisation, and currently, they have doubts about whether this autonomy will be safeguarded when agreements are formalized. They express that they want to be able to decide for themselves how a goal should be achieved or how to execute something.

Another issue that receives scepticism is the situation that if a hospital achieves savings as a result of sustainability initiatives, which quite often means that these hospitals provide less healthcare. The respondents indicate that this will make some healthcare insurers reduce their hospitals' budget for the following year. This is counterproductive within the framework of sustainability, as the hospitals intend to use the saved resources for new sustainability initiatives. The interviewees state that they want to see agreements in the contracts on how savings flow back to the hospital, so that they can allocate them to new sustainability initiatives.

"What we are a bit wary of is that we may not be allowed to spend those savings at our own discretion. Especially that healthcare insurers may impose different requirements than what the hospital would prefer."

"What happened on our side is that the healthcare insurer says: we have seen that you can perform two million fewer endoscopies so we will deduct two million from your budget."

Hospitals mainly recognize opportunities in multi-year agreements, as sustainability is better suited for such an approach. It often involves long-term goals that cannot be achieved within one year. A frequently mentioned time frame during the interviews for this is 3-5 years.

5. Impact

Some uncertainty surrounding the impact of sustainability initiatives in Dutch hospitals.

The code 'impact' is mainly used to indicate the effect or potential effect of sustainability initiatives. Additionally, discussions are held on how this impact can be realized. For example, a hospital emphasizes that even small steps can be important for achieving results and have impact with the hospital.

> *"In terms of sustainability, I think that all the small steps you can take should be implemented."*

The interviews reveal that the expected impact is not always easily measurable, and the magnitude of the impact is not always crucial. It is about the considerations of how to ultimately achieve the desired effect. For instance, a sustainability coordinator mentioned that some initiatives may not have a significant impact but still are important for the foundation of the organisation. For example, consider plastic separation. It may have a relatively low impact, but since employees often do it at home, it would be strange to overlook this small component as a hospital that focuses on sustainability.

> *"Plastic separation is not something with the highest impact, but because everyone does it at home, it is also something that you need to have in your organisation."*

As previous mentioned by interviewees, the quantifiable impact of sustainability initiatives, particularly in relation to CO2 emission reduction, is not always evident or well-defined. The sustainability of material reuse is not solely determined by the act of reusing itself, but also necessitates careful consideration of various factors, including the origin of the material, the cleaning processes involved, and the additional substances required for its utilization. Decisions on which initiative to adopt are currently mainly based on what is proposed, how much it would cost, and whether it fits within the budget with the expected potential savings.

> *"What we implement now mainly depends on what departments propose, what they want to work on, or what we know from other hospitals, for example, where there have been positive experiences. We don't have a ranking of initiatives with the highest impact. It's just not known."*

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> *"I think we could do more if we could just allocate hours to people."*

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> *"In general, reusable is better than disposable, but 99 percent of the products do not have an LCA available. You can hire expensive consultancy firms to determine, for example, the CO2 footprint of your hospital, or make the necessary calculations internally, but this takes time and money. I don't think we have that time, so we just start."*

Other aspects

The remaining codes address more detailed topics, such as waste management, policies and/or strategies, or the implementation of initiatives. Future plans are discussed by hospitals, which will be explained later under the code 'opportunity'. Many of these codes are mentioned in combination with the above-mentioned codes and can be somewhat subsumed under them. For example, waste management is often part of the initiative of plastic separation.

Payment

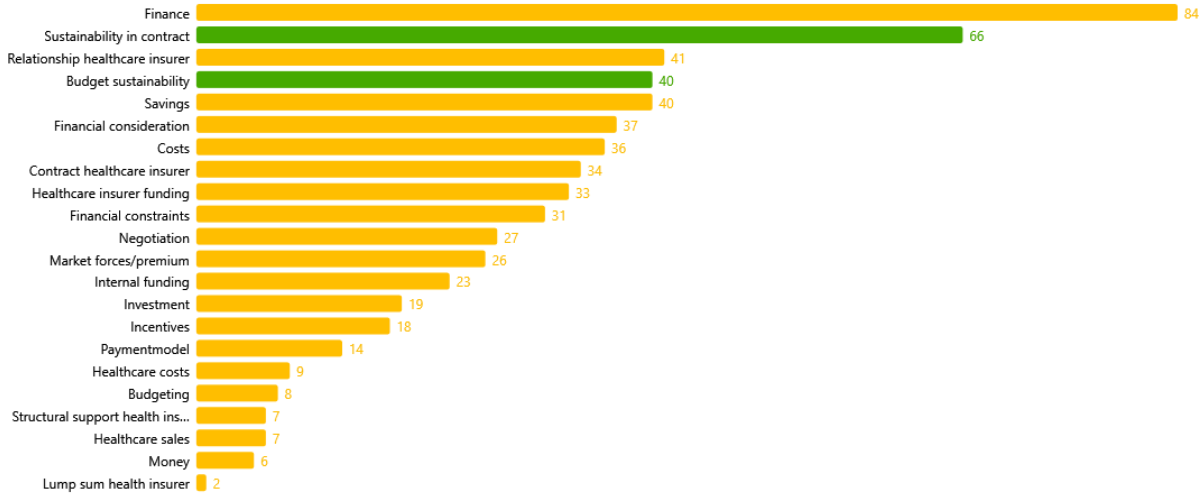

Figure 9, bar chart codes 'payment'

From the thematic analysis, the following five codes, *Figure 9,* emerged as the most frequently used within the theme payment: 'Finance', 'Sustainability in contract', 'Relationship healthcare insurer', 'Savings' and 'Budget sustainability'. Two of the five codes also appear in the sustainability theme, making them part of two themes. The colour is green because these codes primarily fall under the 'Sustainability' theme. This section will highlight the financial aspect of these codes.

1. Finance

The vital role of financing in driving sustainability initiatives in Dutch hospitals.

The answers marked with the code 'Finance' provide information about financial aspects. Financing plays a crucial role in the implementation of sustainability initiatives. Currently, the main sources of income for hospitals come from healthcare insurers and the government. Whether the hospital has sufficient resources to carry out initiatives depends on how these funds are internally redistributed. According to the interviews, sustainability initiatives are mainly financed from the budgets of the involved hospital department(s). For larger investments, approval is usually required from the hospital's board of directors or an investment committee, for example. Each hospital indicates that there are insufficient financial resources available for sustainability initiatives.

The decision to accept or reject an initiative is based on criteria established by the hospital itself. These criteria mainly concern the costs and benefits for the hospital, as well as the ultimate impact of the initiative.

> *"In principle, everything that needs to be financed now is arranged by the department itself."*

One out of ten hospitals has set up a sustainability fund, marginally based on the financial results they achieve in a year. This allows initiatives that are not immediately profitable to still be implemented.

2. Sustainability in contract

Making sustainability a priority in the contracts with healthcare insurers.

Previously, sustainability in contracts with healthcare insurers has been discussed. This section further examines the financial arrangements within these contracts. The previously provided quotations remain unchanged.

Currently, there is no specific provision regarding financial compensation from healthcare insurers to hospitals that carry out sustainability initiatives. Yet healthcare insurers often have to agree to large investments by a hospital, such as the construction of a new hospital building, because banks will not provide a loan otherwise. Concrete agreements regarding this are not (yet) recorded in the contracts.

Hospitals provided a number of suggestions to incorporate sustainability into their contract with the healthcare insurer. One of these suggestions is that hospitals would like to see that the savings they achieve can be retained for new investments and that the budget they receive from the healthcare insurer in the following year is not reduced due to the savings they have realized.

The desired financing options from healthcare insurers range from a one-time investment for start-up or transition costs to structural support. A one-time investment is often considered desirable when large amounts need to be spent at once, such as the purchase of new equipment. On the other hand, structural support is often desired for a surcharge per patient for the use of specific materials. In the context where hospitals incur additional costs per patient, it is plausible that the associated benefits may be distributed across other areas within the healthcare system or society. An example is the provision of urine collection bags to patients after a CT-scan so that no radioactive substances enter the sewer.

Furthermore, in some interviews, it is indicated that, regarding how sustainability should be included in the contracts, money can be specifically reserved or allocated to be deployed in the right place within the hospital. One hospital expresses a preference for not having a separate fund for sustainability, but that sustainability is a requirement for investment:

> *"I am in favour of always labelling the specific money, whatever it is intended for. So, a sustainability committee does not receive unlabelled money."*

Diverse perspectives and dissenting opinions regarding this matter are elaborated upon in the paragraphs below.
Not every hospital saw possibilities in labelling funds, as exemplified in the quote below. Determining where money should go is difficult to achieve in a hospital as a healthcare insurer.

> *"We can often make good agreements with healthcare insurers regarding one-time extra funds. And when it comes to structural higher costs, it becomes difficult. Then I see little possibilities there."*

3. Relationship healthcare insurer
Optimizing hospital-insurer partnerships: fostering collaboration and sustainability in Dutch healthcare.

The input from hospitals regarding the relationship with healthcare insurers is indicated by the code 'Relationship healthcare insurer'. Each relationship between a hospital and a healthcare insurer is unique, with the hospital engaging in individual negotiations with each healthcare insurer. It has been noted that the importance attached to sustainability varies among different healthcare providers and healthcare insurers. This creates challenges for hospitals in establishing overarching agreements on sustainability that apply to every healthcare insurer and hospital. Consequently, the implementation of sustainability initiatives faces greater challenges and obstacles.

> *"Interviewer: and from the other side, do you notice that healthcare insurers have this as a fixed component in the negotiation?*

Interviewee 2: yes, some healthcare insurers more than others, but that's always the case with any topic. There are healthcare insurers who consider this more important than others. You see differences there."

According to a healthcare salesman, congruence would be ideal in terms of sustainability, with market leaders taking the lead in making certain agreements and other parties aligning themselves with this approach. In an ideal situation, all healthcare insurers would exhibit the same behaviour in order to consolidate resources for the purpose of realizing the envisioned sustainability initiatives within hospitals.

Healthcare insurers can play a connecting role among hospitals as they are involved with various hospitals. In the context of sustainability, healthcare insurers can be assigned the role of information provision and knowledge sharing. Furthermore, they could influence healthcare providers in their internal management in terms of sustainability through their control over the allocation of funds.

However, hospitals have concerns about agreements on sustainability with healthcare insurers, particularly fearing that the healthcare insurer may want to have too much say in the hospital's operations and the execution of this. This is mentioned in the quote below. However, no explicit mention was made regarding the allocation of a designated sustainability budget or the provision of labelled funds by the healthcare insurer.

"Interviewer: do you see a role for the healthcare insurer, given that it involves a large flow of money for the hospital?
Team leader: well, I don't know, because they would then want to have a say in everything, I think. With inspections to see if you're doing it right."

A healthcare salesman was willing to share information about their sustainability efforts with healthcare insurers but emphasizes the need for autonomy in their implementation and execution, similar to the agreements on healthcare utilization with healthcare insurers.

The respondents within the surveyed hospitals show no consensus regarding the approach to agreements with healthcare insurers and the extent to which these healthcare insurers should have control over the management related to sustainability.

4. Budget sustainability

The absence of dedicated budgets for sustainability in the majority of Dutch hospitals.

In each interview, it was asked whether there was a specific budget dedicated to sustainability and what it entailed, indicated by the code 'Budget sustainability'. It is found that there were no specific budgets for sustainability at the hospitals. The investments that needed to be made came from regular departmental budgets or, for example, from the budget reserved for major investments. To determine whether money should be spend, business cases are used, which calculate the expected returns and costs over a predefined period of time. At an interviewed hospital, the sustainability steering committee approves or disapproves proposals for significant amounts of funding. Amounts that exceed a department's budget.

"The business case must always be sound, so it only works if the initiatives do not have costs or do not cost too much money and preferably generate revenue."

There was only one hospital in this study that had some form of sustainability budget, having a sustainability fund. This fund is managed by the hospital-wide green team, who decides whether to approve the proposals made for a sustainability initiative. The criteria they use are that it should

contribute to sustainability within the organisation based on the established pillars, and it should be clear what it will yield. The fund is marginal compared to the total hospital budget.
The inclusion of sustainability as a requirement is mentioned in several interviews, for example, as a condition in an investment plan or in transition funds this year. According to the interviewees it should become a structural item, just like quality and working conditions for agreements and contracts.
The rates currently agreed upon with healthcare insurers are focused on the core activity of the hospital, which is treating patients. Sustainability is hardly reflected in these rates, which means that the resources must come from elsewhere within the hospital to finance sustainability initiatives.

5. Savings
Challenges arise in retaining savings from sustainability initiatives in Dutch hospitals.

In ten out of eleven interviews, it is indicated that savings are realized through ongoing sustainability initiatives, as identified by the code 'Savings'.
Savings are achieved by using less or different materials, as well as by avoiding or altering healthcare provision. For example, a current study shows that not everyone requires an endoscopy when they got a longer consultation. Further research is needed to make this possible, and therefore, the aforementioned hospital is currently conducting a pilot project to use the savings realized from this initiative for new studies. This way, more evidence can be gathered to reduce unnecessary healthcare.

However, it is not always clear if these savings are allowed to be reinvested in new sustainability initiatives. For instance, the green team of the operating room in an interviewed hospital is allowed to reinvest savings in new sustainability initiatives.
Allocating the savings to a specific department is not always feasible, which makes it challenging to retain the savings for reinvestment.

When considering whether to adopt an initiative, cost-benefit analyses are always taken into account, although they are often based on rough estimates or assumptions. For example, another hospital has calculated that they can save €13,000 by replacing all disposable cups in the hospital.

Other aspects
Furthermore, the discussion touched upon how funding from healthcare insurers to hospitals could potentially be structured and what exact costs would be incurred. Market forces were also discussed, examining their influence on the current system and whether sustainability aligns with them or not.

Other

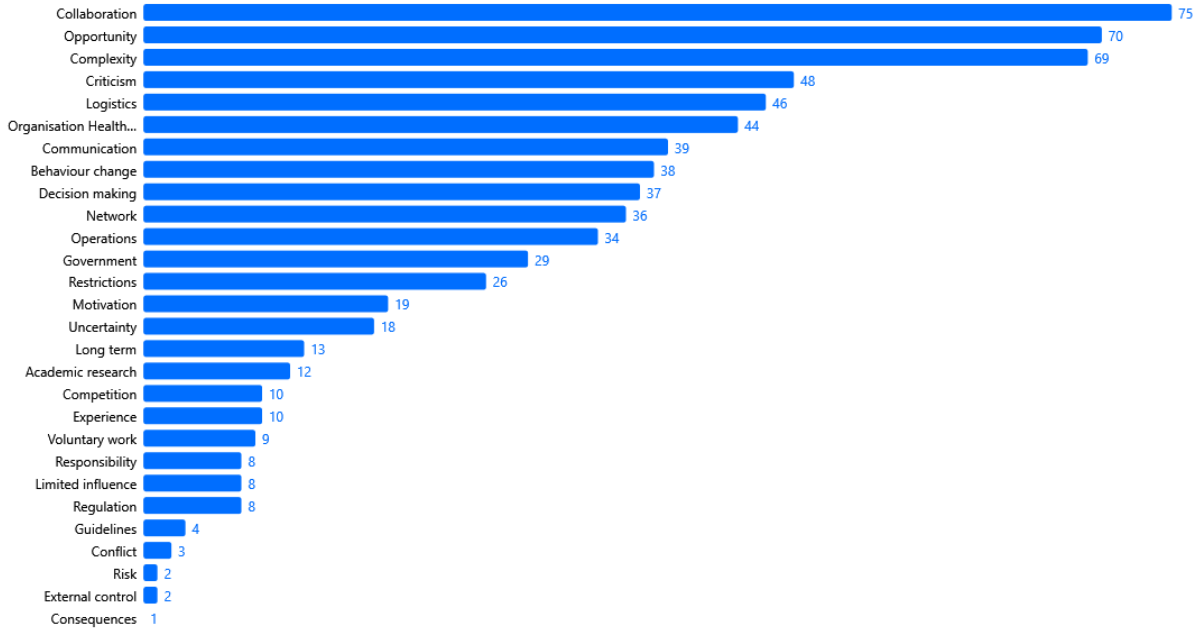

Figure 10, bar chart code 'Other'

The thematic analysis revealed the following five codes as the most frequently used within this theme, as shown in *Figure 10*: 'Collaboration', 'Opportunity', 'Complexity', 'Criticism' and 'Logistics'. These codes emerged during the coding process and were not predetermined.

1. Collaboration

Diverse collaboration initiatives promote sustainable practices in the Dutch healthcare sector.

'Collaboration' is the most frequently used code in this theme, referring to both internal and external collaborations. Examples of internal collaborations include departments within the hospital working together, a multidisciplinary green team, or a monthly meeting involving all green teams. An external collaboration could involve the network for operating room green teams, the Santeon association of seven top clinical hospitals, or the waste management company working with the hospital's waste working group.
This code was used in every interview, primarily discussing how collaborations are organized and established. In collaborations, new ideas are discussed, and efforts are combined to work on projects.

> *"With Santeon, we have several meetings throughout the year, and we have contact with the hospitals in nearby cities. Additionally, we are also part of the Green Care Alliance. The great thing is that we do not compete with each other, so we can freely share information."*

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> *"When the green team started, it consisted mainly of supporting departments. However, in the past year, we have succeeded in including representation from the nursing and medical staff in the green team."*

Not only internal and external collaborations were mentioned in the responses, but also the collaboration with healthcare insurers was discussed, with the healthcare insurer being seen as a partner, among others, in the sustainability issue.

"Of course, we are happy to share our knowledge, and we truly see them as partners. It's not about our demands or the healthcare insurer's demands; it's about a partnership."

2. Opportunity

Abundant opportunities for sustainability in the healthcare sector.

The code 'Opportunity' indicates potential opportunities for the hospital or healthcare insurer in terms of sustainability, as mentioned in the interviews.
The interviewees identified the following opportunities, in order of how often an opportunity is mentioned:

- The provision of investment funds or structural contributions by healthcare insurers as an opportunity for activities such as constructing new buildings or purchasing sustainable materials (n = 8).
- The possibility of public information provision and knowledge sharing on sustainability by healthcare insurers to hospitals (n = 5).
- The lobbying efforts of healthcare insurers in politics, government, the European Union, or the Dutch healthcare institute, particularly for adjusting regulations (n = 3). An example of this is modifying guidelines for hygiene and infection prevention.
- The option of labelling funds for sustainability purposes (n = 3).
- Increasing the availability of hours for staff to engage in sustainability (n = 3).
- Reduction in required healthcare was seen as a possibility through, for example, more extensive consultations that may show that a patient may not need an examination (n = 3).
- Providing funds for research on the climate impact of products or services, such as LCAs (n = 2).
- The need for a full-time sustainability coordinator as a valuable addition to the organisation of sustainability in hospitals (n = 2).
- Critically examine current protocols for material use in the hospital to promote conscious material management (n = 2).
- The establishment of multi-year contracts with healthcare insurers that define long-term objectives (n = 1).
- A "green checkmark" for healthcare providers delivering sustainable care (n = 1).
- The necessity of collaboration among all parties (industry, government, hospital, and healthcare insurer) (n = 1).
- Sharing patient information among hospitals to enhance efficiency in healthcare delivery (n = 1).
- Regional financing, aligning financial resources from healthcare insurers with the healthcare needs and population characteristics in the region of the respective hospital (n =1).

3. Complexity

Unravelling the complexities: challenges and complications surrounding sustainability in Dutch hospitals.

The code 'complexity' was used in ten out of the eleven interviews. The code is used to indicate difficulties experienced within the current healthcare system, both internally within hospitals and externally with other stakeholders.

The primary challenge mentioned pertains the costs and limited budgets, as well as the inhibiting influence of existing protocols and guidelines on sustainability initiatives. The interviewees argue that sufficient evidence is necessary to implement changes in the healthcare process, which is not always readily available.

Many sustainability initiatives require staff to work on them in their own time, limiting the available hours for sustainability. It is crucial that the commitment to sustainability does not compromise the primary healthcare process within the hospital.
A respondent states:

> *"These are initiatives that have no budget and are carried out through online meetings in our own time."*

Calculations or cost analyses are necessary to approve proposals. Currently, the impact of initiatives is often unknown, which complicates decision-making.

Certain staff members, such as sustainability coordinators, may not be easy to find within large hospital organisations. Communication, in general, is often seen as an area for improvement. Intrinsic motivation is important for individuals to achieve results.

Hospitals face dependency on partners in other sectors, such as pharmaceutical companies, who influence choices related to material use. Implementing new initiatives in a complex organisation like a hospital can present logistical challenges. For instance, introducing a system for separating plastics requires installing new waste bins and the responsibility of staff to empty them, which incurs costs.

> *"The problem is getting all stakeholders on board in the hospital and ensuring that things can be arranged."*
>
> ***
>
> *"All those waste bins we have, they need to be placed somewhere. There also needs to be someone coordinating the whole process around that one waste bag. Where everything used to go in one bag, now suddenly four bags need to be emptied. There needs to be clear labelling on the outside of the four bags indicating their contents because if they are all grey bags, downstairs you won't know which bin to throw them in. So, there is a whole process involved beforehand and afterward. And the bins need to be good and large enough."*

4. Criticism

Voices of concern: healthcare professionals raise criticism regarding sustainability in the healthcare sector.

The code 'criticism' indicates that some answers from the interviewees reflect criticism of the current state of affairs in the healthcare system.
It is evident that healthcare providers do not always find it pleasant to negotiate with individual healthcare insurers. They would prefer to see congruent behaviour among all healthcare insurers, which would make the negotiation process more efficient. Currently, agreements are made on an individual level with the healthcare insurers, each expressing their own interests.

> *"Then you don't have to make agreements with each individual healthcare insurer, but you make agreements with the market leader or the first and the second. And that is much more efficient"*

Furthermore, the organisational structure in terms of sustainability is subject to criticism from the interviewees. They see many possible improvements in terms of organisation along with criticism of

material usage, where products are often packaged in a lot of plastic. The interviewees believe that the government should take more responsibility for sustainability in healthcare.

"We don't really have a structure to coordinate things."

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"Why do you need 80,000 plastic sheets around a screw when I have to perform a fracture operation?"

5. Logistics

Navigating the complex logistics of sustainability in Dutch hospitals: a multifaceted challenge.

In order to implement sustainability initiatives, logistical capacity is required. The code 'Logistics' is used to highlight when logistical processes are mentioned in the answers. For example, in the area of waste management, various things need to be organized to enable waste separation.

A hospital generates a significant amount of contaminated waste, which needs to be taken into account in the logistical processes. Contaminated waste is often difficult to separate or recycle. However, not everyone in the hospital agrees with this approach as mentioned below in the quote.

"It is very difficult to change rules, and were we had a lot of trouble was with hygiene prevention. You have to be very strict with anything that has come into contact with a patient or body fluids, while that is nonsense. A lot of it is healthy fluid and does not contain disease-causing agents."

Sufficient logistical capacity must be made available in order to carry out sustainability initiatives. Optimizing logistical processes can reduce resource usage, thus reducing the environmental impact. With fewer resources, the amount of waste also decreases, and waste can be processed more efficiently, including recycling. Additionally, efficient transport route planning reduces the need for transportation movements.

Focus group

After conducting the interviews, it was decided to validate the results of the interviews in the form of a focus group. In which the following parties from the healthcare sector were invited and present: sustainability officer hospital, healthcare sales hospital, healthcare insurer, government, ZN, Dutch healthcare authority (Nederlandse Zorgautoriteit, NZa), employee of Ernst and Young and an academic.
A total of fifteen individuals were present at the focus group, of which three organised the focus group and twelve participated in the discussion. The focus group was in an online Teams meeting and the meeting lasted one hour.
Two topics were discussed: collaboration & knowledge sharing and payment. The selection of these topics was based on the outcomes of the interviews, aiming to establish connections among the interviews and the focus group. During the meeting, a range of ideas were collectively proposed, and a general consensus among the participants was reached. The ideas and comments will be presented in the following paragraphs.

Collaboration/knowledge sharing

The group discussion revealed that there are currently already many structures and organisations present in the Dutch society to bring people together within the healthcare sector in the area of sustainability. The participants mentioned however that it might be unclear for many which party is responsible for what. They recommended that this needs to be clarified. The participants opposed the idea of 'yet another central

coordinating body' as it was believed to most likely add to the chaos. Therefore, the emphasis should be placed on better involving organisations that have demonstrated a willingness to actively participate in sustainability initiatives, by clarifying what each organisation's tasks and responsibilities are.

Facilitating collaboration necessitates participation among stakeholders. A barrier that was identified during the focus group was that parties differ from each other in terms of proficiency in the domain of sustainability. Additionally, the focus group members agreed that collaboration could benefit from standardization. Members from the hospital sector indicated that health insurers not only differ from each other in terms of how they want to stimulate sustainability, they also monitor sustainability in different ways, causing high administrative burdens.

Payment

With regard to payment, the participants proposed a phased approach. Suggesting that healthcare insurers engage in negotiations with hospitals regarding a specific sustainability initiative to be implemented. In this context, an incremental payment model, such as P4P or a shared savings model, was considered appropriate. These models could effectively incentivize hospitals to focus on and successfully implement the targeted initiative. The incentives could take the form of direct rewards for the implementation efforts or direct rewards based on the resulting cost savings.

The healthcare sector was deemed the one sector that is future-proof (there will never be no demand for healthcare), which makes investing in this sector relatively safe. Participants highlighted the potential for increased investments from financial institutions, including banks and healthcare insurers. For instance, leasing arrangements for solar panels were proposed as a feasible avenue for such investments.

Placing sustainability as a priority is imperative for advancing its integration within the healthcare sector. Presently, other issues, such as collective agreements and staff shortages, tend to take precedence over sustainability in the short term according to the participants.

Conclusion

To give answer to the second sub question the main findings from the interviews and focus groups are summarized below.

What are the current initiatives in the hospital sector which have already been implemented regarding the reduction of primary resource use and increasing circularity in healthcare?
Several examples that were frequently mentioned include the establishment of 'green teams,' replacing materials by more sustainable alternatives (e.g. cellulose mats, anaesthetic gasses, reusable OR gowns), recycling (blue packaging), monitoring air quality in operating rooms, and using urine bags after administering contrast agents to patients.
Other examples mentioned include collecting plastic waste, separating waste, conducting campaigns, avoiding unnecessary use of equipment or healthcare supplies, replacing disposable instruments with reusable ones, lowering the active setting of infusion pumps and using different quantities of infusion bags, reducing personal protective equipment, developing a mobility plan, reducing meat consumption, sustainability meetings, and the 'Freezer' Challenge.

Two aspects are identified when answering the third sub question: '*Do current financial incentives stimulate the development and uptake of these initiatives, if not what are the underlying causes?*'
Initially, addressing the extent to which existing financial incentives promote sustainability initiatives, and secondly, examining the evidence supporting this claim.
At present, the encouragement of sustainability initiatives through financial incentives is limited due to various factors.
First, the incentives embedded within the contractual agreements between healthcare insurers and hospitals do not effectively reach the individuals involved in the implementation of sustainability initiatives within the hospital. As a result, the behaviour of the individuals involved is not aligned with these

agreements. Consequently, their efforts in advancing organisational sustainability are not accompanied by direct rewards.
Secondly, the hospitals' income is not contingent upon their degree of sustainability or the extent of implemented sustainability initiatives. This is because it is not incorporated into current contracts and hospitals are not financially rewarded for their sustainability efforts. This results in limited encouragement of sustainability through financial incentives.
Hospitals are incentivized to exhibit efficiency in healthcare expenditure to prevent a deficit in their financial balance. Ideally, this incentive should extend to promoting cost savings, such as reducing the number of treatments, which would in turn minimize resource utilization. At this moment, hospitals frequently face budget reductions by healthcare insurers in the following year if it is determined that they have achieved savings in the current year. This circumstance creates a disincentive for hospitals to reduce healthcare utilisation, as doing so would result in a net loss for them.
Lastly, the incentives must be focussed on rewarding the hospital for their performance with sustainability initiatives. This is to give hospitals the opportunity to prioritize sustainability in their business operations.

Thus, by addressing these factors, it becomes possible to leverage financial incentives as a means of fostering and incentivizing sustainability initiatives within the hospital setting.

Discussion

The goal of the study was to see if financial incentives can be included in contracts with healthcare providers in the hospital sector to encourage more circularity and thereby decrease the use of primary resources in healthcare. In this part we discuss and analyse the findings obtained from the survey, the interviews and the focus group.
We discovered several patterns and themes that emerged from the data and will draw conclusions.

In this thesis study, we investigated how payment models from healthcare insurers can incentivize hospitals to increase their sustainability. Rather than just paying for volume, payment models can be designed such that they promote cost-effectiveness or value instead. Payment models can also be designed such that the incentives that follow from it encourage sustainability. In our theoretical framework we provided a couple of examples, such as P4P models and shared savings models. The following part will give an answer to the last sub question: *'What payment model is best suited to stimulate sustainability in healthcare?'*.

With regard to the conditions and requirements for establishing future financial incentives or a suitable payment model, several options emerged from the collected data. We must first consider what is required or lacking in the present situation in order to implement such a payment model.
First, changing a payment model implies that one introduces new types of financial accountability into the system. As discussed in the paragraph about base payment models and incremental payment models. If hospitals are paid as a function of sustainability, a necessary requirement is that they are indeed able to assume full financial accountability for achieving sustainability goals (46). Otherwise, financial incentives will have no effect (or might even encourage risky behaviours to prevent losses) (47). The interviews revealed several implications as hospitals highlighted their reliance on different sectors such as the government and the industry. Even in cases in which hospitals cannot assume full accountability, however payment models can be designed as to limit the ensuing risk.

Secondly, the inclusion of financial incentives in contracts necessitates increased transparency and information sharing from hospitals to healthcare insurers in order to effectively assess compliance or outcomes. It is necessary for a healthcare insurer to be able to measure (respectively) whether the targets have been met by the hospital, the magnitude of cost savings and whether these are really the result of improved sustainability. However, the interviews pointed towards a prevailing reluctance among hospitals to grant healthcare insurers access or provide insights into their operational processes. Hospitals prioritize the preservation of operational autonomy and flexibility within their organisational frameworks. This resistance poses significant challenges or renders the establishment of such agreements and their subsequent incorporation into contracts difficult or unfeasible.

Thirdly, according to the respondents, healthcare insurers have the potential to fulfil a role in gathering best-practices implemented in hospitals with regard to sustainability. The primary reason for this is because the healthcare insurer has the unique position of having contact with every hospital. However, the key question revolves around the willingness of hospitals to also implement the best practices that will be found in this way (as hospitals also indicated the desire to remain their professional autonomy, as discussed above). Where resistance from the hospitals lies mainly in sharing information with the healthcare insurer.

A fourth issue which plays a crucial role in driving successful sustainability outcomes concerns behaviour change and awareness. From a sustainability perspective, prioritizing initiatives with the highest impact is optimal; however, to garner extensive support among employees, it is equally crucial to recognize and promote smaller-scaled initiatives that have a high workplace visibility (such as sustainable coffee cups) or that resonate with employees' sustainability practices at home. Another issue with respect to awareness, is that medical specialists often lack knowledge about the costs associated with the treatments they prescribe. Enhancing their understanding and awareness of costs can influence more sustainable choices while avoiding unnecessary expenditures. Promoting cost transparency, facilitated by healthcare insurers, can help healthcare providers make conscious decisions regarding the care they deliver. One potential strategy to achieve this objective could involve the mandatory implementation of a sustainability-focused

continuing education program for all healthcare professionals, which is in line with the inclusion of sustainability in the Hippocratic Oath. Sustainability is now incorporated in the education of the younger generation, but since the older generation has not been educated about sustainability, re-education might prove useful.

The fifth issue revealed from the interviews, is that cross-chain cooperation is needed among different stakeholders, including hospitals, government, industry and healthcare insurers. To foster the collaboration, the establishment of a cross-hospital green team would be recommended. Creating a cross-hospital green team offers a potential opportunity to establish a centralized entity responsible for overseeing sustainability practices in the healthcare sector of the Netherlands. Such a collaborative platform would facilitate the dissemination of information and best practices, ensuring accessibility and knowledge exchange among its members.
To foster collaboration among different sectors and medical professionals a value based system could be useful. Value based healthcare (VBHC) is a method introduced in 2006 (48). VBHC is a method of providing healthcare in which the practitioners get paid according to the outcomes of the patients' health, related to the P4P payment model and the shared savings model. Sustainability in hospitals could be measured in a similar way as with the VBHC model. When we compare the implementation of VBHC with the sustainability issues investigated, we see similarities (49), including: 1) relating the effectiveness of underlying practises to the outcomes, and 2) convincing medical professionals to use health outcomes to 'foster learning' between providers to boost the adoption rate of best practices. Trust is an integral part for creating such a learning community. Physicians and stakeholders must have mutual trust in one another and in each other's data in order to benchmark results. The interviews also revealed that trust is needed to encourage people to stay committed to sustainability. In contrast to punishing hospitals for not meeting targets, in the form of performance penalties, trust and rewards encourage the constructive use of data for quality development.
As mentioned above, sustainability efforts benefit from collaboration and the sharing of best practices and knowledge. A challenge we identify, however, is the competition among healthcare insurers and healthcare providers, which drives the delivery of high quality healthcare at competitive prices and sometimes by construction competition is at odds with collaboration. A disadvantage could be that partnerships among hospitals may confer a more advantageous market position, e.g. more towards a monopoly position, potentially granting them a competitive advantage in relation to other hospitals. This advantageous position, if leading to a monopolistic scenario, may negatively impact the cost and quality of healthcare services provided. In such scenarios, there is a potential for increased consumer costs.

Last, the adaptability of laws and regulations proves to be challenging. Laws and regulations are required to maintain the quality of healthcare. Making changes to existing regulations involves inherent risks and necessitates the approval of multiple stakeholders. As individual entities, hospitals often lack the necessary support to challenge existing guidelines. Healthcare insurers could engage in lobbying efforts at national and European levels to advocate for improved laws and regulations concerning for example material reuse and hygiene. Healthcare insurers can also foster collaborations among various stakeholders, for example with regional healthcare institutes in which they act as market leader.

The focus group showed us that a P4P or shared savings model could be a first step to take for healthcare insurers in designing a payment model in the area of sustainability. Primarily the healthcare insurers' focus should lie on rewarding the hospital based on their sustainability performance through the implementation of this payment model. By introducing an incremental payment model alongside the existing base payment model, the performance risk of the hospital is minimized. Since only a small part of its revenue will come from its performance on sustainability. Retaining the basic payment model serves to mitigate the additional risk for the hospital, as it ensures continuity in the current funding.
We use the agency theory to further elaborate and to optimize sustainability performance. According to the agency theory, it is desirable to align the interests of the healthcare insurer (agent) and the hospital (principal) as closely as possible, ideally encouraging shared objectives. In this context, it is essential for sustainability to be given equal priority by both healthcare insurer and hospital. Furthermore, due to the presence of information asymmetry, the healthcare insurer may not possess comprehensive awareness of

the hospitals' activities. Employing a standardized performance measurement model (P4P / shared savings) can serve as a potential solution, enabling the recognition and remuneration of hospitals' based on their achievements with the implementation of the according financial incentives. The R10 ladder could be used as a practical performance indicator within the incremental payment model, allowing performance to be measured based on the different stages included in the ladder.
Successful implementation of the proposed payment model necessitates several requirements including: a) a comprehensive definition of performance; b) the incorporation of advanced risk adjustment mechanisms; c) active engagement of hospitals in the implementation process; d) a preference for group-based incentives rather than individual incentives; e) regular and meaningful disbursements; f) a focus on absolute targets rather than relative targets; g) and ideally, the decoupling of the P4P or shared savings model from the base payment model (50). In addition to these requirements, consideration must be given to the current system in the healthcare sector characterised by competition between hospitals and the degree of overlap between hospitals in terms of the care provided (49). This may affect the implementation of the model, since the proposed model is based on shared information and knowledge, collaboration and a universally applicable definition of value.
The focus group members agreed on the design of a P4P model focused on a single initiative only. In that way, the hospitals can be directly incentivised regarding sustainability by healthcare insurers by starting small. Subsequently, following a successful implementation, the model can be scaled and extended to encompass additional initiatives.
The primary responsibility, and with that the interest, of a healthcare insurer is to procure appropriate care. Therefore, investments beyond the scope of this task are not directly within the domain of a healthcare insurer. For a hospital, it is crucial to have comprehensive knowledge of the available funds and their specific allocations in order to effectively manage resources and engage stakeholders with maximum efficiency.
In addition to incurring costs, it is noteworthy that sustainability initiatives can also yield savings, as previously mentioned. However, the issue of allocating these savings across different sectors in society has not been thoroughly addressed. This highlights the importance of effective communication and joint responsibility in striving for the sustainability objectives among all stakeholders, which is an issue to explore in future research.

The findings and points of discussion were presented to Wouter Bos, CEO of Menzis, in order to get to know his perspective on these findings. His viewpoint, and thereby that from Menzis, regarding this study is that sustainability is definitely an issue that deserves attention. The integration of sustainability into the existing workflow is gradually taking shape, presenting significant opportunities for further advancement in the years to come. Leveraging established networks, such as the dedicated sustainability team within ZN, serves as a valuable resource in this context. Wouter Bos recognized the potential of a shared savings model or P4P model; however, he also acknowledged that Menzis, as a healthcare insurer, cannot take the lead in this endeavour due to their current financial constraints. As a result of consistently losing the total number of insured for several years in a row.

Having explored the various possibilities, we can now answer the final sub-question regarding the most suitable payment model for effectively incorporating sustainability incentives. The proposed recommendation entails the utilization of either a P4P model or a shared savings model. Considering the current circumstances and the potential for future expansion, this approach is deemed most suitable.

Limitations

To further explore the subject matter in this study, it is crucial to consider the following key aspects during future research:

- The analysis and coding of the transcripts is performed by one reviewer. Preferably the analysis and coding is performed by two or more reviewers, to limit code inconsistencies. Code inconsistency may introduce variations and biases in the analysis, which could affect the validity and reliability of the findings. The inclusion of multiple reviewers is desirable to uphold a high level of data quality. With multiple reviewers multiple perspectives and insights are taken into account which may result in less risk of biases and higher validity of the study.

- The data collected consist of self-reported data as interview participants provided responses based on their own perspectives. This implies that the reliability of the collected data relies on participants' memory, perception, and willingness to provide accurate responses, which may introduce errors and biases (51). The representativeness of the study's sample is also a determining factor to consider.
- It is important to acknowledge that the quotes presented in this study have been translated into English, which may introduce variations in the interpretation of tone and expression compared to the original language used during the interviews.
- The subject of sustainability is multifaceted, and significant changes are occurring within the healthcare sector regarding sustainability. It is important to acknowledge that the present circumstances may differ from those depicted in this study upon its completion.

Strengths and contribution

In this section, the strengths and contribution of this master thesis are highlighted, emphasizing the impact and value of the study:

- Within this research, eleven interviews were conducted with a sample of ten hospitals and 18 participants, representing a subset of the 72 hospitals in the Netherlands. With data saturation achieved by the 8th interview as stated in the ***Error! Reference source not found.*** section, it is a nticipated that the findings derived from the collected responses provide a sufficient representation of the broader hospital landscape in the country.
- The quotes presented in this study have been checked by a second person. In order to ensure the accuracy and reliability of the quotes.
- To our knowledge, this kind of study has not been carried out before by a healthcare insurer in the Netherlands. Through the future dissemination of this research to relevant parties and participants, our objective is to enhance awareness regarding sustainability within hospital settings and underscore the potential role that a healthcare insurer can assume in facilitating this endeavour.
- This study enriches the knowledge basis for sustainable healthcare in the Netherlands by providing valuable insights, expanding the existing understanding, and addressing research gaps. The insights gained from this research can inform policymakers, healthcare providers, and other stakeholders in making informed decisions and developing strategies to promote sustainable practices within the healthcare system.

Conclusion

Based on these insights we now revisit our initial research question: *can financial incentives be included in contracts with healthcare providers in the hospital sector to encourage more circularity and thereby less use of primary resource?*

The payment model and agreements in future contracts can be oriented towards promoting circularity and thereby minimizing primary resource utilization in the hospital sector. As addressed in the theoretical framework, waste management could be an ideal area to prioritize as it significantly contributes to the hospital's environmental impact. Moreover, numerous initiatives addressing waste management already exist, making it feasible to implement measurable actions in this domain. However, the payment model can also be structured to encompass the additional objectives outlined in the GDDZ.

Currently, the prevailing circumstances do not favour the integration of sustainability within existing hospital payment models. For instance, among other things, there are still big differences between hospitals, the organisation often does not yet have a fixed structure and money flows are difficult to regulate for sustainability in the hospital. A payment model involving a shared savings or a P4P model wherein the accrued savings are retained by the hospitals and the payments are based on the value of the sustainability initiatives implemented, may support sustainability operations. By linking savings achieved through sustainability initiatives to the hospital's financial outcomes, there is a direct correlation between sustainability efforts and financial benefits. A shared savings model also fosters a collaborative approach between the hospital and other stakeholders, such as healthcare insurers or government entities. Adopting for example a budgetary approach is less favourable as there is an increased likelihood of these funds being pooled generically due to unlabelled money. When money is not earmarked, it is more likely to end up somewhere else without being spent on sustainability.

Thus to conclude, financial incentives can be included in contracts with healthcare providers in the hospital sector where the recommendation is to implement an incremental model such as a P4P model or shared savings model. The focus is placed on incentivizing hospitals while keeping the base payment unchanged, thereby establishing a foundation for promoting sustainability initiatives.

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Appendix

Appendix A. Preparation interviewees

Short questions as preparation for the interview and some extra quantitative data to analyse for the thesis research. Using Qualtrics

Preparation will approximately take 15-30 minutes.

1. Demographics (function, location hospital, experience in the area of sustainability (max 3 sentences)).
2. Name three initiatives currently taking place within your organisation around sustainability in the context of circularity and reduction of primary raw material use that you expect to have the most impact within the organisation.
3. Sending Waste Hierarchy with mail, asking them to consider where to place current initiatives in the waste hierarchy.
4. 'picture Miller', in the picture are different payment models with a brief explanation. Which do you think best suits current sustainability initiatives to reward/incentivise the healthcare provider to become more sustainable?
5. If you could have one initiative funded by a healthcare insurer, which one would it be and why?

Question to send to more people, next to interviews using Qualtrics:

1. Demographics (function, location hospital, experience in the area of sustainability (max 3 sentences)).
2. Name three initiatives currently taking place within your organisation around sustainability in the context of circularity and reduction of primary raw material use.
3. If you could have one initiative funded by a healthcare insurer, which one would it be and why?

Appendix B. Interview topics

Sustainability

Coming back to initiatives they mentioned in preparation.

- Status initiative (just an idea or fully implemented in organisation? Impact of the initiative? (e.g. financially or environmental) Role of healthcare insurer?)
- Place in waste hierarchy of the current initiatives
    - Show model of Waste Hierarchy to help them understand.
    - At what level did the organisation start and how does the initiative contribute to becoming more sustainable/step up in hierarchy?
- What initiatives ensure of getting a step higher in the waste hierarchy?
- Why are these the initiatives with the highest expected impact?
- On what basis are such initiatives chosen to be implemented?
- Awareness of sustainability within the organisation.
    - Is sustainability a requirement or topic to be offered in healthcare sales/purchasing?
    - How is sustainability made visible within the organisation? And how do you encourage sustainability in the organisation?
    - Governance sustainability within organisation.
- How many people are involved in sustainability within this organisation? Direct (sustainability within responsibilities of the job) & indirect (is expected to separate waste or turn down the heating, for example, but not directly responsible for sustainability in the organisation)

Payment models

- Is there budget for sustainability initiatives within this organisation?
    - How is a team funded?

    - Who decides what happens?
    - Is current funding affected by agreements with healthcare insurers?
- How is payment currently regulated?
    - And current barriers, not only financially but also more broadly
- In preparation, I asked you to look at the different payment models, could you comment on this? Which model fits best and why?
- If you could have one initiative funded by a healthcare insurer, which one would it be and why? Further explanation.

Future initiatives/relation healthcare insurer

- How do you see the healthcare insurer's role regarding sustainability?
    - What should they do now in their relationship to healthcare providers that they are not currently doing?
    - Are healthcare insurers already involved in this topic with healthcare providers, according to your opinion and perspective?
- Are there initiatives related to sustainability that are high in the priority list but for which there is currently no budget/capacity?

Appendix C. List of codes

Code

- Academic research
- awareness sustainability
- Behaviour change
- Benefits sustainability
- Budget sustainability
- Budgeting
- Circularity
- CO2-emission
- Collaboration
- Communication
- Competition
- Complexity
- Conflict
- Consequences
- contract healthcare insurer
- costs
- Criticism
- Decision making
- Environment
- Experience
- External control
- Finance
- Financial consideration
- Financial constraints
- Future plans
- Government
- Green Deal
- Guidelines
- Healthcare insurer funding

- healthcare costs
- healthcare sales
- impact
- implementation sustainability initiatives
- incentives
- Internal funding
- Investment
- limited influence
- Logistics
- Long term
- Lump sum healthcare insurer
- market forces/premium
- measurement
- Money
- Motivation
- Negotiation
- Network
- Operations
- Opportunity
- Organisation Healthcare
- Organisation sustainability
- Payment model
- Prevention
- Primary resources
- Recycling
- Regulation
- Relationship healthcare insurer
- Responsibility
- Restrictions
- Risk
- savings
- Structural support healthcare insurer
- sustainability in contract

- Sustainability initiative
- Sustainability policy
- Sustainability strategy
- Uncertainty
- voluntary work
- Waste management
- Waste sorting

Appendix D. Visualisation codes

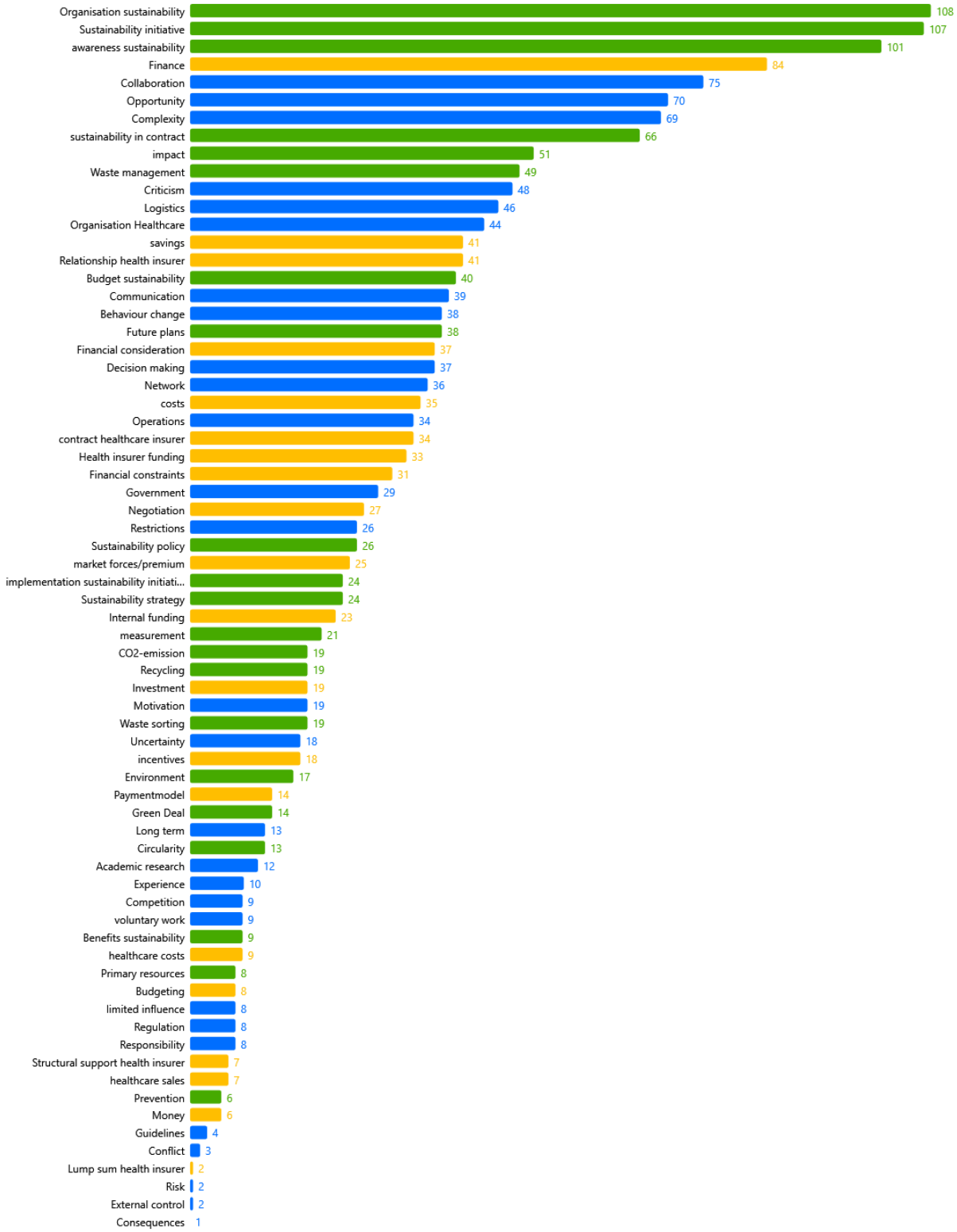

Figure 11, bar chart all codes

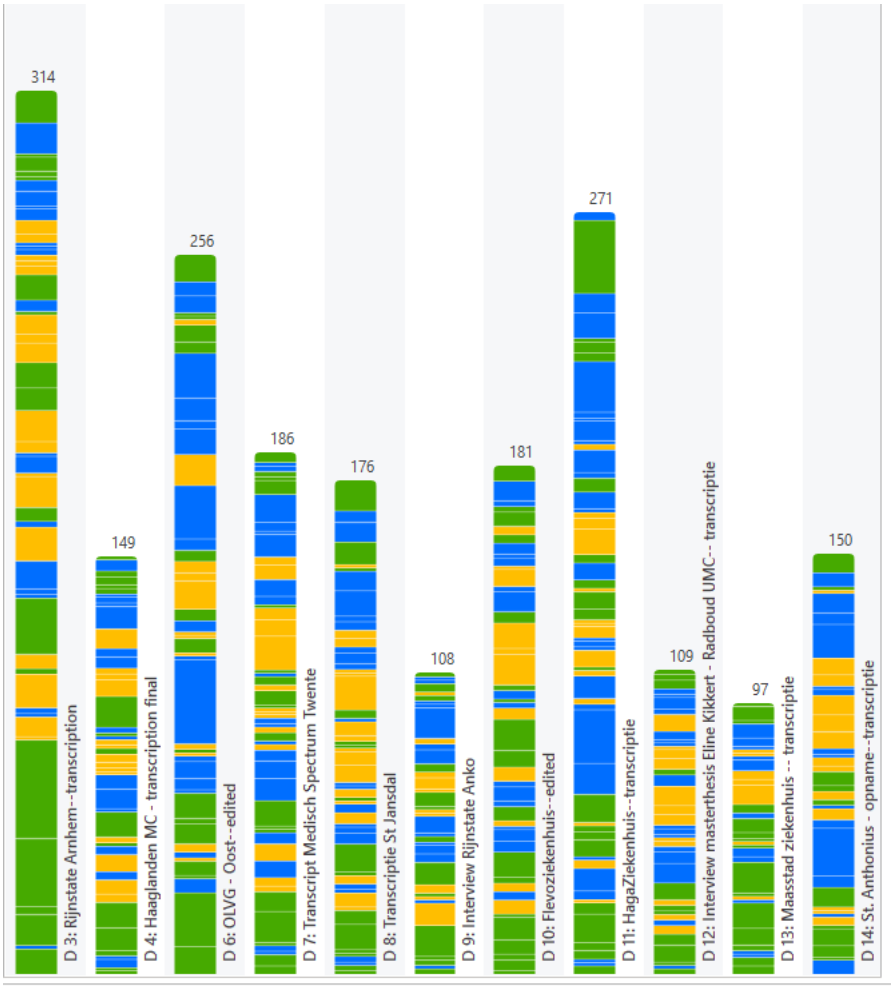

Figure 12, code distribution per document

Appendix E. Organisation sustainability

Name hospital	Green Teams (yes/no)	Sustainability manager (yes/no)	Sustainability in policy
Rijnstate	Yes	Yes	Yes
Haaglanden Medisch Centrum	Yes	No	Yes
Medisch Spectrum Twente (MST)	Yes	Yes	Yes
Radboud UMC	Yes	Yes	Yes
OLVG	Yes	Yes	Unknown
St. Jansdal	Yes	Yes	Yes
Hagaziekenhuis	Yes	No	Yes
Flevoziekenhuis	Yes	No	Yes
Maasstad Ziekenhuis	Yes	Yes	Yes
St. Antonius	Yes	Yes	Yes

Table 3, Overview organisation sustainability in the hospitals